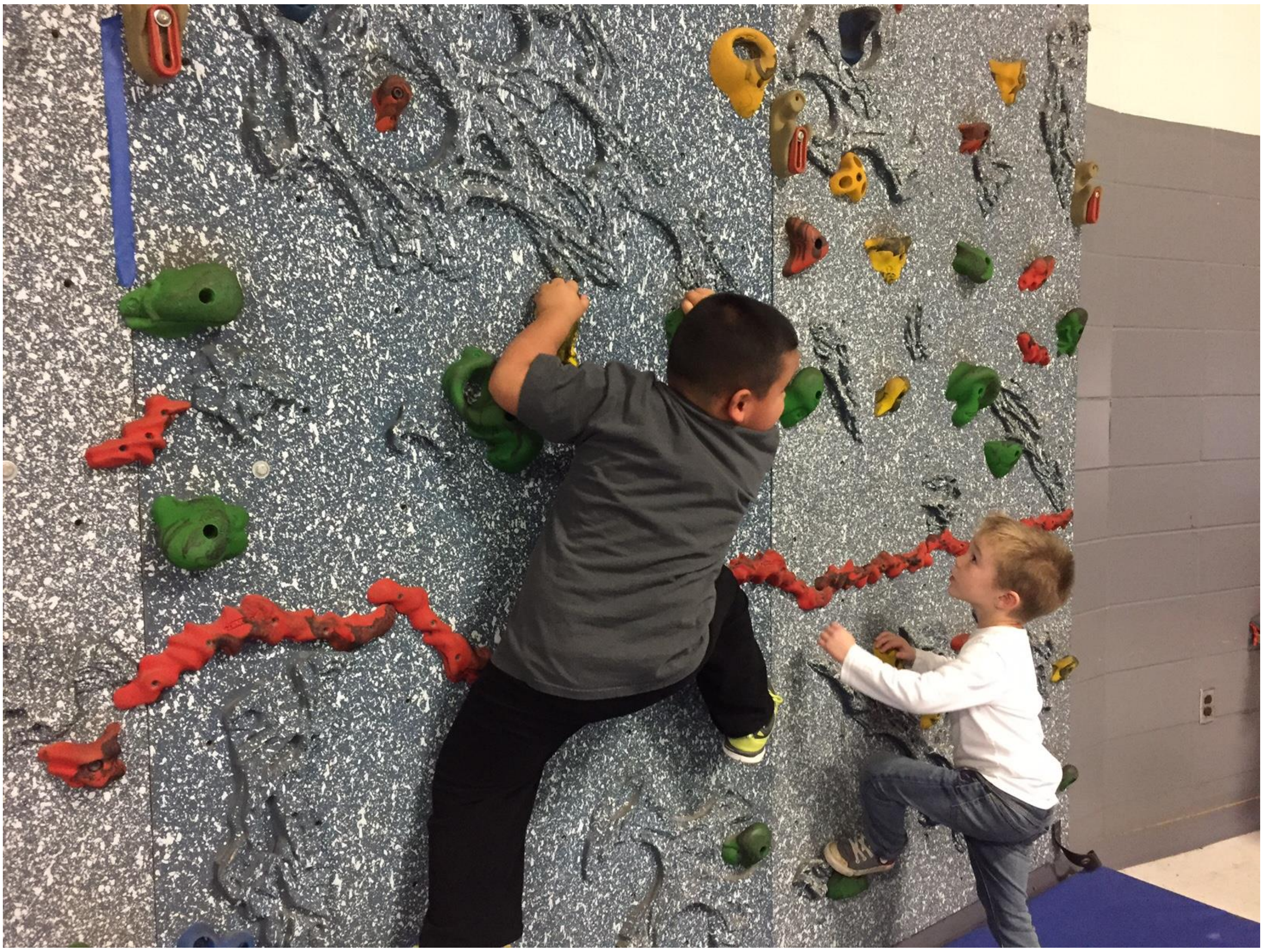
2017 Fall

Kentucky Association of Health, Physical Education, Recreation and Dance



You got to work!!

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A Message from the KAHPERD President

Greetings to our KAHPERD members and Journal readers! Thanks to Steve Chen and his team for publishing a high quality journal full of beneficial information. Also, thank you to the readers for supporting this publication. The Journal is created by many knowledgeable researchers and reviewed by some of our best professionals in Kentucky. Thank you to everyone involved with making this happen.

Sit back and enjoy the research provided for you this Fall!

Sincerely,

Deborah Campbell
Physical Education-Kirksville Elementary (Madison Co.)
President of Ky. Assoc. for Health, Physical Education, Recreation and Dance (KAHPERD) 2017

Acknowledgement

As the Editors of the KAHPERD Journal, we would like to show our appreciation to the following guest-reviewers for their assistance in reviewing this current issue.

Dr. Monica Magner, Morehead State University, Dr. Manuel Probst, Morehead State University, Dr. Louisa Summer, Berea University, Dr. John Stratman, Union College, Dr. Kristi King, University of Louisville, Dr. Travis Esslinger, Western Kentucky University, Dr. Jim Larkin, Eastern Kentucky University, Dr. AJ Mortar, Berea College,

Sincerely,

Gina Blunt Gonzalez, KAHPERD Journal Co-Editor
Steve Chen, KAHPERD Journal Co-Editor

KAHPERD Journal Submission Guideline

SUBMISSION OF A PAPER

The KAHPERD Journal is published twice yearly (spring and fall) by the Kentucky Association for Health, Physical Education, Recreation, and Dance. The journal welcomes the submission of empirical research papers, articles/commentaries, best practices/strategies, interviews, research abstracts (spring Issue only) and book reviews from academics and practitioners. Please read the information below about the aims and scope of the journal, the format and style for submitted material and the submissions protocol. Your work will more likely to be published, if you follow the following guidelines thoroughly.
Articles are accepted via an electronic attachment (must be in Microsoft Word format, doc or docx) through e-mail to the editor before the deadline dates. Submissions should be sent to either one of the co-editors, Gina Gonzalez: g.gonzalez@moreheadstate.edu or Steve Chen: s.chen@moreheadstate.edu
Deadlines: Spring issue—March 1 & fall issue—September 1

AIMS AND SCOPE

The main mission is to bring together academics and practitioners to further the knowledge and understanding of issues and topics related to health, physical education, sport administration and marketing, exercise science, sport coaching, dance, and recreation, etc. We encourage submissions relating to these topics from a variety of perspectives.

CONTENT

All articles should be written primarily to inform senior practitioners and academics involved in areas of health, physical education, recreation and dance.
Research articles should be well grounded conceptually and theoretically, and be methodologically sound. Qualitative and quantitative pieces of research are equally appropriate. A good format to follow would be: Introduction, Literature Review, Methodology, Results, & Discussion, Conclusion, and Implication. Articles may include an abstract of approximately 150 words including the rationale for the study, methods used, key findings and conclusions. Article should not exceed 10 single-spaced pages (not including references, tables, and figures).
Reviews of books and/or reports are welcome (around 1000-2000 words). Information concerning the book/report must be sent to the editor.
Interviews (it would be nice to discuss with the editor beforehand) and best practice/strategy papers of 1,500-3,000 words should be objective and informative rather than promotional and should follow the following format: Objective/Background/Discussion and Practical Implication.
Research abstracts (300 words or less) are welcome. The submitted abstracts should have been presented (either an oral or a poster presentation) in the KAHPERD annual conference in the previous year.
*The editors are keen to discuss and advise on proposed research projects, but this is no guarantee of publication.

FORMAT AND STYLE

Manuscripts should follow the form of the guidelines for publications outlined in the 6th edition of the Publication Manual of the American Psychological Association.
Tables, charts, pictures, diagrams, drawings and figures should be in black and white, placed on separate pages at the end of the manuscript. They must be submitted photo ready and reproduced to fit into a standard print column of 3.5 inches. Only one copy of each illustration is required, and captions and proper citations should be typed on the bottom of the table and diagrams. Jargon should

be reduced to a minimum, with technical language and acronyms clearly defined. The accuracy of any citations is the responsibility of the author(s).
For more specific style questions, please consult a recent edition of the journal.

SUBMISSIONS PROTOCOL

Submission of a paper to the publication implies agreement of the author(s) that copyright rests with KAHPERD Journal when the paper is published.
KAHPERD Journal will not accept any submissions that are under review with other publications. All manuscripts submitted will be peer reviewed by 3 members of the editorial board. To be accepted for publication in the journal, the article must be approved by no less than 2 of the 3 reviewers. Authors will normally receive a decision regarding publication within six to 12 weeks. Rejected manuscripts will not be returned.

KAHPERD
Kentucky Association for
Health, Physical Education, Recreation and Dance

(Peer Reviewed Article)

Social Media and Relationship Marketing in Community Sport

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Abstract

Using social media to meet relationship marketing goals continues to expand in professional and collegiate sport. Community sport organizations still struggle to implement social media into their marketing strategies. Using a case study design, this paper examines perceptions of social media use in relationship marketing within a rural community summer- baseball league. Research findings suggest team administrators believe using social media aids in building fan support, excitement, team awareness, and value. Teams also faced challenges as they attempted to integrate social media in to their marketing strategies, including a lack of knowledge, limited resources, use, post consistency, and content. This case demonstrates the value of social media in providing teams with an opportunity to build fan relationships.

Key Words: Relationship marketing, social media, community sport

Introduction

Limited discretionary income coupled with unlimited entertainment options curb a small-market team's ability to recruit new fans at all levels. Luker (2012) reported one fourth of avid sports fans have less discretionary income because of tough economic times. Fountain and Finley (2010) suggested the NFL could lose middle class fans citing from 1991 to 2009 the purchasing power of fans decreased while the Fan Cost Index (FCI), or average cost for a family of four to attend a contest, increased. The researchers warned that even with price variations within team markets, the league should be aware of the potential loss of the ticket revenue stemming from escalating cost and the baby boomer population aging. Future middle class fans may stop attending games, follow teams through media sources only, increase discretionary spending to attend games, limit family member game attendance, or change game day spending. This trend is also being felt at the colligate level as game attendance is decreasing (Hunn, 2013). Kim and Trail (2011) proposed a shift to relationship marketing so teams could mitigate the effects of economic conditions, market practices, and new technology. Online interactive-technology may also aid sport organizations in this efforts to connect with fans. Hopkins (2013) found even with inherent challenges to its use social media can be used to improve two-way communication between sport clubs and fans. Sashi (2012) suggests social media may provide organizations with capability to facilitate engaged and satisfied customers.

Advances in technology have provided sport organizations with many channels to engage their fan. Yadav and Varadarajan (2005) suggest as new technologies emerge, the ability to interact with consumers becomes easier. What was once a face-to-face communication; it may now take place through social media platforms. Yet, O'Shea and Alonso (2011) suggested professional sport organizations still struggle to implement these advanced technologies in a positive manner necessitating the need to understand social media as a marketing tool. Clavio (2011) found collegiate athletic departments are slow to adopt social media as a marketing tool. The communication sought by sport organizations to connect with fans aligns with relationship marketing. Relationship marketing focuses on developing long-term relationships between the sport organization and fan. This focus is on developing communication, interaction, meeting customer expectations, fulfilling promises, and creating value (Grönroos, 2000; Grönroos, 2004).

Relationship Marketing

Berry (2001) first coined the term relationship marketing in the eighties emphasizing the importance of the customer relationship. Grönroos (1994) later explained relationship marketing involves establishing, maintaining, and enhancing a relationship with customers. Relationship marketing begins by first attracting customers, and then building on that initial attraction through keeping your promises thereby developing a sense of trust. Organizations that sought to develop relationship marketing as a means to contact their customers directly maintain detailed customer files and emphasize customer service (Grönroos, 1996). Grönroos (2000, 2004) further developed his concepts of relationship marketing with an emphasis that was placed on communication, interaction, dialogue, and value. As organizations developed planned communications with customers, opportunities for interaction emerged. Sustained interaction between organization and customer facilitated a potential dialogue. Information from the interactions allowed organizations to align products or services to meet customer expectations. This in turn builds value. Researchers suggested successful relationship marketing requires a marketing paradigm shift in which the marketing function involves all organizational groups and focuses on long term relationships (Grönroos 1994; Gummesson, 1998; Grönroos, 2006).

To help assess social media platform use in relationship marketing, Abeza et al. (2013) outlined a framework of potential opportunities and challenges faced by organizations. Sport practitioners felt social media benefited the organization by providing opportunities to efficiently use resources, evaluate relationship status quicker, facilitate interactions and communication, and helped them better understand their customer. At the same time challenges existed. Practitioners expressed concerns over message control and credibility of information. Other concerns included message effectiveness, customer identification via online sources, and resource allocation.

To capture the nature of communication on Facebook and Twitter, Abeza and O'Reilly (2014) proposed 13 communication elements and three interaction elements. Communication elements focused on sharing of organizational information, positing videos, links, or pictures and videos. Interaction elements related to posts to platforms from users, interactions among user or organization-user interactions.

Social Media and Relationship Marketing

Social media serve as a new tool to complement traditional media sources of a fan's sport consumption (Vann, 2014). Today, individuals of all ages are embracing social networking. The Pew Research Center (2016) reported 79% of adults are on Facebook, 28% use Instagram, and 21% use Twitter. The emergence of new social media platforms provides additional opportunities for sport organizations to relationship market. Advances in social media return on investment (RIO) create a business environment that necessitates small business use and maintain social media platforms (Gehol & Dangelo, 2012). As a marketing tool, social media allows marketers to expose an organization's brand while identifying and building loyal customers (Beqiri, 2015).

Relationship marketing serves to strengthen relationships between team and fan. This benefits teams through increases in fan retention (Gray & Wert-Gray, 2012). Sashi (2012) connected relationship marketing, social media and fan engagement proposing the addition of social media in the marketing mix serves to increase customer engagement through the fan's ability to add value. By engaging customers, sport organizations may turn customers into avid fans. The use of social media as a relationship marketing tool is not without challenges. Waters, Burnett, Lamm, and Lucas (2009) found that majority of nonprofit organizations failed to understand how to incorporate the interactive applications available through Facebook. They concluded that organizations' need to refocus their social media efforts into relationship development. Lovejoy Waters, and Saxton (2012) suggested that social media provides an opportunity to engage stakeholders in dialogues yet nonprofit organizations continue to emphasize information sharing versus interactivity. Lovejoy et al. (2012) found the majority of nonprofit organizations do not fully use Twitter to engage stakeholders. Within their investigation, the examined Tweets still reflected one-way communication missing the opportunity to develop dialogues with their stakeholders.

Fan Use of Social Media

Beverland et al. (2010) suggested that understanding sport consumer behavior begins by understanding the motives behind brand consumption. Bee and Kahle (2006) emphasized a functional perspective to sport relationship marketing beginning with understanding why sport consumers entered and maintained relationships with sport organizations. Thus, how fans interact through social media platforms provides a starting point to examine challenges and opportunities they perceive with the use of social media in relationship marketing. As such, NBA fans' Facebook communication is motivated by passion, hope, esteem, and camaraderie (Stavros et al., 2014). While sport-related Twitter use filled four aims, including information, entertainment, passing time, and expressions of fanship (Witkemper, et al., 2012).

Investigations of single hashtags tied to sporting events suggested similar use motives. Blaszka et al. (2012) found #WorldSeries was predominately used by individuals not officially associated with the league, media, or companies to express fanship and interactivity. While those engaged via Twitter during the 2012 College World Series engaged in conversations calling the game, cheering their team, celebrating victories, and jeers or taunts (Smith & Smith, 2012). It is beneficial for those who seek to develop relationships with community fans to t develop hashtags. Smith and Smith (2012, p. 552) suggest through their selection of hashtags, users gathering around "virtual watercoolers: to interact with like-minded individuals from around the country. Motives for social sharing provided additional insights to sport marketers. Clavio and Frederick (2014) found collegiate sport fans engage in sharing sport event information to promote and encourage friend attendance.

A theoretical understanding of relationship marketing provided the underpinning of this case study. This is supplemented with a current understanding of sport organization and fan use of social media. Several investigations focused on professional sport applications, this investigation sought to understand the utilization of social media in relationship marketing at the community sport level.

Purpose and Research Questions

This investigation seeks to understand how teams in a collegiate baseball league, uses social media to accomplish its relationship marketing goals. The study extends existing social media and relationship marketing research (Abeza et al., 2013), through the examination of opportunities and challenges for social media's application in relationship marketing to a community sport setting. Additionally, the study explores the fan perspective of social media strategies aimed at relationship marketing
Four research questions shaped the investigation: (1) what opportunities do team leaders see associated with their use of social media to accomplish relationship marketing goals? (2) what challenges do teams leaders see associated with their use of social media to accomplish relationship marketing goals?(3) what opportunities do fans see for team leadership to use social media to accomplish relationship marketing goals?, and (4) what challenges do fans see for team leadership to use social media to accomplish relationship marketing goals?

Methodology

The investigation used a case study to explore the team's use of social media. Patton (1985) suggests a benefit of case study research occurs from the depth of understanding provided. The design allowed researchers to gain an in-depth understanding of how team leaders and fans viewed social media usage. The selected league included five teams playing in the Western Kentucky and Southern Indiana. Teams provided access to a sample of community sport organizations using social media in their marketing strategies. Geographical location allowed researchers easier access. Teams were organized as Limited Liability Company's (LLC) or 501c3s. Volunteers and part-time staff provided administrative leadership. Teams designated one-two volunteer or part-time staff responsible for their social media. The tradition of baseball within the communities ranged from three years to communities with rich baseball traditions beginning in the early 1900's. Individuals of all five teams working with social media agreed to participate in the study. Team leadership assisted with fan recruitment, suggesting potential fans that regularly attend games. Teams also allowed the researchers to post requests to participate in the study on their Facebook page. Facebook was selected, since all teams used this platform.

Trustworthiness was ensured through the triangulation of several sources of data (Yin, 2014) including semi-structure interviews of team leaders (N = 8) responsible for managing marketing/social, a selected group of fans (N = 9), and social media coding. Mining of existing social media and relationship marketing research provided the foundation for interview questions. An interview guide was used to help researchers pursue a line of reasoning while allowing additional topic exploration (Patton, 2002). Interview questions sought to understand team leadership and fan perspectives of social media use in team relationship marketing efforts.

Face-to-face or phone interviews lasted 35-40 minutes. With permission, interviews were recorded and transcribed. Researchers also took detailed interview notes and coded each team's Facebook interactions for one-month in-season. During this time the teams and fans generated 430 Facebook posts including team content sharing, posts of game dates and times, cancelations, game updates, upcoming events, and responses to fans. Fans shared limited content but did post questions, cheered for their team, or commented on content shared. Intercoder reliability was calculated using Holsti's reliability formula. The formula takes into consideration the number of coding decisions agreed upon by the coders and divides this number by the number of coding decisions per coder. Holsti's coefficient was .96. Acceptable coder reliability equal a coefficient of .90 or higher (Stacks, 2011). To determine emergent themes from interview data collected, researchers examined individual cases to predict similarities or contradictions based on the conceptual framework (Yin, 2014; Patton, 2002). Researchers then used the constant comparative method (Glasser & Strauss, 1967) to determine themes that were supported by the evidence (Yin, 2014). Within the results section, interviewees are referenced by their initials.

Results

The leadership team responsible for social media included volunteers or designated part-time staff members with different levels of relationships marketing and social media expertise. To overcome misunderstandings of concepts under investigation, the researchers divided opportunities into two perspectives—one from the team, and the other one from fans. All felt social media was a valuable tool, but admitted their use of social media could be better. Four of the five teams maintained an active Facebook presence. One team, shared they were revamping their social media and website. Overall, teams used Facebook to provide information with limited fan interaction.

Team Uses

Three opportunities for social media use emerged across cases. These included awareness, information/communication, and entertainment. All teams believed that social media provided an opportunity to create awareness with the community. Creating awareness was particularly important leading up to the season as a means to build excitement. Team leaders expressed a desire to "push out" more team information with some suggesting a "lot of community members did not even know about the team" (TN, 2015; TJ, 2015; MD, 2015; CP, 2015). Leadership also expressed a desire to promote the team's merchandise, host family opportunities, sponsorships, and events. Information and communication emphasized in-season communication. This included sharing game line-ups, rainouts, inning updates, upcoming events, and media coverage. Facebook information or online broadcasts allowed fans/family not in attendance to follow the game. Entertainment related to creating opportunities to share content. One team leader shared social media provides opportunities to "share videos, pictures of fans and game activities, or have silly contests on Facebook" (MD, 2015).

Team Opportunities

Teams reported three opportunities for social media's use in relationship marketing including building fan support and excitement, create awareness, and building value. Three teams suggested that building fan support by connecting with people was a main opportunity Facebook provided. One leader stated, "You are going to build fan interest when looking at it" (CP, 2015).Another stated, "I think we would build more team support. I think it's a matter of the people of the community embracing the team" (TN, 2015). A final informant suggested they posted uniform pictures on Facebook one month before opening day as a way to build support and excitement (CL, 2015).

Create awareness is closely related to building fan support. One leader felt the more information you "push out" the more awareness you created about the team (TN, 2015). Another spoke of a desire to let people know that the ballpark was "a fun place to be" (MD, 2015). They felt posting field or stand shots allowed people to share pictures and showed what was happening in the stadium. Building value was expressed from three perspectives. The teams felt providing game information, field shots, and upcoming events added value. Up-to-date information allowed fans to know where to get current and correct team information (TN, 2015; TJ, 2015; MD, 2015; CS, 2015). Others felt they could build value by interacting with fans through surveys (TJ, 2015). Leaders felt if they collected fan satisfaction information and addressed concerns fans would see team value their opinion when attending games. Social media use also built value for sponsors. One leader shared sponsor updates on Facebook added to sponsorship packages (CL, 2015). Sharing or liking posts gained sponsors more exposure. Another leader noted, "we're still in the process of highlighting those that bought on-field signage so we'll post a picture of their sign, thank them, and tag them in the hopes that it goes to their people" (MD, 2015).

Team Challenges

Knowledge, resources, and negativity/content control were main types of the challenges faced by teams using social media. Multiple teams suggested they were "just learning how it (social media) worked" or "the biggest thing is we don't know anything about it" and "I'll say it, I'm not on Facebook" (CS, 2015; CP, 2015). We're learning more, the team is learning more about using it" (TJ, 2015). Resource challenges stem from team organization structure. Only a few of the teams had a designated person to handle their organization's social media. A volunteer managed one team's social media. Another team added this responsibility to a part-time position with multiple marketing responsibilities. One leader felt the team needed a champion for social media, maybe an "intern who could run with it" (CS, 2015). Time was also a factor. During games it was difficult to handle marketing responsibilities, in game experiences, and update Facebook. After the season, it was also difficult to find the time to keep the team's page active. One team, concerned with negativity/content control, expressed concerns relating to how to handle negative responses and misinformation (CS, 2015).

Fan Opportunities

Fans shared four types of opportunities including sharing content, sharing general information, creating awareness, and exposure associated with social media use in relationship marketing. Fans believed Facebook provided an opportunity to share content including pictures, video clips, game updates, and the line-up. One fan suggested, "The more they share the more interested I am in following the team" (HM, 2015). Facebook also provided an opportunity to share general information, i.e. schedules, and upcoming events. Creating awareness included building a good fan base within the community. This meant keeping the page active throughout the year by sharing player recruitment information prior to the season to help build excitement. Exposure included opportunities to share what the team does for the community (HS, 2015; JB, 2015). Fans who shared social media provided an opportunity to share what the players do off the field. Fans also believe social media was a way to gain exposure for the players by sharing their bios, interactions with their host families, and successes (KC, 2015; CM, 2015; JB, 2015).

Fan Challenges

Fans shared (posted) five challenges faced by organizations when using social media. These included use, post consistency, resources, content, and knowledge. Fans perceived the fact that not all fans use social media as a challenge. One informant suggested the older fan base made using social media potentially difficult stating, "You know we have a lot of older people that come out to watch the team. They may not use Facebook (NP, 2015). Post consistency was defined as failing to post in a timely manner, not posting enough, and having a difficult time keeping posts going. Resources related to lacking time, not making use of Facebook a priority, and not having a designated person responsible for posting (KC, 2015; CM, 2015; JB, 2015). Content challenges included keeping the Facebook page fresh and handling negative responses (HS, 2015; JB, 2015). Knowledge challenges incorporated a lack of understanding of how to use Facebook effectively (KC, 2015; NP, 2015).

Discussion

Research findings are similar to McCarthy et al.'s (2013) findings that UK Football clubs all recognize the potential of social media yet fail to have a clear plan for utilization. Team leaders and fans both concur with Abeza et al. (2013) and Thompson et al. (2014) concerning resource challenge. Participating teams did not have the resources to designate one person solely responsible for social media. Instead, teams relied on volunteers, interns, or part-time staff members with several responsibilities. Thompson et al. (2014) suggested successful use of social media involved first understanding social media fundamentals within the industry. Success also involved understanding where social media fits within the organization, who will manage the organization's social media, and how success is defined. Like the National Sport Organizations (NSO) in the Thompson et al. (2014), teams within this case study experienced a social media knowledge gap. The gap ranged from understanding the tools available through Facebook to understanding how to use social media to engage their fans. Team leaders attributed their lack of knowledge to the newness of the technology, their age, generation, or changes made within the selected platform. Thompson et al. (2014) also suggested a fragmented organizational structure contributes to a lack of knowledge. In this case, each team determined their own use of social media. The league utilized a website with links to each team's individual homepage, but did not use social media. This, coupled with the small organizational structures and failure to utilize formal marketing plans, may contribute to challenges integrating social meeting into team marketing activities.
Abeza et al. (2013) proposed social media opportunities in relationship marketing goal achievement include better knowledge of customers, effective customer engagement, efficient use of resources, quicker evaluation of relationship status, and advances in customer-organization communication. Within this case study, teams and fans believe opportunities stemming from social media included building fan support and excitement, awareness, and building value. Teams or fans did not mention many of the opportunities

identified by Abeza et al. (2013) such as efficient use of resources, effective engagement of fans and participants, advance interactions among organization and customers, and develop a better understanding of customers. This may be a direct result of the team leaders' limited understanding of relationship marketing and knowledge of social media's use as a tool to interact with fans or lack of planning and formalization of marketing strategies involving social media.

A knowledge gap exists between what researchers define as best social media relationship marketing practices and what is implemented at the grassroots level. This may be the result of resources available to these organizations. A primary resource shortage related to organizational structure. Those working with the team's social media and marketing may not have formal marketing or social media training, and/or may fulfill other roles that restricted the time they could dedicate to fully understanding and incorporating social media effectively.

Some fan perspectives of opportunities and challenges aligned with and extended team leadership perspectives. Both agreed resource and knowledge challenges existed. Both agreed social media use provided the team with an opportunity to create awareness. The addition of the fan perspective may provide a springboard for teams to enhance their social media use. Fans suggested opportunities to share content might build the opportunity to create excitement and fan support. As one fan stated, "The more they share the more interested I'm in following the team" (HM, 2015). Fans were interested in what the teams/players accomplished on the field and their community involvement. Equally important is the consistent use of social media prior to, during, and after the season. Updates during the game were very important to each team's fan base.

Team communication through social media predominately focused on one-way sharing of content and general team information. This provided a starting point to begin interactions with fans but does not provided the true dialogue needed to create meaning and understanding central to relationship marketing. One team leader suggested the opportunity to interact with fans through surveys (TJ, 2015). This statement conveys the essence of relationship marketing; communicating, interacting, and creating a dialogue to meet fan expectations, create value, and enhances the customer relationship (Berry, 2001; Grönroos, 2004). However, this type of communication was lacking in this study. For teams to form relationships, interactions with their fans must improve. Teams should continue to share information and content while attempting to find ways to encourage fan interaction and sharing. Teams may also learn from strategies suggested by others. For instance, Thompson et al. (2014) suggested sport organizations seek to engage fans by using promotions or behind-the-scenes content. Within this case, fans felt promotions would generate social media engagement stating, "you know in order to boost the amount of friends you might try giveaways, you know a hat or tee-shirt, or something at the concession stand. You know something simple like that."

Team leadership and fans recognized that resource availability and knowledge of social media posed a significant challenge to the teams' use of social media. It is important that teams attempt to designate an individual to develop its social media. Within each community, local businesses actively using social media in their marketing initiatives may also serve as a resource for the teams. One fan suggested developing a social media committee composed of team leadership, community members, and interested business partners to assist teams in keeping their social media fresh and supportive of fan and team needs (JB, 2015). The Chamber of Commerce or community college may provide continuing education opportunities for team leaders seeking to understand how to use social media in their marketing efforts. Additionally, examining the challenges fans suggested provides these teams with a starting point to enhance their use of social media in their relationships marketing efforts.

Limitations and direction of future studies

The investigation's sample provides useful information for these small community organizations. However, the findings are not generalizable to all sport organizations as this investigation provides a snapshot of perceptions within the context of a specific sport league. The information provided by team leadership and fans provides a thick description of their perceptions. The sample size is limited by the number of teams in the league and fan base participation in the investigation. Finally, each team's use of volunteer administrative leadership may affect marketing and relationship marketing knowledge as backgrounds of key informants fulfilling roles varied greatly. Future research could use a longitudinal design to examine the team and fan use of social media in meeting relationship marketing goals allowing for the review of multiple seasons. Researchers should continue to examine how sport organization size and structure affect the use of social media in relationship marketing to examine the effectiveness of small grassroots sport organizations in meeting relationship marketing goals.

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(Peer Reviewed Article)

College Football Fans' Levels of Sponsor Awareness, Support and Recommendation

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Introduction

As the college football arms race continues, many Division-I Football Subdivision (FBS) athletic departments struggle to operate in the black. The costs associated with funding a successful football program have increased dramatically in recent decades as programs have spent on massive stadium construction and/or renovation programs and hired well-known coaches to bolster school reputation (Burden & Li, 2003) to attract top recruits, increase ASG donations (booster clubs), and become college football powers. A 2009 financial report of Division-I football programs was bleak: only 14 out of 120 Division I FBS athletic departments showed profits (Zimbalist, 2010). However, according to Thomas and Van Horn (2015), football ticket sales and other football-related revenue streams, including sponsorship agreements, constitute the majority of athletic departments' income. Without football programs, many college athletic departments simply couldn't operate. Consequently, revenue generation is a key activity and primary concern to athletic departments.

Corporate sponsorship has become an increasingly important source of revenue for collegiate athletic departments (Mullin et al., 2007; Howard & Crompton, 2004). As early as the 1990's, Ukman (1995) observed that sponsorship had to become a significant part of the promotion and marketing process of sport organizations. As of 2013, U.S. corporations were spending more than $20 billion annually on sport sponsorship and related activities (Jacobs et al., 2014). Sponsorship is now one of the most common marketing strategies in sport (Maxwell & Lough, 2009). From the standpoint of a university athletic department, sponsorship can be considered a revenue source of the highest-priority, as it requires very little energy and/or effort compared to other methods of revenue generation. From the perspective of the corporation, sponsorship in college athletics involves allocating scarce resources with the intent of achieving certain organizational objectives (Slack and Bentz, 1996); it can be seen as a strategic activity (Gilber, 1998) as well as a competitive advantage (Amis et al., 1999). Because sport consumers tend to have positive attitudes toward their favorite teams, corporations through sponsorship attempt to evoke similar opinions through their association with the team (Madrigal, 2001; Shaw & McDonald, 2006).

Several studies have shown that college football fans are typically more likely to recognize and support the sponsors of their teams (Dodd, 1997; Quester, 1997; Shannon & Turley, 1997). Stotlar (1993) suggested the top reasons that corporations sponsored college sport were an affiliation with the sports, access to intercollegiate athletics, media exposure, ticket access to NCAA championship events, and product/service exclusivity. The majority of mid-major athletic departments rely heavily upon local businesses to generate much-needed sponsorship revenue (Maxwell & Lough, 2009), so it is important for these smaller programs to provide their local and regional sponsors with data that justifies the monetary investment.

Sponsor Awareness & Recognition

Awareness of a sponsor is an accepted method to assess sponsorship program effectiveness (Donlan, 2014; Walsh et al., 2008; Miloch & Lambrecht, 2006). The fans' ability to recognize/recall a sponsor is critical to the purchasing process and is, therefore, foundational to sponsorship (Walsh et al., 2008). Because sponsor purchases cannot be made unless the fan is first aware of the sponsor's presence in a specific product category (Keller, 1993), sponsor awareness is crucial. Though sponsor awareness does not necessarily mean fans can recall a specific brand name, the individual must be able to recall sufficient distinguishing features to make appropriate purchases (Percy & Rossiter, 1992). Researchers typically identify two distinct types of brand awareness: brand recall/unaided recall and brand recognition/aided recall (Belch & Belch, 2012). Whereas brand/sponsor recall refers to consumers' abilities to correctly elicit a brand/sponsor name from memory when prompted by a specific product category, brand/sponsor recognition refers to the ability of consumers to correctly differentiate the brand when they come into contact with it (Keller, 1993).

Johar and colleagues (2010) reported that once sponsor awareness is present, higher-level processing is possible that can lead to desired outcomes such as image transfer (Gwinner & Eaton, 1999) and higher purchase intentions (Ko et al., 2008). However, without fan and consumer awareness of the sponsor, the sponsor's marketing objectives cannot be met (Biscaia et al., 2013). Because official sponsors pay premium prices and expect this status to result in increased purchase intentions of their product (Maxwell & Lough, 2009), the ability of participants at sporting events to properly recognize official sponsors is crucial. Therefore, researchers have examined this phenomenon in the sport context many times (Kohl & Otker, 1985; Madrigal, 2001; Meenaghan, 2001; Pitts & Slattery, 2004) and measuring the ability of spectators to recognize sport team sponsors remains a well-established and accepted method for assessing spectator awareness of sport sponsorships (Bennett et al., 2009; Maxwell & Lough, 2009; Bennett, 1999).

Sponsor Support

Support of sponsors, often measured as purchase intentions, has been explored extensively (Alexandris et al., 2007; Gwinner and Swanson, 2003; Madrigal, 2001). As noted earlier, there are several purposes of sponsorship agreements in sport. However, from the sponsor's perspective, program effectiveness is mainly evaluated by indicators related to product sales (Carrillat et al., 2005). Thus, sponsor support is crucial if these relationships are to be mutually beneficial. Harvery et al. (2006) found that sponsorship can change how consumers respond towards specific sponsors. Sport sponsorship can create positive fan attitudes towards sponsors that can lead to increased consumer willingness to buy the sponsor's products (Tsiotsou & Alexandris, 2009). In the sport context, the relationship between fans and the team/university can be further exploited because individuals who identify strongly with an organization will tend to commit to actions that support the organization (Javalgi et al., 1994). Additionally, greater identification with and support of a team can result in an individuals' willingness to engage in more consumptive behaviors (Fisher and Wakefield, 1997). Gwinner and Swanson (2003) found that individual differences of fans affected their levels of patronage with the teams' sponsors.

Sponsor Recommendation

It is important that the sponsor's message transcends the fan that is confronted with the specific message. Sponsors attempt to create links between the spectators and the sport team/event (Crimmins & Horn, 1996). According to Steyn (2009), one way to measure the strength of that link is the propensity of consumers to recommend a sponsor's brand. Additionally, his research supported the premise that sponsorship recognition was the driving factor behind the brand recommendation. That is, the most important link between the sponsor message and sponsor brand recommendations is sponsor recognition by consumers. Furthermore, the brand recommendation has been found to be a significant indicator of brand association (Steyn, 2009). Reichheld (2003) found that when customers act as references for a given brand, they do so because they believe in the brand; also, they tend to place their own reputation on the line. His conclusion was that highly-identified fans were key to sponsor success, as they were, are more likely to exhibit an array of desired sponsorship outcomes, including sponsor recognition, positive attitudes toward the sponsor, sponsor patronage, satisfaction with the sponsor, and sponsor recommendation (Reichheld, 2003).

The purpose of this investigation is to examine relationship between mid-major football college football fans' and the university's official sponsors. We develop, therefore, the following hypotheses to assess these relationships:
Hypothesis 1a-c: Demographic factors affect fans' levels of (a) importance of awareness of official sponsors, (b) support of official sponsors, and (c) recommendation of official sponsors.
Hypothesis 2a-c: Official sponsors recognition levels will be higher amongst fans who (a) are season ticket holders, (b) attend more home games annually, and (c) have higher self-reported fandom scores.

Methods

Participants

Data were collected at a mid-major college football tailgate in the southern U.S. The researchers incentivized graduate and undergraduate students to assist in the data collection efforts. A convenience sample technique was employed as the students approached tailgaters who donned the home university's colors and explained the purpose of the study. Though there were several thousand tailgaters present, a total of 339 surveys were collected. However, listwise deletion techniques used to address missing data left 334 surveys to be analyzed in this study. Male participants (n=171) accounted for 51.2% of the participants (females=163). Roughly 75% of the participants were 18-29 years of age. Fifty percent of the participants considered themselves to be very big fans (fandom level) of the football team, and 21% were neither alumni nor students (19.5% alumni; 58% students) of the university. Only 15% of the study participants were season ticket holders. Finally, 31% of the participants attended 0-2 games per year, whereas over 60% attended 3-5 games a year.

Data Analysis

There were two primary types of analyses used in this study. For Hypotheses 1a-c, we conducted logistic regression. Logistic regression models are often used in population studies where the dependent variables are categorical and allow researchers to predict discrete outcomes (Kutner et al., 2006). That is, the model can be used to estimate the probability of a binary response based on one or more predictor variables, or features (Amemiya, 1985). Thus, we regressed the seven demographic independent variables of interest onto three dependent variables: (a) the importance of sponsor awareness, (b) sponsor support, and (c) Sponsor recommendation. This model was estimated by the method of maximum likelihood.

Additionally, we tested Hypotheses 2a-c with a series of t-tests (six categorical variables) and an ANOVA (one continuous variable) to discover potential mean differences in independent variables as they relate to official sponsor recognition levels. Participants were given a survey with divided into nine consumer categories (apparel, credit cards, etc.). Each category listed two dummy sponsors and one official sponsor of the university's sport teams. The directions asked the participant to circle the official sponsor. The correct answers for each category were added together (0-9); that number represented the participant's level of official sponsor recognition.

Results

The results of the t-tests comparing self-reported fan level and sponsor variables are shown in 1. Results indicate those fans with higher levels of fandom were more aware of sponsors, more supportive of sponsors, and were more likely to recommend sponsors. Because Levene's Test for Equality of Variances was significant, (p-value < 0.001), we conclude that the variance in fan levels of sponsor awareness, sponsor support, and sponsor recommendation is significantly different. This tells us that we should look at the "Equal variances not assumed" row for the t-test results. Thus, the mean levels of fans that are aware of sponsors, support sponsors, and recommend sponsors are significantly different from those who are not aware of, support or recommend sponsors.

Table1. Results of t-tests comparing Sponsor Awareness, Recommendation and Support on fan levels

Fan Awareness	N	Mean	SD
Aware	176	4.42	.838
Not Aware	158	3.66	1.208
Fan Support			
More likely	198	4.44	.821
Less likely	136	3.51	1.211
Fan Recommendation			
More Likely	182	4.49	.785
Less Likely	152	3.55	1.195

N= 334; F-value (Awareness) = 38; F-Value (Support) = 38; F-Value (Recommendation) = 45
P-value for all grouping variables are $p < 0.001$.

The Importance of Official Sponsor Awareness

In the first logistic regression model, we regressed age, gender, the number of games attended annually, level of fandom, and statuses as alumni, student, and season ticket holder on official sponsor awareness (Table 2). An omnibus test of model coefficients was conducted to test the full model with all seven predictors. It was found to be statistically significant with Chi-square value of 66.953 (df = 7, n = 334, p < 0.001). In addition, the Hosmer and Lemeshow Test statistic yielded a Chi-square of 9.527 (df = 8, p = 0.300), indicating that the model estimates fit the data at an acceptable level (> 0.05). The Nagelkerke R-square indicates that 24.2% of the variance in the independent variables is explained by the predicted variable. The regression showed that 76.1% of the respondents who were predicted to be aware of official sponsors were aware; it also showed that 57% of the fans that were predicted to be unaware of official sponsors were unaware. Overall, the logistic regression model accurately assigned 67.1% of the sample to the correct category.

Table 2: Logistic Regression 1. Predicting Importance of Official Sponsor Awareness

	B	S.E.	Wald	df	Sig.	Exp(B)
Gender	-.720	.245	8.624	1	.003	.487
Age	.905	.395	5.258	1	.022	2.472
Fan	-.606	.133	20.798	1	.000	.545
Alumni	-.465	.358	1.687	1	.194	.628
Student	-.667	.371	3.220	1	.073	.513
Season Ticket Holders	-.778	.398	3.816	1	.050	.459
Attendance	.111	.308	.129	1	.719	1.117
Constant	2.602	.694	14.042	1	.000	13.496
Variable(s) entered on step 1: Gender, Age, Fan, Alumni, Student, Season Ticket Holders, Attendance						

The official sponsor awareness logistic regression resulted in several important findings. First, males are 105% more likely than females to consider official sponsor awareness important. Respondents who were older (30+) were 147% more likely to consider official sponsor awareness important. Also, the odds of a fan finding official sponsor awareness important increased 27% with each level of fandom. Finally, season ticket holders are 117% more likely to consider official sponsor awareness important. We conclude, therefore, in support of Hypothesis 1a, that gender, age, level of fandom, and status as a season ticket holder were significant in the logistic regression model for the importance of official sponsor awareness.

Official Sponsor Support

In the second model, we regressed age, gender, the number of games attended annually, level of fandom, and statuses as alumni, student, and season ticket holder on official sponsor support (Table 3). An omnibus test of model coefficients was conducted to test the full model with all seven predictors. It was found to be statistically significant with Chi-square value of 64.328 (df = 7, n = 334, p < 0.001). In addition, the Hosmer and Lemeshow Test statistic yielded a Chi-square of 8.068 (df = 8, p = 0.427), indicating that the model estimates fit the data at an acceptable level (> 0.05). The Nagelkerke R-square indicates that 23.6% of the variance in the independent variables is explained by the predicted variable. The regression showed that 85.9% of the respondents who were predicted to support official sponsors were actually official sponsor supporters; it also showed that 49.3% of the fans who were predicted to not be official sponsor supporters were not, in fact, official sponsor supporters. Overall, the logistic regression model accurately assigned 71% of the sample to the correct category.

Table 3: Logistic Regression 2. Predicting Official Sponsor Support

	B	S.E.	Wald	df	Sig.	Exp(B)
Gender	-.255	.249	1.052	1	.305	.775
Age	.479	.399	1.436	1	.231	1.614
Fan	-.881	.139	40.322	1	.000	.414
Alumni	.124	.357	.120	1	.729	1.132
Student	-.153	.369	.170	1	.680	.859
Season Ticket Holders	-.267	.393	.462	1	.497	.766
Attendance	-.245	.318	.596	1	.440	.783
Constant	3.125	.703	19.759	1	.000	22.760

Variable(s) entered on step 1: Gender, Age, Fan, Alumni, Student, Season Ticket Holders, Attendance

The logistic regression for official sponsor support resulted in one significant finding. The odds of supporting an official sponsor increased 39% with each level of fandom. Therefore, in support of Hypothesis 1b, we conclude that level of fandom was the only significant factor in the logistic regression model for official sponsor support.

Sponsor Recommendation

Finally, we regressed age, gender, the number of games attended annually, level of fandom, and statuses as alumni, student, and season ticket holder on official sponsor recommendation (Table 4). An omnibus test of model coefficients was conducted to test the full model with all seven predictors. It was found to be statistically significant with Chi-square value of 74.268 ($df = 7$, $n = 334$, $p < 0.001$). In addition, the Hosmer and Lemeshow test statistic yielded a chi-square of 12.587 ($df = 8$, $p = 0.127$), indicating that the model estimates fit the data at an acceptable level (> 0.05). The Nagelkerke R-square indicates that 26.7% of the variance in the independent variables is explained by the predicted variable. The regression showed that 76.2% of the respondents who were predicted to recommend official sponsors did so; it also showed that 63.8% of the fans predicted not to recommend sponsors did not recommend official sponsors. Overall, the logistic regression model accurately assigned 69.5% of the sample to the correct category.

Table 4: Logistic Regression 3. Predicting Official Sponsor Recommendation

	B	S.E.	Wald	df	. Sig	Exp(B)
Gender	-.047	.250	.036	1	.850	.954
Age	.790	.402	3.855	1	.050	2.203
Fan	-.888	.142	39.066	1	.000	.411
Alumni	.325	.359	.823	1	.364	1.385
Student	-.003	.374	.000	1	.993	.997
Season Ticket Holders	-.401	.389	1.062	1	.303	.670

Attendance	.166	.317	.276	1	.599	1.181
Constant	2.817	.705	15.981	1	.000	16.730

Variable(s) entered on step 1: Gender, Age, Fan, Alumni, Student, Season Ticket Holders, Attendance

The official sponsor recommendation logistic regression resulted in two important findings. First, respondents who were older (30+) were 120% more likely to recommend official sponsors. Second, the odds of recommending official sponsors increased 41% with each level of fandom. Thus, in support of Hypothesis 1c, we conclude that age and level of fandom were significant in the logistic regression model for official sponsor recommendation.

Sponsor Recognition

T-tests assessed whether statistical differences existed in official sponsor recognition level means between (a) those participants who were season ticket holders and those that were not season ticket holders (Hypothesis 2a), and (b) those who attend more home games annually (3-5) and those who attended fewer home games (0-2; Hypothesis 2b). In addition, an ANOVA was performed to discover potential differences in the recognition of official sponsor means based on self-reported fandom scores (Hypothesis 3). Table 5 shows the results of the means tests.

Table 5: Sponsor Recognition

	Mean	N	SD
Fan			
Not Very Big Fan	5.56	9	2.07
Not Fan	5.33	24	1.27
Fan	5.20	64	1.40
Big Fan	5.26	77	1.33
Very Big Fan	5.33	160	1.64
Attendance			
0-2 Attendance Per year	5.37	105	1.39
3-5 Attendance per Year	5.26	229	1.56
Season Ticket Holder			
Season Ticket Holder	5.46	50	1.50
Not a Season Ticket Holder	5.27	284	1.51
Total	5.30	334	1.51

Contrary to previous literature (Walraven et al., 2014; Maxwell & Lough, 2009; Dodd, 1997), statistical differences were not realized in any of the groups. That is, season ticket holders, those that attended more home football games, and those with higher fandom levels did not recognize official sponsors at significantly higher rates. Thus, support for Hypotheses 2a, 2b, and 2c was not found.

Discussion and Conclusions

The purpose of this study was to examine how college football fans' demographics affect official sponsors of their university's sport teams. This exploratory study examined mid-major college football fans and related to myriad aspects of sponsorship. Because costs in athletic departments continue to rise and they are dependent upon both fans and corporate sponsors on sustaining operations, it seemed necessary to explore this relationship.

There were two significant findings in this study. First, this study found the three logistic regression models tested could be used to predict the dependent variable from the independent variables. That is, the models predicted (a) the importance of sponsor awareness given gender, age, level of fandom, and status as a season ticket holder (Hypothesis 1), (b) sponsor support based on level of fandom (Hypothesis 2), and (c) Sponsor recommendation given age and level of fandom (Hypothesis 3). The second important outcome was that official sponsor recognition levels were static across all groups in the study.

The level of fandom was the only significant predictor of sponsor support. This is an interesting finding as past research has produced mixed sponsor support results (Dietz et al., 2012; Dodd, 1997; Quester, 1997; Shannon & Turley, 1997; Bucklin & Gupta, 1992). Only those who self-rated themselves as high-level fans were more likely to support official sponsors. This finding agreed with Javalgi et al.'s (1994) research that suggested sponsor sales could be bolstered by certain demographics. Though it should be noted this does not take into account whether or not those high in fandom measures actually purchased official sponsor products, this result supports the prior research of many who suggest sponsorship does indeed connect with sport team fans (Gwinner and Swanson, 2003) and increase support for their products and services (Madrigal, 2001; Carrillat et al., 2005; Harvey et al., 2006). Athletic administrators are therefore tasked with creating marketing strategies and platforms that are more engaging and help fans identify more closely with their teams, thereby increasing their likelihood of supporting official sponsors and potentially increasing the value of these sponsorships. This can be accomplished by building strong, positive, and unique consumer beliefs about the team (Breuer & Rump, 2011).

The level of fandom and age were significant predictors of sponsor recommendation. Recommending sponsors is extremely important, as some researchers have observed that word-of-mouth recommendations from friends and acquaintances are a factor in up to 50% of purchase intentions (Buttle, 1998). Older participants and high-level fans were more likely to recommend official sponsors' products and services to others. This is consistent with previous research (Stein, 2009; Reicheld, 2003) on sport fans and sponsors. Thus, sponsors can create programs that identify those who are fans of a given sport team of which they are official sponsors. Creating positive customer experiences with (potentially) high-level fans leads to higher behavioral reactions of those fans towards sport sponsors (Branscombe & Wann, 1991), of which sponsor recommendation is one (Gwinner & Swanson, 2003).

As for the importance of sponsor awareness, four demographic variables were predictive: gender, age, the level of fandom, and status as season ticket holder. That is, fans that were male, over thirty years of age, season ticket holders, and reported higher levels of fandom felt it was important to be aware of the official sponsors of the university's sport teams. However, when comparisons of means tests were performed, no differences were discovered between any groups in the study. This was inconsistent with the findings of several previous studies (e.g. Gwinner & Swanson, 2003) that all supported the premise that highly identified fans are more likely to exhibit several positive outcomes related to sponsorship, including sponsor recognition. Though males felt it was more important to be aware of official sponsors, their awareness levels were not statistically different from females; though older fans stated it was important to be aware of official sponsors as opposed to their younger counterparts, they recognized no more official sponsors than the younger participants; even though participants with higher levels of fandom felt it was more important to be aware of sponsors than those with lower levels of fandom, their aided recall of official sponsors was not higher; although we found season ticket holders felt it was important to be aware of official sponsors, they did not outperform non-season ticket holders in aided recall.

Given the results show a great inconsistency between those who think it is important to be aware of official sponsors and those who actually recognize the official sponsors, there are interesting implications. It's possible that this particular study (n=334) was simply too small and lacked power. It could be, however, that males, older participants, those who held season tickets, and those with higher fandom levels were educated in collegiate sponsorship to the extent that they knew awareness of official sponsors should be important, even though they were not actually aware of who those official sponsors were. This is somewhat perplexing and potentially problematic for sponsors, though it would not be the first time that sponsorship research revealed ill-fated results (e.g. Hoeck et al., 1997). Although sponsorship is often an appropriate vehicle through sponsors build brand equity, this brand-building success is not guaranteed based on a variety of factors (Donlan, 2014). If this is indeed the case, sponsors must increase both on-site activation strategies, overall awareness strategies (Bennett et al., 2009), as well the overall quality of the sponsorship program to combat these inconsistencies. As Breur and Rumpf (2011) observed, desired sponsor outcomes depend on both the quantity and quality of consumer exposure to sponsor messages, as well as the environmental conditions.

Limitations of the Study

There were several limitations associated with this study. The data collected was a convenience sample from one particular event in one specific location. Thus, caution should be used when interpreting the results as generalizability is lacking. In addition, convenience samples are challenging because they can often lead to sampling bias when the participants are not representative of the larger population. There is also the possibility that the football fans sampled at this particular tailgate are different from the fans those that chose to stay home and not attend. In addition, the fans of a single mid-major football team were used in the study. Further, these surveys were collected from tailgaters who were participating in pleasant activities in a festive atmosphere, many of whom were surrounded by friends, family, and colleagues. Participants who rushed through the surveys in order to resume socialization may have failed to fully read directions, questions, and/ or answer items truthfully.

Future Research

This study was exploratory in nature and sought to better understand the relationship between college football fans and official corporate sponsors of a university's sport teams. Thus, more studies that utilize the proposed model should test whether the results can be replicated with football fans from other universities. It might also be interesting to sample those fans that choose not to come to college football tailgating events, but instead, go straight into the game or stay home and consume the games on television or radio. Still, other studies might attempt to add more independent variables to the model, such as race, ethnicity, and income and education levels to discover whether these increase the overall predictability of the model. Finally, because this study was conducted with a regional, mid-major university, it may be important to utilize this survey with fans from larger universities whose teams play in more prominent conferences.

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(Peer Reviewed Article)

Can an Elastic Band Resistance Training Program Increase Muscular Strength?

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Abstract

The purpose of this paper is to determine if an elastic band resistance-training program is effective in producing improvements in muscular strength comparable to traditional resistance training programs such as free weights and weight machines. The low cost, portability, and accessibility of elastic bands make them ideal for at home resistance programs which may increase the likelihood of adherence to a training program. There appears to be evidence in the research literature to indicate elastic band resistance programs can serve as a less expensive, more portable, more accessible, and safer alternative to traditional resistance training programs (free weights and weight machines) where the goal is to increase muscular strength (Nyberg, et.al., 2014; Colado & Triplett, 2008; Brubaker, 2009). Additional research is needed to determine if an elastic band training program is an appropriate and effective mode of strength training for various demographics groups such as teens, special needs, senior adults, and others who may be unable to utilize free weights or weight machines as a training option.

Key Words: *Elastic Bands, Strength Training, Muscular Strength*

Introduction

Muscular strength is the ability of a muscle or muscle group to exert maximum force against a resistance with a single contraction (Xiao, Kang, & Zhuang, 2016). An increase in muscular strength has been shown to improve an individual's quality of life, activities of daily living, and musculotendinous integrity as well as increase bone strength which in turn reduces the risk of fracture and the development of osteoporosis (Xiao, Kang, & Zhuang, 2016; Sundstrup, et.al., 2014; Martins, et.al., 2013). Furthermore, increasing muscular strength is vital to maintaining an individual's functional health and independence (Lin et al., 2015; Martins et al., 2013; Colado & Triplett, 2008).

In order to increase muscular strength, individuals typically participate in traditional resistance training programs. These traditional programs include using free weights and weight machines, which have produced an increase in muscular strength (Jakobsen et al., 2013). Often, access to weight machines requires having a membership to a fitness facility or purchasing machines for at-home use. Both of these options can be fairly expensive (Colado & Triplett, 2008). Also, some individuals do not have enough self-confidence to begin an exercise regimen at a public fitness facility. Those who do feel comfortable usually discontinue training before the conclusion of the first year. On average, an estimated 50% of participants drop out of formal exercise programs within the first year (Colado & Triplett, 2008). Thus, it is imperative to identify alternatives to traditional resistance training program that do not place high financial demands on an individual, is highly accessible, offers a high level of comfort, and produces desired results.

Elastic resistance in the form of elastic bands (also known as thera-bands, resistance bands, elastic tubing) is a more affordable alternative than exercise machines and free weights and may have the capacity to increase muscular strength (Nyberg, et.al., 2014). Elastic bands come in a wide variety of resistance levels, each indicated by a different color (Simoneau et al., 2001). Unlike free weights, the direction of an elastic band's resistance is dependent on the orientation of the band and not on gravity (Colado et al., 2010; Colado & Triplett, 2008). This characteristic allows for bands to be placed in any plane and still produce the same resistance which results in exercises that are more versatile and ergonomic (comfortable) (Colado et al, 2010). Simply changing the width of one's grip allows for utilization of a larger range of motion both concentrically and eccentrically as well as allows an exercise to be completed in a safe and controlled manner (Colado & Triplett, 2008). The comfort and safety aspects of elastic bands put minimal stress on the body's joints. Elastic bands also prevent joint damage usually seen in those who lift heavy weights during tradition resistance programs (Brubaker, 2009).

Elastic bands may be used as a replacement for free weights and weight machines in a resistance training program or may be used in conjunction with these traditional training programs (Shoepe, et.al. 2011). The low cost, portability, and accessibility of elastic bands make them ideal for at home resistance programs which may increase the likelihood of adherence to a training program. The purpose of this paper is to determine if an elastic band resistance-training program is effective in producing improvements in muscular strength comparable to traditional resistance training programs such as free weights and weight machines.

Producing Resistance Using Elastic Bands

The resistance of elastic bands does not depend on the length of the band but rather depends on the elastic constant (k) and the percent elongation (X) of the elastic band (Melchiorri & Rainoldi, 2011; Guex, Daucourt, & Borloz, 2015; Simoneau et al., 2001). Furthermore, an elastic band with a larger constant will have more resistance. Similarly, an elastic band stretched to a larger percent of its resting length has a larger amount of resistance. The varying amount of resistance is indicated by different colorings of the elastic bands. For example, elastic bands made by Thera Band are available in yellow, red, green, blue, black, silver, and gold (Guex, Daucourt, & Borloz, 2015). The resistance of each band can be measured in kilograms and/or pounds that are sometimes included on the band itself, such as those on Bodylastics bands (Guex, Daucourt, & Borloz, 2015).

Since the resistance of elastic bands is dependent on the elastic constant and percent elongation and not gravity like free weights, the resistance is present in the vertical plane, throughout the range of motion, and in the horizontal plane (Melchiorri & Rainoldi, 2011). For example, when preforming a simple bicep curl using free weights (dumbbells), once the end of the movement is reached and the dumbbell is near the shoulder there is little to no strength involved (Melchiorri & Rainoldi, 2011). However, when doing this same exercise with an elastic band, tension in the elastic band increases over the entire movement

(Simoneau et al., 2001). Thus, once the end of the range of motion is reached there is an increased amount of tension.

The increasing tension throughout an exercise does not mean the resistance is increased but rather implies an elastic band is stretched and demands more force to keep it elongated (Brubaker, 2009). Furthermore, the active muscle(s) must produce a force from the beginning of a movement to the end of a movement in order to overcome tension of the band. The result of this demand is an overload of a muscle. Overloading a muscle causes the muscle fibers to become damaged and therefore be repaired to become stronger than they were before (Brubaker, 2009).

Elastic Band Resistance Training Programs

Elastic bands are very versatile and can be incorporated into a resistance-training program in many different ways. For instance, as previously mentioned, for those who do not have access to a fitness facility or do not feel comfortable exercising in a public setting then elastic bands can be used as an alternative for free weights and weight machines typically found in fitness clubs (Nyberg et al., 2014).

Replacing Weights with Elastic Bands

The use of elastic bands as a modality of a resistance-training program is a fairly new concept. The idea of replacing free weights and weight machines with elastic bands has gained popularity due to the low cost, portability, versatility, and the low amount of stress put on the body's joints (Sundstrup et al., 2014). Elastic bands are typically found in rehabilitation facilities due to their ability to aid in strengthening the small muscles of the body such as the muscle of the neck, shoulders, and arms needed to recover from injury (Sundstrup et al., 2014; Jakobsen et al., 2013). Despite the fact elastic bands have been shown to increase the strength of these smaller muscles, elastic bands have not yet become a widely accepted form of resistance training because their effectiveness to increase strength of larger muscles is still being investigated (Sundstrup et al., 2014; Jakobsen et al., 2013). However, research has tested the proficiency of elastics bands and their effect on larger muscles of the body including the biceps brachii, hamstrings (semitendinosus, semimembranosus, and biceps femoris), quadriceps (rectus femoris, vastus lateralis, vastus medialis, and vastus intermedius), and gluteals (gluteus maximus, gluteus medius, and gluteus minimus) (Jakobsen et al., 2013).

Electromyography

A number of research studies have investigated the effects elastic band resistance training has on larger muscle include an analysis of muscle activity during popular exercises such as a bicep curl, squat, back extension, row, and lunge (Jakobsen et al., 2013; Sundstrup et al., 2014; Colado et al., 2010; Melchiorri & Rainoldi, 2011). The muscle activity was measured using Electromyography (EMG). EMG indicates what percentage of the maximal muscle activity is utilized during the movement. An EMG activity of 60% or greater during a movement indicates physiological adaptations such as strength gain, neural adaptation, and muscle fiber hypertrophy are feasible (Sundstrup et al., 2014). A study conducted by Sundstrup and others (2014) tested the EMG activity during a lunge performed with dumbbells, the leg press machine, and elastic resistance. Results indicated while performing a lunge with elastic bands there was 66% max EMG in the gluteals and greater than 80% max EMG in the quadriceps; therefore, it can be inferred lunges with elastic bands will produce physiological adaptations including an increase in muscular strength. The study concluded lunges performed using elastic resistance are a practical, portable, and easy-to-use alternative to traditional training exercises, ideal for home-based programs with no traditional strength training machines. However, higher EMG activity in the quadriceps was found during the lunges with the machine and free weights making it a recommended modality over elastic bands to build strength in the quadriceps (Sundstrup et al., 2014).

A similar study conducted by Jakobsen and others (2013) tested EMG while performing lunges with dumbbells and elastic bands. The results were similar to the previous study. The EMG of the hamstrings remained constant during the dumbbell lunge whereas the elastic band lunge EMG activity increased once the knee joint got closer to reaching full extension. This particular result showed there was a difference in muscle activation when using the two different modalities. The use of elastic bands produced a lunge that is more posterior kinetic chain-dominant compared to the dumbbell lunge. This result aligns with the results Sundstrup (2014). The study also concluded lunges performed with elastic resistance appear to stimulate a variety of leg and hip muscle groups, which makes it effective for thigh, hip, and back strengthening and thereby an ideal exercise modality for the rehabilitation and prophylactic prevention of musculoskeletal disorders (Jakobsen et al., 2013).

Similarly, Melchiorri & Rainoldi (2011) conducted a study to test the biceps brachii EMG during exercise with elastic bands and weights. A machine was built where the participant could add either elastic bands or weighted plates to create the desired resistance. The study concluded greater muscle activity (the amplitude of the EMG signal) was found when elastic resistance was used with respect to free weight lifting (Melchiorri & Rainoldi, 2011).

Rate of Perceived Exertion and Targeted Number of Repetitions

Some studies have compared elastic band resistance training programs and traditional weight training programs by applying the same Rate of Perceived Exertion in the Active Muscles (RPE-AM) and the Targeted Number of Repetitions (TNRs). The REP-AM is measured using an OMNI Resistance Exercise Scale. A study by Colado & Triplett (2008) tested the effects of a training program on two groups: elastic band group and weight machine group. The types of exercises were kept constant as well as the TNRs and RPE-AM. Doing so ensured the amount of resistance was kept constant whether due to weighted plates or elastic bands. The body composition and muscle function of all participants were evaluated before initiation of the training programs and after completion of the programs. It was concluded when intensity is controlled as it was in the study with RPE-AM and TNRs training using elastic bands can be just as effective as training with weight machines. Another conclusion was elastic band resistance training produces adaptations similar to those with weight machine training in the early phases of strength training as long as perceived exertion through OMNI-RES AM and TNRs are taken into account (Colado & Triplett, 2008).

Research by Colado and others (2010) assessed participants’ ability in a squat, back extension, and rowing using either elastic bands or weight machines/free weights. Results revealed the elastic band group showed a 14.07% increase when preforming a squat, 19.87%

increase in rowing, and 14.41% increase in the back extension which was comparable to the weight machine/free weight group whose increases were 28.88%, 19.76%, and 14.00% respectively. It was concluded using elastic tubing in strength training in young, physically active women was effective and was able to yield results equivalent to those obtained using weight machines and free weights.

Conclusion

There appears to be evidence in the research literature indicating elastic band resistance programs can serve as a less expensive, more portable, more accessible, and safer alternative to traditional resistance training programs (free weights and weight machines) where the goal is to increase muscular strength (Nyberg et al., 2014; Colado & Triplett, 2008; Brubaker, 2009). It is important to note when using elastic bands as an alternative to free weights and weight machines, the exercise intensity must be closely monitored and controlled such as with OMNI-RES AM and TNRs in order to acquire the desired increase in muscular strength (Guex, Daucourt, & Borloz, 2015; Colado & Triplett, 2008).

Studies indicated elastic bands are a relevant tool for increasing muscular strength in many different demographics that included young and physically active women, perimenopausal period women, elderly, and adults (both male and female) with and without musculoskeletal pain (Colado et al., 2010; Xiao, Kang, & Zhuang, 2016; Martins et al., 2013; Sundstrup et al., 2014). An elastic band training program for older adults has the ability to increase muscular strength, functional health, quality of life, and help maintain their independence (Lin et al., 2015; Martins et al., 2013; Colado & Triplett, 2008).

Greater hamstring and gluteal EMG activity was observed in the participants who performed a lunge exercise with elastic bands in comparison to participants who used free weights (dumbbells) (Sundstrup et al., 2014; Jakobsen et al., 2013). Therefore, elastics bands have been shown to be more effective than free weights and weight machines when training the posterior kinetic chain (hamstrings and gluteals) by performing a traditional lunge exercise. Furthermore, increased activity was seen in participants who used elastic bands to perform a biceps curl when compared to bicep curls on a weight machine (Melchiorri & Rainoldi, 2011). In contrast, free weights and weight machines remain the recommended equipment for increasing quadriceps strength due to greater muscle activation (Sundstrup et al., 2014).

In summary, elastic bands have been proven to be effective resistance tools for increasing muscular strength of the larger muscles of the body including the gluteals, hamstrings and biceps brachii. Furthermore, some exercises (especially those training the posterior kinetic chain) showed higher EMG activity than free weights and weight machines. Elastic bands are an inexpensive, easy-to-use, safe, and comfortable alternative to traditional resistance training programs when exercise intensity is controlled with TNRs and OMNI-RES AM and can produce similar neurological and physiological adaptations including an increase in muscular strength.

Additional research is needed to determine if an elastic band training program is an appropriate and effective mode of strength training for various demographics and such and teens, those with special needs, senior adults, and others who may be unable to utilize free weights or weight machines as a training option.

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(Peer Reviewed Article)

The Addition of Electrolytes to a Carohyrdate-Based Sport Drink: Effect on Continuous Incremental Exercise Done against Progressively Greater Workloads

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Abstract

In a randomized double-blind study, subjects (n = 34) performed two workouts on a cycle ergometer to estimate their VO_2 max. Workouts were preceded by intake of a 2% sucrose solution, one of which was an electrolyte-rich sport beverage (Outlast; Houston, TX) while the other was devoid of added electrolytes and served as a placebo. Heart rates (HR) were recorded before, at four times during, and after workouts. A rating of perceived exertion (RPE) was provided at the end of workouts. There were significant inter-time differences for HR. RPE and VO_2 max each had inter-gender differences. Per dependent variable there were no inter-treatment differences. While little research exists on the ergogenic effects of formulations with the electrolyte and carbohydrate concentrations of Outlast, our results concur with prior study outcomes that noted a lack of inter-treatment differences. Our study's environmental conditions and the types of subjects examined may have also contributed to the lack of an ergogenic effect.
Key Words: VO_2 max, rate of perceived exertion, heart rate, ergogenic aid

Introduction

Sport beverage ingestion, to offset performance impairments seen with exercise, aids many forms of physical activity. Beverages with both carbohydrates and electrolytes are thought to be best, as the former increases fluid intake, while the latter helps retain plasma volume; such beverages may abate exercise-induced heart rate increases and limit the risk of dehydration (Hoffman, 2015; O'Neal, 2013). Yet questions persist as to the ideal beverage composition to enhance performance and abate heart rate increases. Beverages with formulations unlike commercial drinks may have different impacts on physiology and warrant inquiry. Commercial sport drinks have carbohydrate concentrations between 4-10% solution, along with Na^+ and K^+ levels that range from 0-23 and 0-10 mmol · l^{-1} respectively (Coombes, 2000; Kalman, 2012). Prior studies noted such beverages improved exercise performance versus water- or no fluid-treatments (El-Sayed, 1997; Maughan, 1996; Nikolopoulos, 2004). Yet their drawbacks include delayed gastric/duodenal fluid absorption, which is due to their high osmolality from large carbohydrate contents (Coyle, 2004; Maughan, 1989).

Intake of high volumes of sport drinks may also evoke hyponatremia. Drinks low in electrolytes exacerbate Na^+ losses and increase the risk of hyponatremia (Coyle, 2004; Hoffman, 2015). While disagreement exists on the amount of electrolytes needed in drinks (Coombes, 2000; Rehrer 2001), hypotonic carbohydrate beverages may enhance fluid and electrolyte absorption due to their low osmolality (Gisolfi, 1992). Therefore, drinks with more Na^+ to prevent hyponatremia, but lower carbohydrate concentrations to enhance their osmolality, may limit fluid absorption delays and hasten plasma restoration. Heart rate increases may be abated when such drinks are ingested with exericse (Coyle 2004; Hoffman, 2015).

A supplement (Outlast; Houston, TX), with carbohydrates in the form of sucrose, may improve water and Na^+ absorption. When mixed with 236 ml of water, Outlast provides carbohydrates at a concentration of 2% solution. Yet one serving has more Na^+ and K^+ than many beverages (Coombes, 2000). While many beverages were tested for their ergogenic effects, those with Outlasts' electrolyte and carbohydrate concentrations have received little attention (Peacock, 2013). Since low osmolality and high Na^+ levels may enhance plasma restoration and keep heart rates low (Coyle 2004; Hoffman, 2015), inquiry about this novel supplement is warranted.

Presumably to elicit intra-study differences and ergogenic effects, prior electrolyte-based investigations had treatments, or exposed subjects to conditions, whose risks may be deemed excessive. They include long or arduous exercise bouts (Kingsley, 2014; Linesman, 2014; McRae, 2012; Russell, 2012), fluid restriction before or during workouts (Peacock, 2013), warmer exercise environments (Hoffman, 2015), or fluid deprivation concurrent to long-term activity (Peacock, 2012; Roberts, 2012). Before such conditions are adopted for Outlast trials it is first worthwhile to note if intra-study differences occur under less stringent conditions; that way ergogenic effects may be attributed more to the supplement, and are less a function of extreme exercise/hydration/environmental situations. The purpose of our pilot study is to assess the impact of added electrolytes from Outlast on physiological and perceptual responses to continuous incremental exercise against progressively greater workloads. We hypothesize Outlast will improve responses moreso than workouts with a placebo that provides the same carbohydrate concentration but without added electrolytes.

Methods and Materials

Institutional Review Boards at the Universities of Tulsa and Louisville each approved our protocol for data collection at each site. College-age subjects (13 men, 21 women) provided their informed written consent, as well as filled out a medical questionnaire to affirm they were in good health. A double-blind repeated measures placebo-controlled design was used to test our hypothesis. Subjects made three laboratory ($22\text{-}23^{o}$ C, 40% humidity) visits spaced 7-14 days apart. Our laboratories' environmental conditions were like those of a prior sport drink study (Desbrow, 2004). First visits entailed collection of subject's anthropometric data, and their familiarization to our exercise protocol and equipment.

First Laboratory Visits

We obtained the following anthropometric data: height, body mass, body fat percentage, upper and lower leg lengths. Heights were measured to the nearest 0.1 cm. Body mass and body fat were measured from a bioimpedance scale (Tanita; Tokyo, Japan). Upper and lower leg lengths were assessed in triplicate and averaged for analysis with a cloth tape using established methods (Del Prado-Lu, 2007). Upper leg lengths equaled the distance from the left hip's anterior superior iliac spine to the lower border of the left femoral condyle. Lower leg lengths spanned the distance from the left leg's fibular head to its lateral malleolus. Subjects were then familiarized with the chest and wrist straps monitors used to record heart rate, as well as our cycle ergometers (Ergotest; Stockholm, Sweden). Subject's ergometer settings were recorded and used for testing. First visits lasted 25-30 minutes.

Second and Third Laboratory Visits

Subjects underwent identical procedures for their second and third visits, which occurred between 1300-1700 hours. They were also told to arrive for laboratory visits well rested and consume the same pre-workout meal before those visits to further limit potential sources of variability. To begin those visits subjects ingested 236 ml of a beverage with either one serving of the placebo or Outlast mixed in water. One serving of Outlast had: 1 mg of vitamin B-12, 500 mg of vitamin C, 100 mg of Mg^{+2}, 400 mg of K^{+}, 200 mg of Na^{+} and 1 µg of Cr. The remainder of the drink contained sucrose in 2% solution. When mixed with water, the placebo provided sucrose in 2% solution without the electrolytes found in Outlast. The placebo, made by the Outlast Corporation, was identical in taste and appearance as the supplement. Before the start of our study, the composition of the Outlast supplement and placebo were verified by an independent laboratory, whose members were not part of our investigative team. They found no undeclared substances.

The placebo and Outlast beverages were consumed in a randomized fashion. Non-investigators held the double-blind coding and distributed the powders to the researchers so that neither they or the subjects knew what treatment was given per laboratory visit. Only after all data collection concluded was the coding for all subjects broken. Subjects received the same absolute dose of the placebo and Outlast. After beverage consumption subjects wore a chest and wrist monitor (Polar; Hauppauge, NY) and sat quietly for 20 minutes after which a resting heart rate value was recorded. Since this was done for both the second and third visits, resting heart rates were obtained before rides done under the placebo and Outlast conditions. Subjects then sat on an ergometer to perform a YMCA bicycle test, which had four three-minute exercise stages that ran consecutively. Data from each stage permitted direct comparison between the placebo and Outlast treatments. The first stage was done against 0.5 kiloponds of resistance. Subsequent stages were more difficult as resistance was increased based on heart rate values obtained at the end of the first stage. Yet we also recorded heart rates at the end of each subsequent stage. Our heart rate measurement procedures are an accurate means to obtain such data from continuous incremental exercise done against progressively greater workloads (Harper, 2016; Linesman, 2014).

Throughout each stage, subjects pedaled in cadence with a metronome at 50 rpm. VO_2 max estimates were calculated based on YMCA bicycle test guidelines, which note a linear relationship between heart rate and oxygen uptake during steady-state exercise (El-Sobkey, 2015). At the end of the fourth stage resistance was reduced to 1.0 kilopond as subjects continued to pedal at 50 rpm for seven minutes. At the end of the seven-minute cool-down period a recovery heart rate was obtained. Subjects then provided a rate of perceived exertion (RPE) value to rate the workout's rigor, which was recorded on a 1 (very easy) to 10 (very hard) scale. The final two visits each lasted 45 minutes. RPE, heart rate and estimated VO_2 max values from workouts were used for statistical analysis.

Statistical Analyses

Power analysis revealed, due to the large effects sizes common to exercise interventions, our sample was large enough to proceed with the current study's statistical analyses (Keppel, 1992). Data were examined for assumptions (normality, independence, homogeniety of variances) to ANOVA computations. Anthropometric values were assessed for inter-gender differences with t-tests. Data from the second and third visits were assessed for their compliance to ANOVA assumptions. Heart rates were examined with a 2x2x6 ANOVA, with repeated measures for treatment and time. Estimated VO_2 max and RPE were each assessed with a 2x2 ANCOVA, with repeated measures for treatment. Body mass and body fat percentage were each examined as covariates to our ANCOVA computations. Scheffe's post-hoc identified the source of our significant differences. A 0.05 alpha denoted significance for our analyses.

Results

Each subject completed all three visits and our ANOVA assumptions were met. Table 1 shows our anthropometric results. There were significant inter-gender differences for each anthropometric variable except upper leg length. Among the significant anthropometric variables, only body fat percentage did not see higher values in men. With body mass as a covariate, ANCOVA identified significant inter-gender (men > women) differences for estimated VO_2 max (Table 2). With body fat percentage as a covariate, ANCOVA identified a trend for inter-gender (men > women) differences in estimated VO_2 max (Table 3). Neither ANCOVA computation for estimated VO_2 max, whether body mass or body fat percentage was the covariate, saw significant inter-treatment differences. Table 4 shows non-significant differences in RPE when body mass was the covariate. Yet with body fat percentage as a covariate, ANCOVA identified significant inter-gender (men < women) RPE differences (Table 5). Heart rate results show significant time differences (Table 6). Post-hoc analysis revealed the following temporal differences: stage 4 > stage 3 > stage 2, recovery > stage 1 > pre-exercise. Tables 1-6 show raw values per dependent variable. Estimated VO_2 max and RPE (Tables 2-5) data provide adjusted mean values per covariate.

Discussion

Our double-blind repeated measures placebo-controlled design is appropriate for the assessment of Outlast ergogenic effects. Before Outlast is assessed in subjects exposed to extreme exercise/hydration/environmental stressors, it is first worthwhile to note what, if any, impact it has under less stringent pilot study conditions. With a study design and sample that meets power analysis requirements, our results reflect the merits of Outlast under the aforementioned experimental conditions. Our results concur with outcomes that compared various beverages on heart rate and RPE values (Harper, 2016; Kingsley, 2014; Linesman, 2014; O'Neal, 2013). Many studies that provided beverages during long-term exercise saw no significant inter-treatment heart rate and RPE differences (Harper, 2016; Kingsley, 2014; Linesman, 2014; O'Neal, 2013). Heart rates correlate to exercise workloads, regardless of a person's hydration status (Desbrow, 2004; El-Sobkey, 2015). Our temporal heart rate differences are typical for continuous incremental exercise done against progressively greater workloads irrespective of the treatment administered. Our lack of significant inter-treatment heart rate differences concurs with several (El-Sayed, 1997; Gisolfi, 2001; Maughan, 1996), but not all (Khanna, 2005), studies on this topic.

No significant inter-treatment heart rate differences occurred in subjects who did two 1-hour cycling bouts, and ingested either a carbohydrate-rich or placebo drink 25 minutes before rides (El-Sayed, 1997). Another study examined different beverages over five cycling workouts and saw non-significant inter-treatment heart rate differences over the last 45 minutes of the rides (Gisolfi, 2001). In randomized double-blind studies, subjects performed multiple cycling rides as they drank a beverage whose composition differed with other solutions under inquiry, yet resulted in no significant inter-treatment heart rate differences (Maughan, 1989; Maughan, 1996). Running and cycling studies also saw no inter-treatment heart rate differences when drinks were given during (Harper, 2016; Kingsley, 2014; Linesman, 2014; McRae, 2012; O'Neal, 2013; Russell, 2012), or after (Kalman, 2012) exercise. Our non-significant inter-treatment heart rate data concur with prior results.

In contrast to current and prior results, evidence exists significant inter-treatment heart rate differences can occur (Khanna, 2005). Ten men performed two runs. For the first run no fluids were provided, but during the second they ingested 100 ml of a 5% carbohydrate-electrolyte drink and then 100 ml of a 12.5% carbohydrate-electrolyte fluid post-exercise. The carbohydrate-electrolyte drinks led to significantly lower heart rates during and after exercise, versus runs done with no fluids. While multiple reasons likely led to inter-treatment heart rate differences, the most probable cause is the discrepancy in fluid/carbohydrate/electrolyte intakes for those runs (Khanna, 2005).

In addition to temporal heart rate differences, our results show gender-based differences for estimated VO_2 max and RPE. Our estimated VO_2 max results, with higher values seen in men, concur with prior outcomes. Men had significantly higher absolute, and relative to their body mass, VO_2 max values when measured from graded exercise (Warren, 1990). With respect to RPE, leg and arm ergometry data showed men had lower absolute values from submaximal exercise than women, despite attaining higher peak workloads (El-Sobkey, 2015). Endurance runs revealed women perceived the exercise as more difficult for a given absolute speed (Garcin, 2005). Thus precedent exists for our gender-based estimated VO_2 max and RPE differences.

Despite current heart rate, estimated VO_2 max and RPE results, we cannot affirm our hypothesis, as added electrolytes did not yield an ergogenic effect above and beyond that from a 2% sucrose (placebo) solution. Evidence exists that supports and contradicts our results. Contradictory evidence comes from studies in which treatments or fluid volumes were vastly different. In contrast we assessed equal volumes of similar (in taste and appearance) drinks in order to preserve our double-blind assignment. Studies that saw ergogenic effects also used more rigorous and/or longer exercise protocols. Research that saw ergogenic effects compared experimental drinks (with electrolytes and carbohydrates from ~6-10% in solution) to placebos or no fluids during long-term (70-120 minute) exercise. Experimental drinks better maintained blood glucose and abated performance losses during long-term exercise as compared to placebo/no fluid treatments, yet did not yield inter-treatment heart rate or RPE differences (Kingsley, 2014; Linesman, 2014; McRae, 2012;

Roberts, 2012; Russell, 2012). Our results also yielded non-significant inter-treatment heart rate and RPE differences; yet for exercise and fluid treatments far different than ours, ergogenic effects are more likely.

Hydration strategies, administered both before and during exercise, were assessed for their impact on performance (Anantaraman, 1995). Subjects did three 60-minute workouts. In a randomized double-blind fashion, they received one of the following treatments at each workout: pre-exercise glucose polymer (10% in solution) with placebo administration during exercise, the glucose polymer given both before and during workouts, and the placebo given both before and during exercise bouts. There were no differences until 40 minutes into workouts, whereby exercise that included the glucose polymer before and placebo during exercise produced significantly higher work values (Anantaraman, 1995). It was concluded the polymer's high osmolality likely impaired water/Na^+ absorption during exercise which negated an ergogenic effect.

Other studies saw ergogenic effects due to the duration and rigor of exercise, as more arduous workouts raise the risk of dehydration such that the type of fluid ingested has more impact on performance. Subjects performed 1-hour cycling bouts, and ingested either a carbohydrate-rich (8% solution) or placebo before rides (El-Sayed, 1997). Significantly better performances were seen with the experimental treatment that was attributed to greater carbohydrate oxidation and reduced fatigue (El-Sayed, 1997). A 6.4% carbohydrate-electrolyte drink, at volumes equal to 8% $ml \cdot kg^{-1}$, concurrent to cycling bouts led to a 13% greater ride time than a water-only treatment (Nikopoulous, 2004). Yet some research shows small inter-treatment differences. Studies with two 1-hour cycling rides revealed concurrent intakes of 7.6% (Jeukendrup, 1997) or 6% (Desbrow, 2004) carbohydrate-electrolyte drinks had no ergogenic effect as compared to placebo-based rides, which was attributed to the variability in performance, as the coefficient of variation for cycle ergometry tests is ~ 3% (Jeukendrup, 1997).

Finally, with a formulation the most like Outlast of all the beverages discussed in this paper, the merits of 2% carbohydrate-electrolyte drinks were assessed for their impacts on performance, physiology and perceptual responses (Peacock, 2012; Peacock, 2013). One study compared a 2% carbohydrate-electrolyte drink to water; subjects restircted their fluid intake 24 hours before they performed multiple 20-minute exercise bouts (Peacock, 2013). The other required subjects perform workouts as they received one of three treatments ad libitum: a 2% carbohydrate-electrolyte drink, water, or no fluid intake (Peacock, 2012). In addition, they had a choice to ingest the type of carbohydrate-electrolyte drink that tasted best to them for use during that workout. Results showed subjects drank more of the carbohydrate-electrolyte drink, which in turn improved performance, hydration and blood glucose levels versus the other treatments. Yet in agreement with our results, both studies showed non-significant inter-treatment heart rate differences (Peacock, 2012; Peacock, 2013).

If our study had greater inter-treatment differences and/or more rigorous exercise, we may have seen an ergogenic effect. Electrolyte-based drinks may be best under certain exercise/environmental conditions and/or types of subjects, such as those who are dehydrated (Montain, 1998). Sweat-induced Na^+ losses typically range from 20-80 $mmol \cdot l^{-1}$ (Coyle, 2004). Higher Na^+ losses increase the risk of cramping; in such persons added dietary Na^+ before and during exercise is recommended (Coyle, 2004). Thus Outlast may benefit persons prone to muscle cramps as they exercise, which may not be practical or safe to test, even under carefully controlled laboratory settings. Nonetheless to best understand the merits of Outlast, new research, perhaps under more stringent exercise/hydration/environmental conditions, is warranted.

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Table 1. Anthropometric data (mean ± sd) of our subjects. Asterisks denote significantly ($p < 0.05$) higher values and an inter-gender difference per dependent variable.

	Men	Women
Height (cm)	180.0 ± 9.4*	167.2 ± 5.8
Body mass (kg)	88.3 ± 10.9*	65.6 ± 7.8
Body fat percentage	13.6 ± 4.1	22.8 ± 7.2*
Upper leg length (cm)	44.9 ± 3.2	44.3 ± 3.3
Lower leg length (cm)	43.7 ± 3.3*	39.8 ± 4.5

Table 2. Estimated VO_2 max (mean ± sd; in $ml \cdot kg^{-1} \cdot min^{-1}$) values with subject's body mass as a covariate. Asterisks denote significantly ($p < 0.05$) higher values and inter-gender differences.

	Men	Women
Outlast	46.0 ± 10.4*	35.8 ± 6.1
Placebo	45.5 ± 10.1*	36.1 ± 6.1

Table 3. Estimated VO_2 max (mean ± sd; in $ml \cdot kg^{-1} \cdot min^{-1}$) values with subject's body fat percentage as a covariate.

	Men	Women
Outlast	44.6 ± 10.4	36.7 ± 6.1
Placebo	44.1 ± 10.1	37.0 ± 6.1

Table 4. RPE (mean ± sd) values with subject's body mass as a covariate.

	Men	Women
Outlast	5.7 ± 1.4	5.2 ± 1.4
Placebo	5.7 ± 1.8	5.4 ± 1.8

Table 5. RPE (mean ± sd) values with subject's body fat percentage as a covariate. Asterisks denote significantly ($p < 0.05$) higher values and inter-gender differences.

	Men	Women
Outlast	4.8 ± 1.4	5.8 ± 1.4*
Placebo	4.8 ± 1.8	6.0 ± 1.8*

Table 6. Heart rate (mean ± sd; in $beats \cdot min^{-1}$) values. Letter superscripts denote significant ($p < 0.05$) inter-time differences.

Pre-exercise	Stage 1	Stage 2	Stage 3	Stage 4	Recovery
73.0 ± 7.0[a]	92.3 ± 8.7[b]	118.2 ± 8.7[c]	136.2 ± 9.4[d]	151.2 ± 9.5[e]	116.7 ± 9.1 [c]
women: 78±10 men: 68±9	women: 101±12 men: 86±11	women: 125±12 men: 110±7	women: 146±16 men: 124±12	women: 162±16 men: 135±16	women: 127±18 men: 104±9

e > d > c > b > a

(Peer Reviewed Article)

Experiential Learning in an Afterschool Parkour Program

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Introduction

Most children do not regularly participate in physical activity due to sitting in the classroom for hours and then after school consumed with mobile devices, texting, participating in social media, playing video games and streaming videos and television shows (Shape America, 2016). This increase in inactivity has caused more children to become obese with the rate having tripled since the 1970s. Obesity has been linked to chronic diseases such as cancer, type 2 diabetes, and heart disease (Fryer et al, 2014). Physical activity has been shown to increase self-esteem, improve mental and cognitive health, improved cardiovascular endurance, bone health and muscular fitness (Institute of Medicine, 2013). Despite all of the benefits, physical activity programs are being cut from the curriculum in schools. According to the Shape of Nation Report (2016) on the status of physical education in the United States, only eight states require physical education in middle and elementary schools. In response to the reduction of funding for physical education programs, schools are seeking innovative ways to increase physical activity among youth to help reduce obesity (Kun, 2010 and Debate et al, 2009). Quality after school programs are a viable option for promoting physical activity in youth. (Connor, Fryer, Fryer, & Drake, 2009; Coleman et al., 2008; Yin et al., 2005; Jordan & Nettles, 1999).

Physical activity comes in many forms. Parkour is gaining in popularity as a sport in the United States. Parkour, from the French meaning the art of moving, originated approximately 17 years ago in a suburb of Paris, by David Belle (Bavinton, 2007). Parkour uses obstacle courses designed for strength training, speed, and stability. Each obstacle works a different component of fitness by training the body to move efficiently as the athlete progresses through it. Typically, parkour athletes can move freely while climbing, leaping, vaulting, or running. Parkour is a noncompetitive sport where the challenge is with one's own abilities (Gilchrist & Wheaton, 2011). Alternative sports, like parkour, are on the rise and are beginning to replace traditional team sports (Gilchrist & Wheaton, 2011). In Canada, Tremblay and Williams (2003), suggests children gained more from participating in an unorganized sports rather than participation in organized sports. Parkour is a sport for everyone and has attracted participants who had previously shown little interest in sport, especially team games (Grabowski and Thomsen, 2014). Parkour allows for play, which is important for all ages both mentally and physically (Health Fitness Revolution, 2014).

Due to the attraction to youth, schools have introduced parkour into physical activity lessons and after school clubs (Gadea and Jacobs, 2016). According to Gadea and Jacobs (2016), the most common place to practice parkour outdoors is the school playground using rocks, curbs, walls, trees and benches as obstacles. The school setting is also ideal for practicing parkour indoors. Use of agility ladders, plyo boxes, hurdles, rock wall, mats, and ropes can be parkour obstacles. Parkour promotes creativity and fitness regardless of the resources (Gadea and Jacobs, 2016). According to Grabowski and Thomsen (2014), parkour is a non-competitive and flexible physical activity, which varies in difficulty levels based on the individual student abilities.

A study done by Fernadez-Rio and Surez looked at views and feelings of twenty-six sixth grade students who participated in a physical education parkour unit. Four themes emerged from the study: enjoyment, social skills, problem solving, and cooperation. The authors concluded parkour could be a fun, safe alternative unit in physical education. According to Health Fitness Revolution (2014), parkour builds self-confidence, core strength, quick thinking skills, agility, power, balance, speed, coordination and reaction time, bone strength and cardiovascular endurance, confidence and creativity.

Implementing alternative forms of physical Activity

The challenge when trying to introduce a new method of movement education is the cost to purchase specialized equipment. While an activity like lacrosse is novel and has both fitness and skill related benefits, the equipment cost and need for a safe open space limits its feasibility as a potential activity selection. This is a strength of parkour training. With a basic set of equipment, often already part of a traditional physical education program, a variety of challenging obstacles can be created and scaled to the ability of the child.

The program described in this article was funded by an internal student-centered grant, and was awarded to an undergraduate exercise science student and two mentors in the Kinesiology and Sport Department, both of whom had organized and implemented other after-school programs. The funding allowed for the purchase of equipment specifically dedicated to the parkour program. The elementary school where the program took place did not own many of the items budgeted in the grant, but additional equipment including basketballs or volleyball were available, if necessary. The elementary school considered us visitors, so the grant-funded equipment was brought out to the school each day and taken back to the university campus after the session. Table 1 identifies the equipment purchased and how it was used to create a simulated parkour environment. In addition, an alternative piece of equipment is suggested if a school does not have not the pieces listed available. Table 2 provides an early sample training session. In later weeks, skills were combined, for example, balance beam walking followed by hurdle hops followed by squats weighted with small medicine balls.

Space considerations are also less of a concern when compared to traditional sport (basketball, volleyball, or kickball) gymnasium based activities. Parkour can be safely performed in gyms, hallways, classrooms, or on playgrounds. The environmental flexibility also makes our modified version of parkour weatherproof. Many areas of the country are limited by weather conditions that do not allow for outdoor activity during extended parts of the year. The nature of parkour allows for modification to any available space. Our program experienced many of the weather challenges during the 12 weeks. The program began during the university’s spring academic semester so activities were restricted to mostly indoors until the last few weeks of the program. An unexpected obstacle was the number of times the gymnasium was reserved for a special event, program, or practice even after receiving permission to use the gymnasium over the entirety of the 12 weeks. Parkour’s versatility is best demonstrated when ideal situations are not available. On many occasions, the training was held in an alternative location on very short notice. Other traditional forms of activity are less adaptable. In an "open gym" model a variety of activities can be used to meet the needs of many of the participants, but if the gym is not available, then the afterschool program is often cancelled. If the program is cancelled enough times the rate of dropout is likely to increase because parents need to be confident that the program will always be available. Even with the unexpected loss of the gym on several occasions, all 24 of the scheduled Tuesday and Thursday sessions were held with high attendance rates. The only drop off in attendance was seen in the final 2 weeks due to the beginning of the spring baseball and softball leagues.

Personal Perceptions

The program was a highly successful community service out-reach, as well as, a practical experience for the group of university students who participated in the implementation of the program. Many pre-professional (Pre-Occupational Therapy and Pre-Physical Therapy) exercise science majors are looking toward careers working with children, but find opportunities to only shadow in clinical settings. While none of the elementary students within the programs were in need of rehabilitative therapy, the exercise science students found it beneficial to work with this age group. Bringing college students to an elementary school to work with the children did require them to submit to background check before being involved with the project. This is a relatively easy procedure, but the time to get clearance must be considered when offering this type of program. A secondary benefit, which may also be considered a minor recruiting initiative, was that on several occasions the elementary students were able to visit the campus Recreation, Fitness and Wellness Center to use the pool and climbing wall facilities. These were highlight events for the children and an early opportunity to show off the campus to potential local students and parents.

Observations of participant social interactions

Having run other unique programs with elementary school kids including triathlon training the previous two years, getting 3rd-5th grade students to sign-up for a virtually unknown type of activity was not difficult. In fact, the 35 student capacity was reached the first day the permission slips were sent home. In reality, some of this was driven by the fact that it was a free program and the children would not have to pay to attend the school's aftercare program for 12 weeks. Once the program began the response was very positive from both the children and parents. The children were participating in a physically challenging program, but motivating them to give a superior effort was not difficult. The pace, variety, and emphasis on free body movement was atypical in comparison to the sport practices or physical education classes the students were used to attending. An observation that stood out was the leveling of the playing field the occurred between the athletes and non-athletes and between the genders. The skills required in the modified form of parkour designed are beneficial when training athletes, but are always secondary to the sport skills. This caused many of the athletes to struggle with relatively simple balance, coordination, strength, power, and endurance tasks. This provided a confidence boost to the children who did not compete in sports because the rate of acquisition was similar or even faster in some cases when compared to the athletes. Similarly, the female children often outperformed male peers. In the initial weeks of the program, reminders were given to especially the male athletes to be respectful of the other students because there was a perceived belief that the activities would come more naturally to those who participate on sports teams. After a few sessions, it became evident that this was not the case, and the competition became friendlier as each individual was trying to improve time to task completion or number of repetitions achieved. A particularly interesting occurrence related to the training was the number of students who really enjoyed jumping rope. Many of them had never jumped rope, which was a surprise to the college students.

Objective and Anecdotal data

Pre/post data was collected on a portion of the students following the 12 week portion. Inferential statistics were not appropriate based on the number of students who dropped out prior to the completion of post testing. With no intent to provide statistically significant comparisons, the general changes in the mean scores for the children who tested on both occasions were as follows: height increased slightly, weight was maintained, muscular endurance was improved, lower body power increased, and running speed time increased. Additional studies are needed to seek the impact of parkour training on health and skill-related fitness variables because it has the potential to impact both sets of variables based on the type and style of training that the students were exposed to during this program. In addition to the physical testing, each session included a health related concept that would be related to participating in parkour type activities, both under the supervision of the program leaders, as well as, when training at home. These topics included: hydration, preventing sunburns, healthy snacks, the role of weight and health, and the importance of flexibility.

The parents were pleased for reasons other than free afterschool care. The first example of this was the recognition at pick-up time that the program was challenging and there was no complaining. A common comment from parents was that the program was the first time the children enjoyed performing physical activity. In fact the enjoyment led to the request for future programming that would be provided 4 or even 5 days a week program.

Conclusions

Research evidence and our practical experience indicates the use of non-traditional movement education should be considered when working with children. The individual psychological and physiological changes that are possible because of the uniqueness of the training methods are worth further investigation with additional age groups, over a longer period of time, and at a greater frequency per week.

Exercise science faculty are also encouraged to seek a variety of volunteer opportunities for undergraduate students including after-school programming for those who are wanting to work with children.

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Table 1 Equipment, piece usage, and alternatives.

Piece of equipment	Usage options	Alternative pieces
Medicine ball	Weighted implement when moving though the course, tossed to create changes in center of gravity, while in unstable environments, hand-grip strength	Any sport ball.
Agility ladder	Foot coordination, plyometric exercises for lower body, change of plane (crawling, ducking under) obstacle	Tape on the floor or elastic stretched just above the floor.
Small/adjustable hurdles	Vertical obstacles to go over, under and around	Students lying prone or cones.
Bosu ball	Static and dynamic balance and stability challenge tasks	
Jump ropes	Individual and group plyometrics,	Clothesline or elastic.
Foam balance beams	Static and dynamic balance and stability challenge tasks	
Stability balls	Core and upper body challenge tasks	

(Peer Reviewed Article)

Implementing Farm to School Programs in Kentucky: A Social Ecological Approach for Nutrition Education and Community Development

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Abstract

Farm to school programming engages multiple social ecological levels to improve the health status and performance levels of students, nutritional wellness of families, and overall development of communities. Resources for smooth implementation of the three farm to school components of local food procurement, classroom education, and school gardens are available from national, state, and local or nonprofit agencies. Examples, including the National Farm to School Network, Kentucky Farm to School, Growing Minds, and the Food Literacy Project, offer curriculum and activity ideas, funding opportunities, procurement guides, and field trip experiences. The purpose of this research was to compile resources for school personnel to utilize and effectively implement farm to school initiatives. For inspiration to begin a farm to school program, many success stories exist throughout the country, especially in Kentucky where these initiatives are growing.

Key Words: Farm to school, eating habits, garden, nutrition, children

Introduction

Farm to school programs connect schools and local farms by serving healthy meals in school cafeterias, improving student nutrition, providing experiential health and nutrition education, and supporting local farmers (Kentucky Farm to School Task Force, 2012). The three components of farm to school programs include local food procurement, classroom education, and school gardens. Farm to school programing can be implemented using a social ecological approach by incorporating parts of the program at the community level, cafeteria/school level and classroom level. The social ecological model focuses on both individual and social environmental factors for health promotion interventions. Interventions are directed at changing interpersonal, organization, community and public policy factors (McLeroy, Steckler, Bibeau & Glanz, 1988).

The United States Department of Agriculture (USDA) Farm to School Program and the National Farm to School Network are national agencies that provide services for implementing farm to school programs. The USDA Farm to School Program offers support for incorporating local foods in the National School Lunch Program and grants for training and research (Food and Nutrition Service, 2017). The National Farm to School Network is an information, advocacy and networking hub for communities to bring local foods and education into schools (National Farm to School Network, 2017). In 2015-2016, the National Farm to School Network launched Seed Change, an initiative to expand farm to school activities in three states including Kentucky. Seed Change provided grants to support activities such as building school gardens, providing food, nutrition and agriculture education, local food purchasing and food service staff training.

Over 5000 school districts or 42% of those surveyed by USDA, participated in farm to school programs nationally (Farm to School Census, 2017). In Kentucky, 48% of the school districts participated in farm to school activities, involving 77 districts, 907 schools and over 421,000 students. The most common farm to school activities reported in the USDA Farm to School Census were 1) serving locally produced foods in the cafeteria 2) promoting locally produced foods at school 3) holding taste testing/demos of locally grown food 4) conducting student field trips to farms or orchards and 5) using smarter lunchroom strategies to encourage consumption of local foods (Farm to School Census, 2017).

Farm to school programs offer a social ecological approach, integrating positive food and farm experiences into curriculum, engaging parents and community partners and connecting classroom and cafeteria activities. These activities may be a critical component of obesity prevention of students by helping students develop lifelong healthy eating habits. Many studies have shown increased fruit and vegetable intake following incorporation of fresh farm produce into school salad bars, meal selection or class-based activities (Joshi, Azuma & Feenstra, 2013; Song, Grutzmacher & Munger, 2016). The educational components including school gardens, farm field trips and cooking with local foods improve student attitudes and behavior (Joshi, Azuma & Feenstra, 2013). Studies have shown that these components have contributed to increases in science achievement scores of elementary students (Williams & Dixon, 2013). In addition to improving children's health and education, farm to school programs also offer a market opportunity for local farmers (Kane, Kruse, Markesteyn Ratcliffe, Anada Sobell & Tessman, 2011).

Purpose

The purpose of this research was to compile resources for school personnel to utilize and effectively implement farm to school initiatives for healthier students, families and communities. The USDA Farm to School Program and the National Farm to School Network are key national resources. Kentucky is making great strides in providing information for school professionals, with resources such as the Kentucky Farm to School Curriculum and the Kentucky Farm to School Handbook. Other resources that have received national attention are provided by Growing Minds, Slow Food USA, Whole Kids Foundation, Edible Schoolyard Project and Georgia Organics.

Procurement

The Kentucky Farm to School Handbook includes useful information on how to begin the procurement process of the farm to school model (Kentucky Farm to School Task Force, 2012). This guide is free and is available online. The Kentucky Farm to School Task Force advises schools to start small by incorporating local foods into the cafeteria menu. The first step is to determine if existing distributors offer local products for purchase. The task force recommends involving the entire community, especially the students, in advocating for and beginning farm to school procurement. The handbook includes a list of contact information for connecting with Kentucky food service directors who have successfully implemented local foods into their school cafeteria (Kentucky Farm to School Task Force, 2012).

Inspiration can be drawn from many Kentucky schools that are successfully engaging in strong relationships with their local farmers. For example, Jefferson County Public Schools (JCPS) in Louisville has mastered the art of procurement and has even implemented a Local Food Procurement Policy to ensure farm to school is a key aspect of the day-to-day procedures in JCPS cafeterias (Kentucky Farm to School Task Force, 2012). While at first the task of incorporating local foods into the school menus seemed too large of a task to tackle, the food and nutrition professionals at JCPS decided to start small by purchasing local apples from Huber's Orchard in Indiana. JCPS was then able to begin to form relationships with nearby farmers, after requesting prices for local produce within 150 miles of Louisville. Student response was positive as the local produce tasted fresher, and local purchasing kept dollars within the community. In order to integrate local produce all year long, JCPS purchases seasonal produce in the summer, and then freezes it to have vegetables like summer squash and green peppers available when school is in-session. JCPS has created an effective paradigm for farm to school procurement that other schools can use for guidance when beginning their own farm to school movements (Kentucky Farm to School Task Force, 2012).

Classroom Education

Education is another core element of farm to school implementation. Farm to school practices include students participating in educational activities related to agriculture, food, health, and nutrition. There are a variety of free resources and tools available for teachers to help students make connections between what they eat and what they learn in the classroom. The Kentucky Farm 2 School curriculum is designed for grades 9-12 (Drury, Garland & Walters, 2011) .This research-based curriculum meets the Kentucky core academic standards. In addition, Kentucky Proud lesson plans are available for grades 3-5, which integrate lessons with math, science, geography and literature core content (Kentucky Department of Agriculture, 2017). Other nationally recognized resources for curriculum are provided by Slow Food USA, Growing Minds, Edible Schoolyard Project, and Georgia Organics (Slow Food USA, 2017; Growing Minds Farm to School, 2017; Edible Schoolyard Project, 2017; Georgia Organics, 2017). The USDA Center for Nutrition Policy and Promotion released a new toolkit called MyPlate, MyState, which introduces the relationship between nutrition and agriculture (USDA Choose MyPlate, 2017).

There are many examples of curriculum success stories in Kentucky. Mercer County High School is utilizing a hands-on farm to school model. Students are engaged by growing food in the school garden and greenhouse. The harvested produce provides fresh ingredients for the meals served in the school cafeteria. The school has used its farm to school programming to connect different academic areas including agriculture and science, as well as bring together students from various backgrounds and experiences.

The Anne Mason Elementary School took their second grade class on a field trip to Evan's Orchard as an introduction to a classroom science lesson on living things, their needs, and the life cycle of plants. The students ranked different varieties of apples based on taste, and learned about the processes behind products made from apples, such as cider (Kentucky Farm to School Task Force, 2012).

Boyle County and Perry County Schools served as model school districts for the National Farm to School Network's Seed Change project. These schools served as demonstration sites and training hubs for other Kentucky school sites to visit (National Farm to School Network, 2017).

Gardens as Classrooms

Garden education is another vital component of farm to school programing. The 2015 USDA Farm to School Census reported that there are over 7000 school gardens in schools across the nation, with 78 of these gardens in Kentucky. Funding opportunities and comprehensive guides are widely available for schools who wish to start or sustain school garden programs. The USDA Farm to School Program and the Whole Kids Foundation provide key resources. Information includes tips for planning and starting gardens, how to engage stakeholders and gain support, creating a planning and leadership committee, the resources and funding necessary for successful implementation, and maintenance plans for the sustainability of a school garden. In addition, tips for acquiring funds through grants, donations and special events, grant writing courses and tutorials are available (Food and Nutrition Service, 2017, Whole Kids Foundation, 2017).

Extensive curriculum and activity ideas to assist with garden education are available. The USDA provides free materials for garden based curricula through Team Nutrition (Food and Nutrition Service, 2017). Helpful information includes webinars, videos, and toolkits. The Edible Schoolyard Project has a searchable database of shared lessons for the garden, kitchen and academic classrooms and cafeteria, organized by type, grade level, and season (Edible Schoolyard Project, 2017). Growing Minds developed school garden lessons for preschool through 5^{th} grade that align with national standards for literature, science and math. Besides lessons, a monthly farm to school newsletter, funding for farm field trips, school garden projects, and information on workshops and trainings for teachers is available on the Growing Minds website (Growing Minds Farm to School, 2017).

Several schools in Kentucky have used school gardens and farm to school programs to help bring communities together. For example, Owsley County Elementary School students worked with community members to build raised garden beds to grow fruits and vegetables to use in the school cafeteria and in the summer feeding program. In addition, the Owsley County High School hosted community gardens and provided space for a local farmers' market. The Bergin County High School collaborated with a local church to maintain a school garden during the summer and collaborated with the local extension service to provide canning lessons and host a farmers' market. The Madison County Farm to School program connected with the community by publishing a monthly school newsletter to educate students about local farms (Kentucky Farm to School Task Force, 2012).

Case Study: The Food Literacy Project

A farm to school nonprofit organization based in Louisville, Kentucky, the Food Literacy Project, has created a successful model for farm to school programming (The Food Literacy Project, 2017). The Food Literacy Project collaborates with Family Field Day Farm to provide hands-on farm-based education to local students and organizations. During the single farm visits, students are encouraged to get their hands dirty, try something new, and be respectful of all living things on the farm. A typical program includes a tasting tour of the learning garden where students use inquiry-based learning. Students prepare a field-to-fork recipe from produce harvested from the garden. In addition, students create seed start containers from recycled materials as a take-home to learn to care for a plant at home.

Field-to-Fork club is a 10-12 week after-school program in partnership with several area schools at the third, fourth, and fifth grade levels. The club introduces students to everything related to the food system as they prepare a recipe with seasonal produce each week. This program has been successful in improving the students' nutritional awareness, teamwork and communication skills, and social and leadership abilities. The Field-to-Fork club affects the entire family by providing a weekly produce share for the students to take home. The students are able to share what they learned and prepare the week's recipe with their families (The Food Literacy Project, 2017).

The Youth Community Agriculture Program, or YCAP, is an initiative through the Louisville Mayor's Summer Works program that provides jobs for high school age students during the summer on Oxmoor Farm in collaboration with the Food Literacy Project (The Food Literacy Project, 2017). The YCAP crew members become engaged leaders in their local food system as they work alongside the farm crew and learn how to grow, harvest, cook, and market their farm-fresh produce. They visit important local organizations throughout the program to learn about what their community is doing to improve the local food system and how they can be involved in this movement. This program also allows for personal growth through a focus on professional development skills in the high school students, such as time-management, teamwork, and communication with community leaders.

A key goal for the Field-to-Fork program at the Food Literacy Project is to promote healthy lifestyles for the prevention of childhood obesity among children. Currently, a collaborative study between the University of Louisville and the Food Literacy Project is assessing the effectiveness of specific Field-to-Fork components, including classroom and farm-based student education, family engagement activities and Field-to-Fork afterschool clubs in four elementary school in Louisville, Kentucky (O'Neal and Perez, 2017). This research will help validate the educational benefits of farm to school programs.

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(Peer Reviewed Abstract)

The Effects of Upper and Lower Body Fatigue on Drive Distance in Golf

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Abstract

Muscular weakness and muscle fatigue has been shown to increase the risk of overuse injuries and have a negative impact on performance in golfers. The purpose of this study was to determine the effect of muscular weakness on drive distance in golf by pre-fatiguing major muscle groups in the upper body (UB) and lower body (LB). METHODS: 15 male subjects (25 $\pm$ 5.0 years) drove a golf ball using a Titleist 915 D2 driver with an extra stiff Matrix Ozix Blacktie shaft. Ball flight distance was tracked by the 3D Doppler Tracking Radar Flightscope Technology. Subjects then pre-fatigued their upper and lower bodies and teed up again. The mean flight distance (FD) was calculated for the control, and upper and lower body fatigue tests. RESULTS: One-way repeated measures ANOVA showed a significant effect of pre-fatigue on FD [$F(2,22.22) = 17.11$, $p < 0.05$], with a significantly lower FD for UB compared to control (-28.84 $\pm$ 3.49) and LB (-17.97 $\pm$ 5.52). CONCLUSION: It appeared that pre-fatiguing the upper body can reduce FD in golfers whereas pre-fatiguing the lower body had less of an influence on FD.

Keywords: muscular strength, fatigue, golf