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Promoting a Healthy Active Alabama

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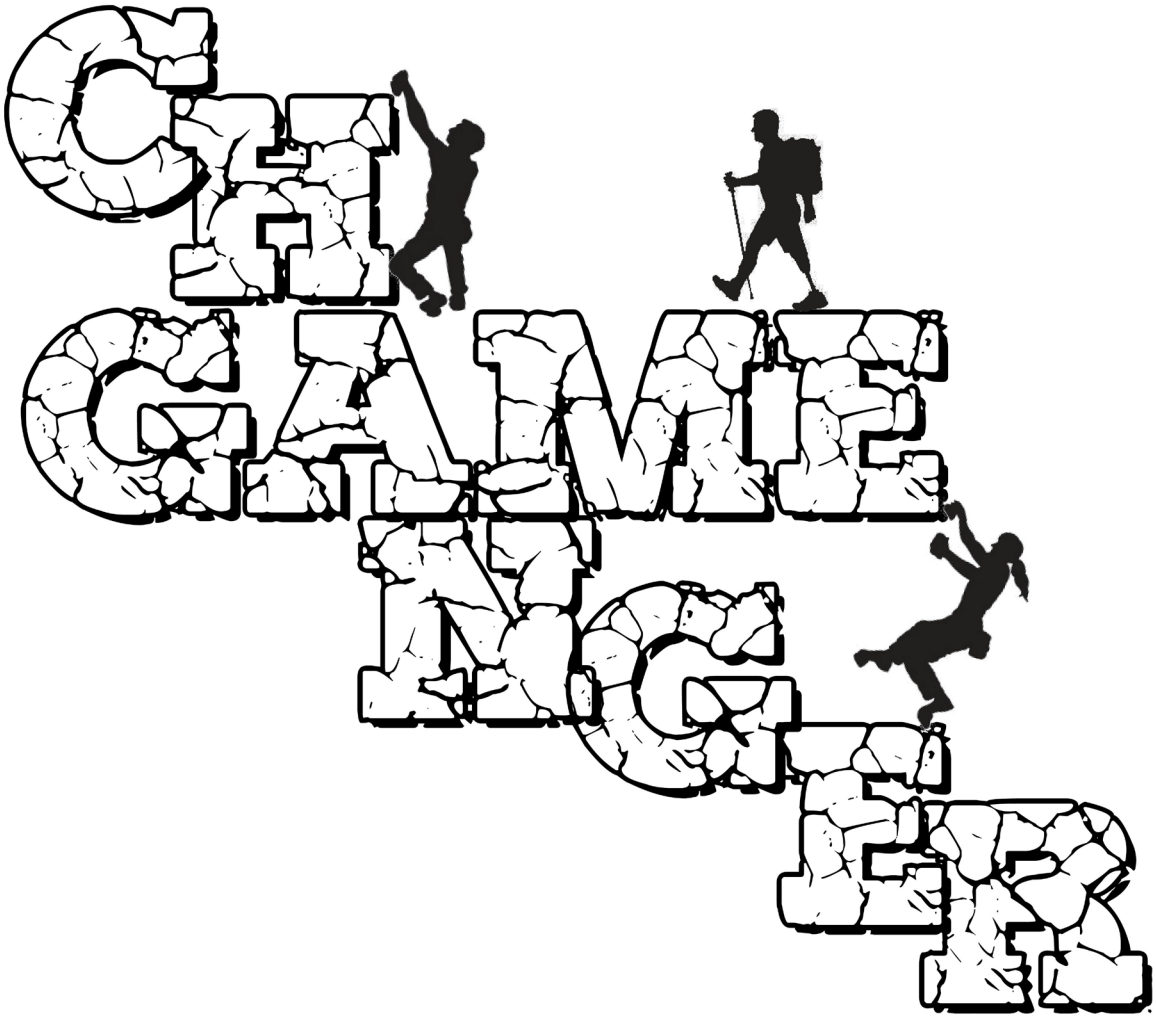

Alabama State Association for Health, Physical Education, Recreation and Dance

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CONTENT

About the Cover

Game Changer, this year's theme selected by President Penny Edwards, challenges everyone to not only be *in the game* but to be a GAME CHANGER by making a difference for the children of Alabama. Now, more than ever, is the time for individuals in our profession to step up and change the game by providing quality physical activity opportunities in our schools, fitness facilities, recreation programs and sports leagues for ALL children.

Policy Statement

The *ASAHPERD Journal*, a refereed and blind peer reviewed journal, is the official publication of the Alabama State Association for Health, Physical Education, Recreation and Dance and is published two times annually in the fall and spring. Manuscripts, photos, and news items are invited and should be submitted in accordance with the Author's Guidelines found in this *Journal.* The authors' opinions are their own and do not necessarily reflect the attitude or views of ASAHPERD, its officers, or the editors of the *Journal.*

Message from the President

Penny Edwards, National Center on Health, Physical Activity and Disability

ASAHPERD Members,

As fall is finally here, we have a wonderful opportunity to get out and explore the great outdoors! Since this is the time of year that we traditionally have awesome weather, I encourage each of you to sign up for the 100 Alabama Miles Challenge at 100alabamamiles.org and joining the ASAHPERD Group. You can join us through the group directory. This time of year can be stressful with the Holidays approaching and what better way to reduce stress than to get outdoors?

My theme for this year is GameChangers. Be a game changer; re-think the way you teach physical education? Use the cooler weather to introduce your students to activities they can play in their own backyards. I encourage you to think outside the box and find ways to introduce activities that allow for full participation of every child in your classroom so that no child is left out or excluded.

In support of health, physical education and physical activity, we will have ASAHPERD representatives in DC in March at the annual Speak Out! Day. This is a day where physical educators and health educators gather in Washington, DC to push congress to fully fund Title IV, Part A of every Student Succeeds Act for FY20. This is one of many advocacy efforts supported by ASAHPERD. We will have also host a Speak Out! Day in Alabama in March. This will be a day for you to come and speak to our state leaders about physical education. Be sure to keep an eye out on information related to this event.

We have so many great things happening across our state. Several schools have begun to implement the new course of study for physical education as well as the one for health education. If you haven't seen the updated courses of study, you can learn more about them at the ASAHPERD Fall Conference or go to ALSDE Health and Physical Education page and download them. We know that several of you are doing innovative things in your classroom and we would love to see them. Please share them via your social media platform and use the #alphysed or #asahperd19 when you post so we can see them and share them as well.

ASAHPERD has three opportunities for teachers to raise money for their schools this year. I encourage each of you to take advantage by making time to look at the information found at asahperd.org and learn more about them. You can do this by clicking on the name of the fundraiser. Here are the three fundraisers that ASAHPERD has selected: Health.Moves.Minds, Y-Ties and Game On!

Begin now with a renewed commitment to your profession. Be the GameChanger, be the best teacher, coach, mentor, and role model that you can be. Be the person you would want teaching your child how to be healthy and active for a lifetime.

In conclusion, I hope to see you at the Health and Physical Literacy Summit in February and the Spring Conference the first weekend in April. Go to www.asahperd.org for more information and registration.

See you soon,
Penny Edwards

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Adventure Education and its Perceived Effect on Participant Life Effectiveness – A Review of Original Research

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Introduction

Since the end of the World War II, outdoor adventure recreation has become a major industry worldwide and new adventure thrill – based activities have been developed to cater to the growing number of individuals seeking this type of experience. As a result, educators found that these types of experiences may have an added developmental benefit for participants that had not been originally realized (Neill, 1997). Outdoor education (OE) programs were developed to specifically attain these perceived benefits.

Priest (1986) defined OE as an "experiential method of learning by doing, which takes place primarily through exposure to the out-of-doors." In OE, the emphasis for the subject of learning is placed on relationships: relationships concerning humans and natural resources. OE is therefore made up of a two-fold approach including adventure education (AE) and environmental education (EE) (Priest, 1866). According to Priest (1986), AE programs have historically concentrated on the intrapersonal and interpersonal relationships of the participants, whereas EE historically concentrated on the ecosystemic and ekistic relationships of the environment. Prescott College (2013) defines AE as "an experiential process that takes place in challenging outdoor settings where the primary purpose is to build and strengthen interpersonal and intrapersonal relationships, personal health, leadership skills, and environmental understanding."

For the purpose of this meta-analysis, only the AE aspect of outdoor education will be studied. AE programs vary from institution to institution, in that each AE program may utilize differing types of adventure elements such as: canoeing, camping, hiking, rock climbing, and kayaking to name but a few. Despite the differing approaches to AE, most programs boast of the benefits that participants gain from participation. According to Outward Bound, a leading provider of AE, participants gain in their personal strength of character, ability to lead, and desire to serve (Outward Bound, 2014).

One problem that many researchers and providers of AE programs have had to confront is how to adequately measure the perceived benefits of their individual programs. Neill (1997) addressed this by developing the Life Effectiveness Questionnaire (LEQ) to measure self-perceptions both before and just prior to completing the AE programs. The LEQ has become the company standard in measuring the outcomes of many AE programs. The LEQ measures personal factors of self-development and self-concept that when enhanced can aid participants in becoming more effective in life (Neill, 1997). The LEQ domains are time management (TM), social

competence (SC), achievement motivation (AM), intellectual flexibility (IF), task leadership (TL), emotional control (EC), active initiative (AI), and self-confidence (S). These domains will be explained in more detail in the following section.

Another problem that researchers are confronted with while utilizing AE programs is the limitation of a small treatment sample size. This is in part due to the fact that AE programs have an ideal group size for participation. For example: a canoeing trip of eight canoes will have a limitation of only 16 participants. An increase in participants would cause logistical and safety problems for the providers. Furthermore it has been found that an ideal AE group size of 10 participants provides higher potential for achieving social harmony within the group (Neill, 1997).

The high “monetary” cost associated with participation may be another reason researchers continue to face small sample sizes. This is partly caused by the very “risky” nature of the AE elements being used. For example, rock climbing has an apparent risk associated with participation. This risk can increase the cost to the participant by requiring additional insurance coverage, liability insurance, professional instruction fees, and transportation fees. The monetary cost may prevent many individuals from participating because of the cost involved. AE programs also have a large cost in “time” to providers and participants. Many AE programs have a duration of several days or more. This “time” cost may prevent many individuals from participating due to the obvious amount of time missed from school or work. Because of these issues, researchers continue to complete studies with small sample sizes and are unable to apply their data to a more general population.

Each study included in this meta-analysis has several LEQ domains that did not show statistically significant changes which may have been a result of small sample sizes. The widespread belief that AE enhances participant development may have led many researchers to publish non-significant results in a positive light (Lane, 2008). The purpose of this meta-analysis is to reduce the limitations of sample size in five original AE research studies and determine if, by increasing the sample size, there will be an overall significant main effect. If statistically significant LEQ change is shown to have occurred, this meta- analysis will have added further weight to the results of the studies included.

Adventure Education and Life Effectiveness

At the end of WWII, soldiers returning home found there was not a lot of opportunities to meet their new thrill – seeking needs. The adventure sports (AS) industry soon began to take shape and various adventure opportunities were made more readily available. Institutions like Outward Bound developed by Kurt Hahn became popular outlets for individuals seeking thrill-type activities (Outward Bound, 2014). Adventure activities such as river rafting in surplus military rafts, rock climbing, and canoeing became more and more accessible to the general public. Researchers realized that participants of these AS programs were reporting increases in their self-confidence, achievement motivation and social skills (Neill, 1987). AS industries began touting the perceived benefits of

participation in their programs and educators began to take notice. The first reported use of AE by an institution of higher learning was Dartmouth College in 1935 (Hooke, 1987). According to Neill (1997), AE programs are typically utilized by small groups of people participating in adventurous activities in outdoor settings and primarily use each other as the resource for problem solving. Common features found in AE programs are: wilderness or backcountry settings, small group size, prescribed mentally and/or physically challenging objectives, intense social situations, problem solving, a nonintrusive trained leader, and duration of two to four weeks (Burrows, 2007). AE not only enhanced the importance of self but also importance of the group (Gass, 1993).

It was soon realized a problem existed, since there was no uniform way to adequately measure these perceived benefits of AE programs. The lack of a uniform method or “company standard” in determining the effectiveness of AE programs results in too little specific information about what it was about these programs that actually worked (Burrows, 2007). In a 1994 meta-analysis, Cason measured the perceived benefits of outdoor adventure programming with adolescents. Neill (1997) created the LEQ survey by combining Cason’s (1994) previous research with that of his and his colleagues. Neill (1997) in effect created a company standard by using common aspects from Cason’s surveys as well as his own. The LEQ was developed as a Likert scale which included eight domains of life effectiveness (Neill et al., 2003). The notion of "life effectiveness" is that there are some personal skills that are important factors in how effective a person will be in achieving his/her desires/wishes in life (Neill, 2008). The LEQ consists of 24 questions that relate directly to the eight domains with a Likert scale ranging from 1 “false – not like me” to 8 “true – like me” for participant responses with a maximum score of 24. The eight domains of life effectiveness are defined in Table 1(Neill, 2003). According to Neill, the underlying performance in these various aspects of life, are core personal effectiveness skills which can be developed and learned. Since the LEQ’s development, it has been used to measure the short-term and long-term effects of AE programs with treatment subjects ranging in age from adolescents to adults (Hattie et al., 1997). A copy of the LEQ survey can be found in the Appendix.

Methods

An extensive online database search for peer-reviewed and un-published original research was conducted using Google Scholar. Four separate searches were conducted using a variation of different descriptive or key search terms. The first search used keys terms: outdoor recreation and education. Boolean words used in this search were: and. The first search yielded 39,000 results with parameters set for articles from the year 2000 to present. The second online database search yielded 33,500 results and used keys words: outdoor education and life effectiveness. Boolean words used in this search were: and. The second search year parameter was set at 2000 to present. The third search yielded 118,000 results using the keys words: adventure education. No Boolean words were used. The search year parameter was set at 2000 to present. The fourth

search yielded 25,800 results, using key words: adventure education and life effectiveness. Boolean words used in this search were: and. The search parameters for year were set at 2000 to present. Bibliographies of research articles found in all four searches were utilized to locate additional related articles.

Inclusion/Exclusion

Studies included in this review are original and un-published quantitative research from the year 2000 to present, utilizing multi-element AE programs and a data collection method of LEQ surveys which measured participant attributes of TM, SC, AM, IF, TL, EC, AI, and S . This study was limited to five studies on treatment subjects ranging in age from adolescent to adult. Each study used a single group with repeated measures and served as both treatment and control. The meta-analysis conducted in this study did not account for gender differences which may have been a factor regarding the results of the original research studies. The means and standard deviations in the Flood (2009) study were separated according to gender. For the purpose of this meta-analysis the male and female groups were treated as separate studies within the original study and designated as Flood (1) and Flood (2). Demographics due to race or economic status were not included. Studies excluded from this analysis were any studies published prior to the year 2000. The fact that each study involved in this meta-analysis used varying AE treatments and duration of treatment may be limiting factors of this analysis. Another possible limitation to this study may be the large difference in treatment subject age in each study. Further explanation of the limitations of this study will be explored in the discussion section of this paper.

Inclusion Studies

The first study included in this meta-analysis was conducted by Burrows (2007). The Burrows study utilized a multi-element treatment on nine volunteer teenage students from an independent school in Southwestern Ontario. The study was conducted in Costa Rica at Outward Bound for 17 days in which the treatment subjects were given LEQ surveys at four different intervals through the study. For consistency of this meta-analysis, only data from the pre-treatment LEQ and the first post- treatment LEQ were used. The multi–element treatment consisted of participants taking part in hiking, camping and white water rafting. All data collected was self-reported by the participants in the study. At the conclusion of the study, Burrows found that of the eight LEQ domains, only TM, SC, EC, AI, and S showed statistical significant improvement from pre-test to the first post-test taken. Burrows (2007) reported no significant differences in AM, IF, and TL.

The second study included in this meta-analysis was conducted by Lane (2008). Lane utilized a multi-element treatment on 50 volunteer adolescents participating in a summer travel camp. The treatment had a duration of 24 days. The summer camp was conducted by Longacre Expeditions and treatment consisted of travel to and from each of the multi-elements sites. The treatments used in this study were biking, rock climbing, and kayaking. Data was collected by administering the LEQ survey at three different intervals, once at the beginning of the camp prior to any

treatments, a second time at the conclusion of summer camp, and a third interval in which surveys were mailed to participants just prior to six months following the end of the program. All data collected was self-reported by participants in the study. For the purpose of consistency of data, this meta-analysis used only data collected from the first and second LEQ surveys. At the conclusion of the study, Lane found that of the LEQ domains, only SC and EC had a statistically significant increase. No significant increases were found in the six remaining domains (Lane, 2008).

The third study in this meta-analysis was conducted by Flood et al, (2009). This study was conducted for one day utilizing a single element treatment on 48 college students in an "Introduction to Recreation" class. The students volunteered to take part in the study although the class was a requirement of their curriculum. The treatment in this study was a high ropes challenge course. Data collection was taken utilizing the LEQ survey at three intervals, once as a base line, once as a pre-test, and once at the conclusion of the one day challenge course program. All data collected was self-reported by participants in the study. The Flood study separated participant scores according to gender. There were 19 males (Flood 1) and 29 females (Flood 2). For the purpose of consistency, this meta-analysis used only data collected from the pre-test and post-test. At the conclusion of the study, Flood found that there was statistical significant improvement in all eight LEQ domains for the female domains. For the males only TM showed significance (Flood, 2009).

The fourth study in this meta-analysis was conducted by Khamis (2009). This study was conducted for 70 days utilizing a multi-element treatment and its effects on 55 adolescent students from NorthLight School in Singapore. Participants were randomly selected to participate in the study while in their second year at the school. Treatments in this study included canoeing, camping, and high ropes. Data collection was conducted at two intervals as a pre-activity and post activity using the LEQ survey. All data collected was self-reported by participants in the study. Khamis found at the conclusion of the study that SC was the only LEQ domain to show statistically significant improvement. AM was found to have a moderate increase and TM, IF, AI and S showed small positive effects. SC and TL had no difference in effect (Khamis, 2009).

The last study included in this analysis was conducted by Lathrop (2012). This study was conducted for a period of five days using a single element treatment on seven freshmen college students of Brock University, Ontario Canada. The treatment element in this study was a five day canoeing and camping trip. Data collection was conducted at three separate intervals utilizing the LEQ survey; pre-trip, post-trip and four months later. For the purpose of consistency of data, this meta-analysis only used data from the pre-trip and post-trip surveys. All data collected was self-reported by participants. At the conclusion of this study Lathrop found that only the LEQ domains of TM, TL, and AI showed statistically significant increases while all remaining domains did not (Lathrop, 2012). A list of the studies and their results can be found in Table 2.

Meta-Analysis Results

A total of 169 subjects were represented in the five research studies included in the meta-analysis. A weighted mean effect summary for each of the domains was measured using a random effects model to account for the differences in sample size. The meta-analysis was performed using Comprehensive Meta-Analysis Version 2. The meta–analysis revealed that AE had an overall significant mean effect on participant LEQ domains in each of the five studies. Results of the meta-analysis on the LEQ domains are depicted in box and whisker graphs and can be found in Tables 3 – 10.

Table 3 depicts the results of the meta-analysis for the TM domain. The meta-analysis revealed that AE had a significant overall main effect on the LEQ domain of TM. Significance was found at p=0.00, with a standard error of 0.11 and a standard difference in means of 0.43. TM had an overall variance of 0.01. The meta-analysis found a 95% confidence interval of 0.21 to 0.65.

Table 4 depicts the results of the meta-analysis for the SC domain. The meta-analysis revealed that AE had a significant overall main effect on the LEQ domain of SC. Significance was found at p=0.00, with a standard difference in means of 0.51 and a standard error of 0.12. The meta-analysis found a 95% confidence interval of 0.27 to 0.74. SC had a variance of 0.01.

Table 5 contains the results of the meta-analysis on the AM domain. The meta-analysis revealed that AE had a significant overall main effect on the LEQ domain of AM. Significance was found at p=0.02, with a standard difference in means of 0.38 and a standard error of 0.16. AM had a variance of 0.02. The meta-analysis had a 95% confidence interval of 0.05 to 0.70.

Table 6 depicts the results of the meta-analysis on the IF domain. The meta-analysis found that AE had a significant overall main effect on the LEQ domain of IF. Significance was found at p=0.01, with a standard difference in means of 0.47 and a standard error of 0.19. The meta-analysis had a 95% confidence interval of 0.08 to 0.85 with a total variance of 0.03.

Table 7 depicts the results of the meta-analysis on the TL domain. The meta-analysis found that AE had a significant overall main effect on the LEQ domain of TL. Significance was found at p=0.00, with a standard difference in means of 0.44 and a standard error of 0.16. The meta-analysis had a 95% confidence interval of 0.11 to 0.77 with a total variance of 0.02.

Table 8 shows the results of the meta-analysis on the EC domain. The meta-analysis found that AE had a significant overall main effect on the LEQ domain of EC. Significance was found at p=0.00, with a standard difference in means of 0.57 and a standard error of 0.20. The meta-analysis had a 95% confidence interval of 0.17 to 0.98 with a total variance of 0.04.

Table 9 depicts the results on the meta-analysis on the AI domain. The meta-analysis revealed that AE had a significant overall main effect on the LEQ domain of AI. Significance was found at p=0.00, with a standard difference in means of 0.41 and a standard error of 0.11. The meta-

analysis had a 95% confidence interval of 0.19 to 0.62, with a total variance of 0.01.

Table 10 depicts the results of the meta-analysis on the S domain. The meta-analysis revealed that AE had a significant overall main effect on the LEQ domain of S. Significance was found at p=0.00, with a standard difference in means of 0.56 and a standard error of 0.11. The meta-analysis had a 95% confidence interval of 0.33 to 0.80 with a total variance of 0.01.

The results of the meta-analysis confirm the hypothesis, however there are limitations regarding this analysis, so interpretation of the results should be taken with caution. The limitations of the analysis, applicability of results and the need for future research will be discussed in the following sections.

Discussion

The purpose of this meta-analysis was to reduce the limitations of sample size in five original AE research studies and determine if, by increasing the sample size, there will be a statistically significant overall main effect of AE on participant life effectiveness domains of TM, SC, AM, IF, TL, EC, AI, and S. The meta-analysis confirmed the hypothesis that a significant overall main effect would be found. AE appears to have had a significant main effect on participants' LEQ. The notion of "life effectiveness" is that there are some personal skills that are important factors in how effective a person will be in achieving his/her desires/wishes in life (Neill, 2008). AE industry leaders like Outward Bound and Project Adventure have touted the benefits of their programs on participant life skills since their inception, however finding an effective way to quantify those benefits has been difficult. Many researchers have used various typologies to record and report data. The LEQ developed by Neill et al (2008) has begun to serve as the company standard for measurement (Burrows, 2007). Small sample size continues to be a limitation in many new AE research studies possibly due to the high monetary cost of participation. Perhaps meta-analysis provides researchers an instrument that can eliminate or reduce these limitations. As a result of this analysis, the findings could be applied to a broader application. If participants in a AE program indeed benefit by gaining increases in TM, SC, AM, IF, TL, EC, AI, and S, then participation may help in their future personal, academic, and professional pursuits. According to Tinto (1993) personal characteristics such as TM, SC, AM, IF, EC, AI and S could be useful for new college students attaining success in their academic career. Many universities and colleges have developed programs designed to help new students make the transition from high school to college life (Tinto, 1993). One major problem that AE programs may bring is the monetary cost of facilitation and participation. One AE program offered at a small southeastern university had a cost to participant of approximately $2000.00 for a two week trip. This particular AE program was only able to recruit six participants. This might show that AE programs may not be accessible to many people due to the cost involved.

As discussed earlier, a "time" cost of participation may also limit the number of participants able to benefit from AE programs. Many universities and colleges have addressed these problems by creating campus adventure

centers with a sole purpose of engaging students in introductory adventure experiences. Some universities have begun to add AE programs to their freshmen orientation programs. The "cost of participation" may be taken on by the university rather than the student in such cases. One such university uses required student fees as a means of funding its AE program. In this instance students attend AE events free of charge.

The positive benefits of participation in AE programs has been confirmed by this meta-analysis however caution should be taken in interpreting the results too broadly. Only three of the five studies used in this analysis made an attempt to conduct follow-up measures of participant LEQ scores. This was done to determine whether or not the new LEQ levels were sustained. Lane (2008) found that after six months there was a drop in scores. According to Lane, the scores showed that the personal growth that occurred in an AE program can diminish over time. This is not surprising. Consider this example as an illustration of the possible diminishing aspect of AE programs. A runner needs to qualify for a race. The runner can only run a distance of 2 miles when he starts training. Through further training, the runner progresses in distance attained to six miles. The runner now qualifies for the race. The runner competes, does well but decides that this is all he wanted to accomplish and gives up running. A few months pass after the end of the race and the runner has had a change of heart. He gets invited to run another race. The runner shows up the day of the race and barely finishes. Just as a runner needs to continue to train his physical skills to maintain them, so too does a person need to "train" their personal skills.

AE programs tend to present situations in which participants can attain success. Conversely, when a person experiences a negative situation which results in failure, this may serve to reduce certain personal skills. Self-confidence, when enhanced, can lead to success. However, when a person's self-confidence is shaken the opposite could be true. It seems clear that AE programs do have a positive effect on participants. However, not all AE treatments have equal effects. This may be due to the fact that different treatments may only enhance certain LEQ domains while not fully engaging others. This is inherent in the nature of the AE type. A multi-element type seems to be the answer to this problem. To illustrate this problem consider the following scenario: a one day high ropes course event with 20 participants. Which LEQ domains would one logically assume will be enhanced if at all? Logically, a researcher might assume that AM, TL, EC, AI, and S would all show possible improvement. What about TM, IF, SC? A high ropes course may not lend itself to the development of social skills. This may be because many participants are first time participants and fear can be a major governing factor in their initial performance on the course. In such circumstances many participants do not spend a lot of effort improving their social skills while 35 feet up a tree. There are exceptions to this scenario. However, if one considers that in this scenario the treatment is only a one-day event, improvement in social skills, time management, and intellectual flexibility may take place but to what extent and is it measurable? Keep in mind that some participants may

struggle to the extent that they become emotional to the point of tears. This can be a major growth situation for that particular individual, but it could also serve as a means of self-imposed isolation from the group if handled improperly. In many cases the person that suffered an emotional experience is their own worst critic. Because of their own "negative perception" of how they performed, they may reduce their own AM, S, and TL. A multi-element AE treatment can still have instances where individual participants have negative personal experiences but because of the variety of treatment types offered, those persons have additional opportunities to succeed where more of their strengths can be utilized. The success in other AE treatments still allows for personal growth in domains not initially activated, while stimulating those that may have suffered as a result of a negative experience. In comparison of the scenario of a one-day high ropes event with a five day camping, canoeing and rock climbing treatment it might be expected that the second scenario could possibly reap greater benefits toward enhancing the LEQ domains.

Limitations

The purpose of this meta-analysis was to reduce the limitations of sample size in five original AE research studies and determine if, by increasing the sample size, there would be a statistically significant overall main effect of AE on participant life effectiveness domains of TM, SC, AM, IF, TL, EC, AI, and S. The meta-analysis has confirmed the reviewer's hypothesis; however the results should be interpreted with caution. The original limitations must be taken into account before applying the results to a broader application. Each of the studies included had a lack of control or non-experimental group. Each study used a pre-treatment survey of their participants as the control group. This is a recognized limitation of research in AE programs. However, the use of a non-experimental control group would allow for a more isolated possible AE effect difference between both control and treatment groups.

The next limitation is each study gathered data that was self-reported by the participants. The validity of self-reported data may be a factor when one considers that three of the studies utilized student participants. These students may have reported what they felt the researcher wanted to hear. The next limitation is one created by the meta-analysis, which is a lack of uniformity of AE types and duration utilized in the analysis. For the purpose of this meta- analysis all AE types utilized in the original studies were combined into one group termed AE. This could be considered a significant limitation due to the fact that differing AE types may have entirely different main effects on participant LEQ. Duration of the treatments could have a significant effect on the extent the AE had on participant LEQ. Duration of AE treatment was not accounted for in this analysis. This aspect of the meta-analysis will be discussed in the next section. These limitations should be considered when interpreting the results of this meta-analysis to a broader application.

Future Research

There are no perfect studies and this is a fact that all researchers face. However, future researchers may want to explore exactly which LEQ domains

are being targeted for improvement by the treatments chosen for their studies. Another limitation relative to this meta-analysis is a lack of homogeneity of the studies included in this analysis other than the utilization of the LEQ. Future researchers may want to conduct meta-analysis on single AE treatment types in order to more fully understand the effects on participants' LEQ domains. This would lend further weight to the original studies but also serve as a guide for educators, employers, therapists, and AE professionals wishing to enhance certain LEQ domains in their constituents.

One factor that Flood (2009) identified as a possible reason for the differing responses by his participants is AE facilitator performance. Flood (2009) may have recognized that not all AE facilitators facilitate in the same way. Of course this would be an obvious observation. Why would facilitator skill possibly make a difference in participant gains? One facilitator may socially engage his/her participants more than another. This socialization serves to calm and reassure the participant that "they" can succeed regardless of their fear or fatigue levels. Some facilitators take a more hands-off approach to facilitating. The reason for this hands-off approach is to "keep the fight" in the course. In other words, by talking a person through a difficult event, they may in part take some of the challenge out of the event, thus retarding the overall benefit to be gained by success. Additionally, facilitators may show up to facilitate after a long night out-on-the-town. This will affect their performance in facilitating their craft to the participants. Future researchers may explore the affects that facilitator skill has on participant LEQ gains.

In his study, Flood (2009) also identified that women responded much more positively from the one-day event than men. This is not surprising and might even be expected. Men and women perceive challenges differently and respond emotionally to those challenges in an entirely different manner (Greenberg, 2002). Men may be less likely to reveal their true feelings when surveyed on their perceived success at a particular AE event that stressed them both physically and emotionally. Men tend to keep it to themselves, problem solve, and move on (Greenberg, 2002). Women on the other hand, tend to seek a social outlet to express their feelings and find similar experiences with which they can identify (Greenberg, 2002). Women may express themselves to a greater degree when faced with a stressor and also report more accurately their perceived benefits than men (Greenberg, 2002). Future researchers may need to conduct studies to determine the possible reasons for differences in male versus female responses to AE treatment benefits on participant LEQ.

Conclusion

This meta-analysis may serve as a tool that aids researchers in answering questions concerning possible effects of AE programs on participant's overall LEQ scores. Measuring the overall effects of various types of AE programs, may provide the AE field with more validity to support the perceived benefits associated with participation. The meta-analysis has confirmed the hypothesis that participation in AE programs does, in fact, have an overall mean effect on participant's LEQ scores. There are still many aspects of AE programs and participant's LEQ that need to be

addressed. Future research needs to be conducted to further isolate individual AE program treatments and exactly what LEQ domains these programs aim to stimulate. Inherent limitations in AE program research need to be addressed and reduced if possible. Together with additional meta-analysis of such studies, a significant overall mean effect could be found and serve researchers, educators, and professionals as a guide. Research studies are conducted not only to find possible answers to questions, but to ultimately help their participants. Using meta-analysis, researchers may, in fact, be able to make discoveries that can be interpreted to their treatment subjects but also possibly to a larger population.

Table 1. LEQ Domains and Definitions

LEQ Dimensions	Description
Achievement Motivation	The extent to which the individual is motivated to achieve excellence and put the required effort into action to attain it.
Active Initiative	The extent to which the individual likes to initiate action in new situations.
Emotional Control	The extent to which the individual perceives he/she maintains emotional control when he/she is faced with potentially stressful situations.
Intellectual Flexibility	The extent to which the individual perceives he/she can adapt his/her thinking and accommodate new information from changing conditions and different perspectives.
Self Confidence	The degree of personal confidence the individual has in his/her abilities and the success of their actions.
Social Competence	The degree of personal confidence and self-perceived ability in social situations.
Task Leadership	The extent to which the individual perceives he/she can lead other people effectively when a task needs to be done and productivity is the primary requirement.
Time Management	The extent that an individual perceives that he/she makes optimum use of time.

Table 2. A Review of Adventure Education and Its Perceived Effects on Participant Life Effectiveness

Study	Measure	AE TYPE	Duration	N = Treatment	N = Control	DV's	Pretest M, SD	Posttest M, SD	Results
Burrows (2007)	LEQ – H Survey Likert Scale	Camping Hiking Rafting	17 days	N=9	N=9	TM SC AM IF TL EC AI S	11.8±5.3 17.3±5.7 18.7±4.4 18.2±4.8 16.6±5.4 15.0±6.0 18.2±4.1 17.7±5.0	18.3±3.0 20.5±3.0 21.0±2.4 20.0±2.6 18.8±3.6 19.3±3.0 21.0±2.6 21.8±1.5	Statistically significant improvements in TM, SC, EC, AI, and S. There were no significant differences in AM, IF, and TL.
Lane (2008)	LEQ – H Survey Likert Scale	Biking Rock climbing Kayaking	15 – 24 days	N=50	N=50	TM SC AM IF TL EC AI S	5.5±1.4 6.0±1.0 6.6±0.9 6.3±1.0 5.7±1.1 5.6±1.4 6.3±1.1 6.4±1.1	5.8±1.1 6.6±0.9 6.7±1.0 6.4±0.9 6.0±1.2 6.1±1.1 6.6±1.0 6.7±0.9	Statistically significant improvements in SC and EC. No significant differences were found in remaining domains.
Flood(1) (2009)	LEQ – H Survey Likert Scale	Challenge Course	1 day	N=19	N=19	TM SC AM IF TL EC AI S	5.3±1.0 6.4±0.6 6.6±0.7 6.2±0.7 6.0±0.6 6.3±0.7 6.2±0.8 6.7±0.7	5.9±0.9 6.7±0.8 6.7±0.9 6.7±0.9 6.5±0.8 6.7±0.9 6.6±0.8 7.0±0.8	Statistically significant increase in TM only.
Flood(2) (2009)	LEQ – H Survey Likert Scales	Challenge Course	1 day	N=29	N=29	TM SC AM IF TL EC AI S	5.5±1.0 6.4±0.8 6.5±0.6 6.3±0.8 5.8±1.1 6.2±0.8 6.4±1.1 6.7±0.9	6.4±1.4 7.2±0.9 7.2±0.7 7.2±0.6 6.8±1.0 7.2±0.7 7.2±0.8 7.4±0.5	Statistically significant improvements in all eight domains.
Khamis (2009)	LEQ – H Survey Likert Scale	Canoeing Camping High Ropes	70 days	N=55	N=55	TM SC AM IF TL EC AI S	5.5±1.5 5.4±1.6 5.8±1.4 5.4±1.6 5.2±1.6 5.3±1.4 5.4±1.5 5.6±1.4	5.84±1.5 5.75±1.2 6.1±1.3 5.7±1.4 5.2±1.5 5.4±1.7 5.7±1.5 6.4±1.2	SC was the only LEQ domain to show a significant improvement. AM had a moderate increase. TM, IF, AI, and S showed small positive effects. EC and TL had no difference in effect.
Lathrop (2012)**	LEQ Survey Likert scale	Camping and Canoe Trip	5 days	N=7	N=7	TM SC AM IF TL EC AI S	17±4.1 19±4.0 21±3.0 20±5.0 17±3.0 19±4.0 20±3.3 20±3.2	20±2.4 20±3.0 22±2.4 21±3.0 19±3.0 21±3.0 22±2.4 21±3.0	Only the LEQ domain of TM, TL, and AI showed statistically significant increases while all remaining domains did not.

These studies all utilized the LEQ Survey which is a 24 question 8 point Likert scale with a grade range from 1 "false –not like me" – 8 "true – like me "responses. Maximum score on the survey is 24.The above abbreviations for dependent variable measured are: (TM) Time Management, (SC) Social Competence, (AM) Achievement Motivation, (IF) Intellectual Flexibility, (TL) Task Leadership, (EC) Emotional Control, (AI) Active Initiative, and (S) Self-confidence. * Means and standard deviations in the Flood (2009) study were separated according to gender. Flood (1) male scores and Flood (2) female scores.

Table 3. Time Management

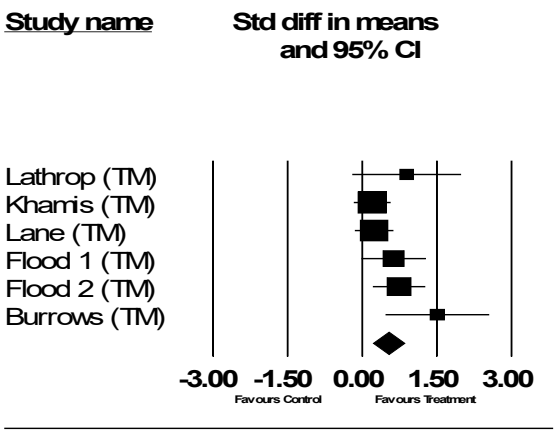


Table 4. Social Competence

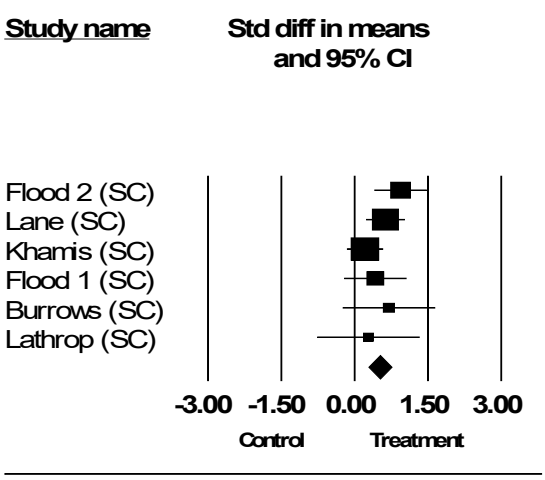


Table 5. Achievement Motivation

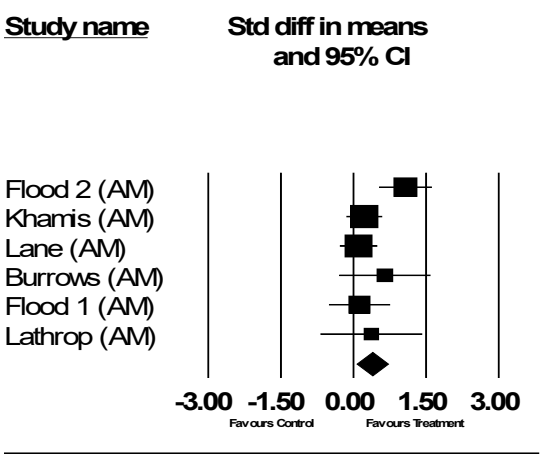


Table 6. Intellectual Flexibility

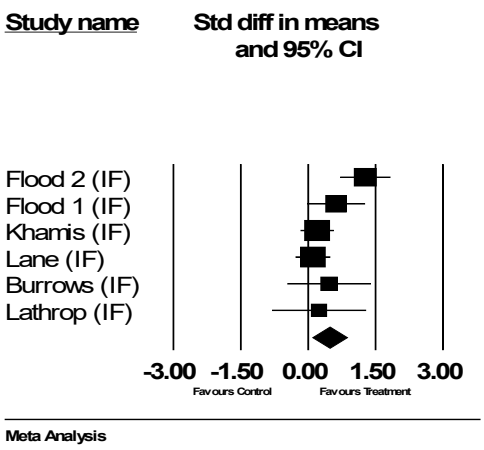


Table 7. Task Leardership

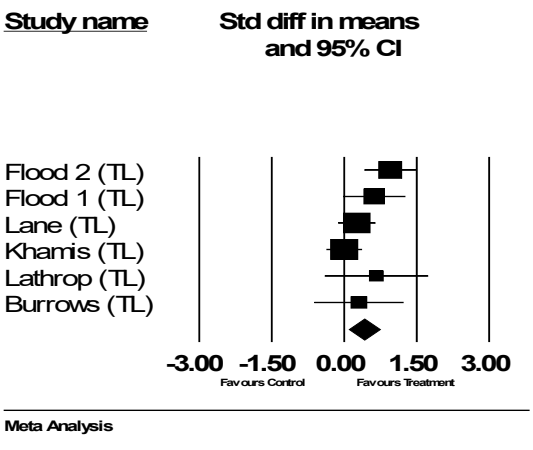


Table 8. Emotional Control

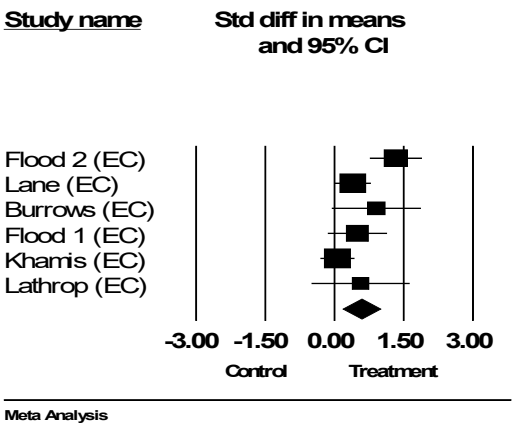


Table 9. Active Initiative

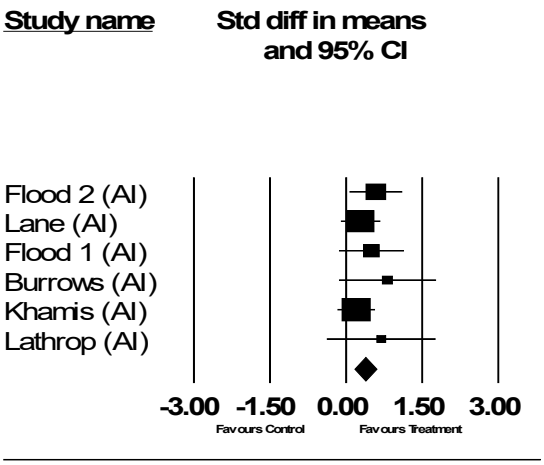
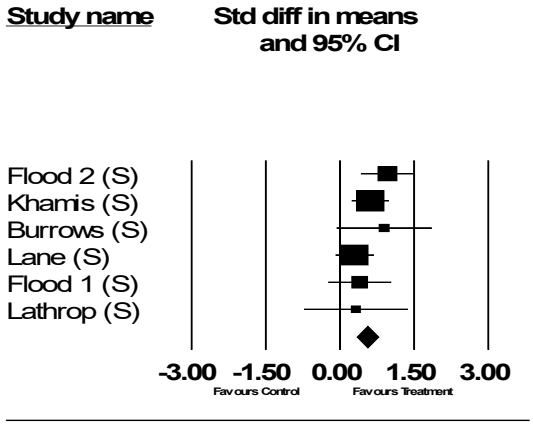


Table 10. Self-confidence



Appendix

L.E.Q. - H©

PLEASE DO NOT TURN OVER YET

READ THESE INSTRUCTIONS

This is a chance for you to consider how you think and feel about yourself in some ways. **This is not a test** - there are no right or wrong answers, and everyone will have different responses. It is important that you give your own views and that you be honest in your answers and do not talk to others while you think about your answers. They will be used only for research purposes and will in no way be used to refer to you as an individual at any time.

Over the page are a number of statements that are more or less true (that is like you) or more or less false (that is unlike you). Please use the eight point scale to indicate how true (like you) or how false (unlike you), each statement is as a description of you. **Answer the statements as you feel now**, even if you have felt differently at some other time in your life. Please do not leave any statements blank.

FALSE NOT LIKE ME							TRUE LIKE ME
1	2	3	4	5	6	7	8
This statement doesn't describe me at all; it isn't like me at all		More false than true		More true than false		This statement describes me very well; it is very much like me.	

SOME EXAMPLES

A. I am a fast thinker. 1 2 3 4 5 (6) 7 8
(The 6 has been circled because the person answering believes the statement "I am a fast thinker" is sometimes true. That is, the statement is sometimes like him/her.)

B. I am a good storyteller. 1 (2) 3 4 5 6 7 8
(The 2 has been circled because the person answering believes that the statement is mostly false as far as he/she is concerned. That is, he/she feels he/she does not tell good stories.)

C I enjoy working on puzzles. 1 2 3 4 5 6 7 (8)
(The 8 has been circled because the person really enjoys working on puzzles a great deal, therefore the statement is definitely true about him/her.)

**** ARE YOU SURE WHAT TO DO? ****

If yes, then please turn the page over, write your name, today's date, and circle your answers for all the statements.

If still unsure about what to do, ASK FOR HELP.

PLEASE GIVE HONEST, PRIVATE ANSWERS

SID

L.E.Q. - H©

NAME:_____ AGE:_____(years) DATE:___/___/____

MALE / FEMALE (circle one) COURSE CODE:_____ GROUP:_____

STATEMENT	FALSE not like me							TRUE like me
01. I plan and use my time efficiently.	1	2	3	4	5	6	7	8
02. I am successful in social situations.	1	2	3	4	5	6	7	8
03. When working on a project, I do my best to get the details right.	1	2	3	4	5	6	7	8
04. I change my thinking or opinions easily if there is a better idea.	1	2	3	4	5	6	7	8
05. I can get people to work for me.	1	2	3	4	5	6	7	8
06. I can stay calm in stressful situations.	1	2	3	4	5	6	7	8
07. I like to be busy and actively involved in things.	1	2	3	4	5	6	7	8
08. I know I have the ability to do anything I want to do.	1	2	3	4	5	6	7	8
09. I do not waste time.	1	2	3	4	5	6	7	8
10. I am competent in social situations.	1	2	3	4	5	6	7	8
11. I try to get the best results when I do things.	1	2	3	4	5	6	7	8
12. I am open to new ideas.	1	2	3	4	5	6	7	8
13. I am a good leader when a task needs to be done.	1	2	3	4	5	6	7	8
14. I stay calm and overcome anxiety in new or changing situations.	1	2	3	4	5	6	7	8
15. I like to be active and energetic.	1	2	3	4	5	6	7	8
16. When I apply myself to something I am confident I will succeed.	1	2	3	4	5	6	7	8
17. I manage the way I use my time well.	1	2	3	4	5	6	7	8
18. I communicate well with people.	1	2	3	4	5	6	7	8
19. I try to do the best that I possibly can.	1	2	3	4	5	6	7	8
20. I am adaptable and flexible in my thinking and ideas.	1	2	3	4	5	6	7	8
21. As a leader I motivate other people well when tasks need to be done.	1	2	3	4	5	6	7	8
22. I stay calm when things go wrong.	1	2	3	4	5	6	7	8
23. I like to be an active, "get into it" person.	1	2	3	4	5	6	7	8
24. I believe I can do it.	1	2	3	4	5	6	7	8

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Goalball: Strategies for Teaching One Paralympic Sport in Inclusive Physical Education

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Introduction

Goalball is a Paralympic sport played by individuals who are blind or visually impaired. This exciting team sport requires skills such as ball control, throwing, rolling, passing, and blocking. The aforementioned skills are present in traditional sports played in inclusive physical education settings. Yet, it is likely that goalball is not currently a unit in your curriculum. Goalball offers a chance to bring awareness to inclusion, diversity, equal opportunity and Paralympic sports. When Goalball is incorporated into an inclusive physical education curriculum it allows all students to be challenged equally, and the game itself is designed to negate differences among participants. All children can participate, and, in some respect, goalball may level the playing field. The purpose of this article is to provide physical education teachers with (1) an introduction to basic rules of goalball, (2) the basic skills of goalball, and (3) strategies for creating an inclusive environment.

Goalball

Goalball was invented in Europe around 1946 as a means of rehabilitation for visually impaired World War II veterans. Goalball was a demonstration sport in the 1972 Paralympics in Germany and an official sport for men in the 1976 Games in Canada. While women's Goalball was added in 1984. This game is a team-oriented sport and requires all players be rendered totally blind by wearing eyeshades. It is played in a silent gym, and the goal of the game is to score by throwing (rolling) a ball across the opponent's goal line. The International Blind Sports Association (IBSA) developed the rules of Goalball (United States Association of Blind Athletes, 2018).

Equipment. Goalball requires minimal equipment and is relatively low cost. Much of the equipment can be handmade as needed.

1. A regulation ball is natural rubber, 76 centimeters in circumference and weighs about 1.25 kilograms. It is close to the size of a men's basketball, but in comparison is almost double the weight. The ball contains bells that allow players to audibly track ball movements during play. A regulation ball is not suggested for physical education, alternatives include a goalball trainer, a beep kickball, or a homemade ball made of a volleyball with bells (see figure 1).
2. Boundary lines must be tactile. Tape and string line each section and boundary of the court for students to touch to ensure correct positioning during game play. A colored low adhesive tape with string under it is safe to use on any gym

floor (Laughlin, & Happel, 2016). Boundaries are a low-cost item and depending on developmental level students may be able to mark out the courts themselves.
3. Goals are 30’ wide by 4” tall and netted goals. These are expensive, an alternative is to make goals out of PVC pipe, use traffic cones, or the goal line for scoring (Laughlin, & Happel, 2016).
4. Eyeshades/ blindfolds should be worn by all players. Players may not touch or remove their eyeshades during the game. While goalball has official eyeshades for competition, physical education teachers can use sleep shades, eye patches, headbands, bandanas or blacked out ski or water goggles (Laughlin, & Happel, 2016).
5. Kneepads and elbow pads are helpful for student safety. If unavailable, encourage students to wear long sleeves and long pants during games (Laughlin, & Happel, 2016). Alternatively, students may have pads from other sports such as volleyball or skateboarding that can be used.
6. Place a shaker behind the goal line that can be used by a sighted student referee to signal to players that a goal has been scored. A tin can with beads inside serves as a homemade noise maker. (Auxter, Pyfer, Zittel, & Roth, 2010).

Court Dimensions. The dimensions of a regulation court are 30’ x 60’ (18m x 9m), and there is a centerline that divides the court (see figure 2). There are six 10-foot sections on the court and those sections are marked by textured tape or string that can be felt by the players. On both ends of the court are 10-foot sections of the team area and that is where the three-team members line up for the game. Another 10-foot section in front of the team area is the throwing area and players are allowed to go up to this line to throw but not defend. The only reason a player can go across the throwing line is for a ball deflected after a shot (Winnick, 2017).

Time. Each game consists of two 12-minute periods with a halftime between the two periods that last 3 minutes. The clock is stopped when a goal is scored or during time-outs. Each team gets three 45-second time-outs during a regulation game. Clock times are relayed to players through whistles throughout the period (IBSA, 2019).

Players. Each team is allowed 6 players on the team, but only three players are allowed on the floor at one time. Balls are typically thrown or rolled underhanded, resembling rolling a bowling ball, towards the opponent’s goal. Once the defending team hears that a shot has been attempted, they may lay down laterally in an attempt to block the shot. Players are not allowed to lay down prior to a shot being attempted. Player positions vary from standing, kneeling, or lying down. Once the ball has been thrown to begin the game by a designated team the players are allowed to shoot or pass to a teammate, but the players only have 8 seconds after possessing the ball to attempt a shot or pass the ball. Sighted referees preside over the game to ensure boundaries, clock, and penalties are enforced (Winnick, 2017).

Communication. Rules prevent verbal communication with players during play. Coaches may only communicate with players at halftime or during official timeouts. Communication between players is permitted and players can use various means of communication such as talking, snapping, or tapping the floor.

Goalball Skills

Goalball requires a set of skills and through intentional skill development the game can be played in an inclusive physical education setting.

Orientation & Mobility. Familiarizing students with wearing a blindfold is an important first step in the orientation process. Allow students to practice putting the blindfold on and taking it off. Some students may not like wearing a blindfold. For example, students with sensory processing disorders may find the blindfold irritating on their skin. Options could be to try a variety of different textures of blindfold or to have the student just close their eyes. Once students are orientated to the blindfold, the next step is to work on mobility. A good beginning activity is to use partners, one student is blindfolded and the other is a sighted guide. The sighted guide should navigate the blindfolded student through a variety of simple activities such as walking or completing a simple obstacle course. Students wearing blindfolds can progress to standing, crawling, and navigating their surroundings on the actual goalball court.

Team Communication. Eliminating sight heightens the need to utilize other senses. Communication is important in all team sports but looks a little different in goalball. The rules enforce a quiet atmosphere, thereby allowing players alternate means of communication such as snapping or tapping the floor to let teammates know where they are on the court. Allow teams to invent and practice ways to communicate within the rules of the game and determine what sounds mean during the game (Laughlin et al., 2016).

Throwing (Rolling). The main offensive skill is the throw or roll. Typically, the throw is used to shoot on goal. See figure 3 for cues and critical features of the roll. Students can practice throwing the ball with a partner towards a target, listening to the bells to determine location.

Passing. Teammates pass the ball to each other to gain offensive throwing opportunities. To pass the ball, gently toss the ball to a teammate so they can hear the bells during game play (see figure 3). Communication is key for passing to be successful, so students can practice with teammates and ascertain where teammates are on the court.

Blocking. The defensive skill in goalball is blocking. A strong block prevents a score but also allows players to quickly get ready to throw. The most effective technique is to lay horizontally on the ground facing the opponents goal line (see figure 3). Students should practice listening for the ball and then lying horizontally with arms and legs extended to block the ball against a shot on the goal (Winnick, 2017). Safety is of utmost importance and students may need to practice throwing, passing, and blocking without blindfolds. A sighted game can be played to familiarize

students with skills and rules. Blindfolds can be added later in the unit.

Goalball in Inclusive Physical Education

As goalball was originally created for individuals with visual impairments the design and rules of the game make it an ideal activity for inclusive physical education. Modifications can be made to allow participation for all students.

Equipment. Modifying equipment is a simple strategy to enhance student success. Eyeshades can be used, or the game can be sighted as needed. Scooter boards may assist students with mobility difficulties or students could lie on mats for comfort. The ball could be larger, lighter, and softer when practicing blocking skills and smaller, quicker, heavier when practicing throwing skills. Additional equipment can be added to assist with blocking such as a noodle or paddle (Winnick, 2017).

Court Dimensions. Modifying the size of the entire court or specific zones to meet student needs can easily be accomplished as the taped lines can be moved. A court shorter in length will allow students with difficulty rolling to have more success whereas a court with a wider width may allow more players to cover the goal line. Goals can be the length of the goal line to be covered by the entire team or multiple smaller goals could make scoring more difficult as needed.

Players. Adding or decreasing the number of players during practice and/or game play can be helpful for students. Adding to the number of players can be beneficial for students with mobility challenges by requiring a smaller area of responsibility on the court. While decreasing the number of players allows students to cover more area. Another strategy is for players to take turns being sighted coaches providing feedback during skill practice and in games to improve knowledge and performance (Winnick, 2017).

Activities. Practicing basic drills increase goalball readiness such as throwing towards the goal for accuracy, blocking a ball for defense, and timed passing drills for team play. Circle Pass is a simple orientation group activity (4-5 students per group) that requires students of varying abilities to pass the ball across the circle while seated. Begin by passing without blindfolds. As students become comfortable give them the choice to close their eyes or use eyeshades. Add in opportunities for communication by snapping or tapping the floor to signal for the ball (Winnick, 2017). As proficiency increases groups can be challenged to pass the ball more quickly while maintaining ball control. To introduce mobility the group could move further apart and practice rolling and blocking. Small-sided games such as one versus one can be a great way to add developmentally appropriate competition (Haegele & Wiegel, 2018). Using these skill enhancement exercises in an inclusive physical education unit would be an important step to ensure the success of a goalball unit.

Conclusion

Due to its inclusive design, goalball would be an excellent addition to any physical education curriculum. Goalball is a popular Paralympic sport that has the potential to inspire all students to participate and grow not only as players but as individuals who celebrate inclusion, diversity, and equal opportunity for all. Similar to traditional sports goalball includes basic skills such as throwing (rolling), passing, blocking, communication, and teamwork. Modifications can easily be made to meet the needs of all students regardless of ability. Through goalball all students can enjoy the benefits of an inclusive physical education curriculum.

Figure 1. Goalball Ball Choices

			
Regulation Goalball	Goalball Trainer	Beep Kickball	Volleyball with Bells

Figure 2. Standard Goalball Court Dimensions (Laughlin, Larranaga, Gonnelli, & Murata, 2016).

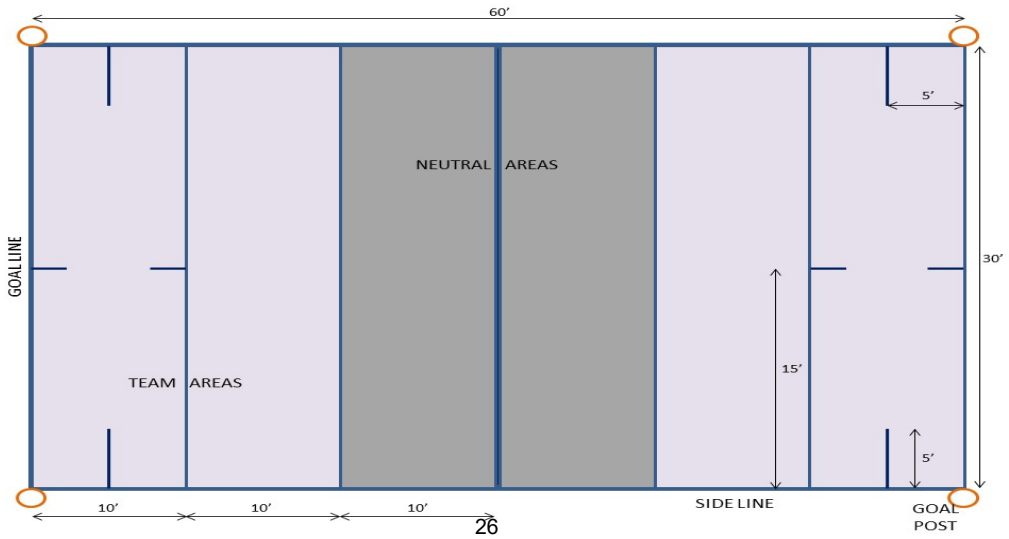
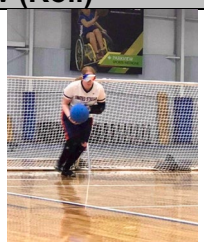
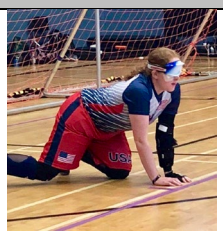


Figure 3. Basic Goalball Skills

Throw (Roll)	Pass	Block
 All photos courtesy of Ali Lawson, Olympic Goalball Player, Tokyo 2020.		
Face target ---Use orientation lines on court to face opponents goal line.	**Face teammate** ---Face teammate	**Ready position** ---Knees are shoulder width apart, hands are on orientation line supporting body, anticipating the block.
Arm back ---Hold the ball, swing the arm back at waist level.	**Communicate** ---Say teammates name.	**Contact floor** ---Drop hip to the ground, outstretch arms and hands to cushion contact with the floor.
Step ---Step towards the target with opposite foot.	**Communicate** ---Receiver taps the floor to signal it is ok to pass.	**Lie on side** ---Lie on side facing the opponents goal line with legs and arms outstretched to block incoming ball.
Release ---Swing arm forward and release ball out in front at a low level.	**Toss** ---Gently toss ball to teammate so it bounces, and the bells signal its location.	**Protect face** ---Position top arm in front of face and tilt head back slightly.

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Updating Alabama's Health Education Course of Study: An Analysis of Process and Product

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Introduction

The Health Course of Study Committee and Task Force consisted of members representing the entire state of Alabama and its School Board districts in accordance with the *Code of Alabama* (1975). The qualifying members consisted of elementary teachers, secondary teachers, administrators, educators from state institutions of higher learning, and Governor appointees with expertise in the field. Members took an oath of office and met monthly over the course of a year with the purpose of reviewing and revising the Alabama Health Education Course of Study (COS). Additional input was gathered through state, regional, and national conferences, professional publications, neighboring states' courses of study, and public review.

Background

Health education is the synthesis of learning experiences that influences students to improve their health outcomes through improved health literacy and supportive attitudes (World Health Organization, 2019). Research indicates a plethora of beneficial outcomes as the result of K-12 Health Education. The impacts are far-reaching not only to students but to the community and economy. Health Education increases health literacy and academic achievement and influences positive outcomes in student behavior and attendance. The impacts further reach the community and the economy by ultimately promoting a healthy population, decreasing health risk behavior, and reducing healthcare and health insurance costs (Centers for Disease Control and Prevention, 2019a; Basch 2010).

Skills Based Health Education

Seminal educational research and theories contributed over the decades provide rationale for the use of skills-based health education. The Social Learning Theory suggests that individuals learn the behavior that is acceptable in a particular setting by examining the behavior of others (Bandura, 1977). This theory also proposes the idea that the likelihood of a behavior reoccurring is increased when the behavior is rehearsed mentally or performed. This concept provides a foundation for the use of participatory methods in skills-based Health Education. Additionally, the Constructivist Theory posits that the fundamental brain development in children is dependent on peer collaboration interactions and problem solving (Vygotsky, 1978). This reasoning provides support for skills-based health education because it encourages cooperative work to normalize pro-social behaviors. If these behaviors become the norm, students will be more likely to engage in such

behavior and make positive decisions (World Health Organization, 2003).

In recent years, Health Education has evolved from being primarily knowledge-based to skills-based. Skills-based health education is unique and effective in the sense that it emphasizes the evolution of the knowledge, attitudes, values, and skills of students. By emphasizing these areas, skills-based health education equips the learner with the tools to decide which choice is the most favorable concerning their health. Skills-based health education yields positive results because of the participatory and collaborative methods that are incorporated (Partnership for Child Development, 2019).

Health Education skills are acquired when students have the freedom to observe and practice them. Research advocates for students to be given the opportunity to practice Health Education skills within the supportive environment of the classroom. This practice yields a higher likelihood that Health Education skills will transfer and students will be equipped to use them both in and outside of school (World Health Organization, 2003).

Development towards higher-order thinking and chances for practicing health-related skills are essential to Health Education (SHAPE America, 2019). The current National Health Education Standards are based on sound skill-based theory and provide a scaffolding for students to acquire the skills and information conducive to improving health outcomes and decisions (*National Health Education Standards,* 2007).

Application of skills-based Health Education revolves around student participation and practice. Topical information alone is not sufficient to change behavior. Students need opportunities to practice skills such as decision making, advocacy, and communication. Intentional role play, guided interactions, peer discussions within the safe confines of the classroom prepare students for real-life health scenarios. Effective examples could include Kindergarteners using paper bag puppets to practice conflict resolution or High School students designing a public service announcement advocating for the use of seatbelts.

Course of Study Overview

The Course of Study (COS) contains academic standards used to create curriculum and specifies student outcomes in Health Education for each grade. Traditionally, the Alabama Health Education COS has been organized according to topic areas (*Alabama Course of Study*, 2009). The updated COS (2019) is skill-based as seen in its eight anchor standards for K-12: advocacy, goal setting, decision making, health promotion, self-management, analyzing influences, communication skills, and access to information. Topics based on youth risk behaviors as identified by the Centers of Disease Control and Prevention inform the content and are expressed from the standards: alcohol and other drug use, inadequate physical activity, injury and violence, poor nutrition, tobacco use, and risky sexual behavior (Centers for Disease Control, 2018). The revised COS also incorporates the six dimensions of Health: physical, mental, social, spiritual, intellectual, and environmental (*Alabama Course of Study*, 2019).

In addition to the eight anchor standards, the COS includes content standards and sub-standards which indicate exactly what students are to know by the conclusion of a course. Content standards and sub-standards are required to be taught. They also serve as a basis for meaningful learning experiences and measurable outcomes. Examples are provided for clarification of the standards. (*Alabama Course of Study*, 2019).

Framework

Since the passage of Every Student Succeeds Act (ESSA) in 2015, Health Education has been recognized as a subject area and an integral part of the 10-component Whole School, Whole Community, Whole Child (WSCC) model (SHAPE America, 2019). Developed by the Association for Supervision and Curriculum Development (ASCD), the WSCC is an updated version of Coordinated School Health. It separates Community and Family Involvement into two categories and distinguishes Social and Emotional School Climate from Physical Environment instead of the previously all-encompassing Healthy School Environment component. Most importantly, the WSCC emphasizes a child-centered and collaborative approach to Health Education in our schools and communities and serves as part of the framework for the new COS (Centers for Disease Control, 2019b; *Alabama Course of Study*, 2019).

Goal

Optimal Health for Life is the ultimate goal for Health Education in Alabama. This goal is displayed prominently at the top of the cover of the COS. Positive health outcomes and a high quality of life are within reach for Alabama's students through excellent and effective Health Education (*Alabama Course of Study*, 2019).

Organization

The organization of anchor standards, content standards, content sub-standards, and examples in the new COS are intuitive and user-friendly. The chart format is visually and logically organized according to grade level. It flows with the natural progression of the skills and increasing vigor. Anchor standards are listed at the top of each table and also abbreviated vertically in the far-left column. Content standards, sub-standards, and examples are listed within each text box.

Standards are numbered with the first number indicating grade level, then the anchor standard, and finally the content standard. This numbering system provides a clear and predictable way for standards to be referenced. For example, 3.7.1 indicates third grade, the seventh anchor standard, and first content standard. For high school, the course abbreviation is listed first and replaces the grade level.

New Electives

Two new health electives have been added to the COS for 9th-12th grade students: World Health (WH) and Leaders in Health Advocacy (HA). Each elective is worth one-half credit and may be taken by high school students with the pre-requisite of successfully completing the required Health Education course. Students may take electives in any order.

Through these electives, students will gain exposure to the health field and health-related careers. World Health

focuses on public health concepts and issues with a global perspective. Leaders in Health Advocacy help students learn how to promote personal, peer, and societal health. Additionally, the classes may support the efforts of high schools to meet the mandates of Erin's Law, the Jason Flatt Act, HIV/AIDS requirements, and character education (*Alabama Course of Study*, 2019).

These new electives are open and available to all Alabama high schools. However, it is a local decision to include elective offerings or not. ACCESS distance learning does not anticipate having online versions available for the time being. It takes considerable time to create, review, and evaluate online courses before going live. Although the 2019-2020 school year is transitional for Health COS implementation, there are approximately 75 students throughout the state currently enrolled in the new electives. This number is anticipated to rise for the 2020-2021 school year when implementation of the new Health COS becomes mandatory (ALSDE, personal communication, October 2019).

Best Practices

In Alabama, Health Education must not be taught during the time allotted for Physical Education for all grade levels. However, it may be integrated into other core subject areas. Stand-alone Health Education courses in middle and high school are required to be taught by a certified Health Education Teacher. A separate Health Education grade should be included on student report cards for Grades K-8 (*Alabama Course of Study*, 2019).

To get started with implementation of the new COS, review the standards written for your grade level. Study the skills and each standard's outcome and plan your units of instruction. Use the listed examples in the standards for ideas when developing and expanding lessons. Alternatively, choose aligned lesson plans from existing resources. Keep a written or digital record as each standard is met in your classroom.

Remember that effective K-12 Health Education is a collaborative effort. Identify and partner with health-related agencies in your community. Involve parents and families in meaningful ways to cultivate their child's health. Stay focused on skills that will reduce risky health behaviors among students. Encourage faculty and staff to set a positive example for health on your campus.

Resources

Check out the following resources and excerpts to support Health Education in your school:

- Alabama State Department of Education: www.alsde.edu

To obtain a copy of the Alabama Course of Study for Health Education, go to www.alsde.edu; select Support Systems; select Health Information; select Standards/COS & Textbooks (bottom of page).

- Alabama Learning Exchange (ALEX): www.alex.state.al.us

The Alabama Learning Exchange includes multimedia, learning activities, lessons, and unit plans all connected by the Alabama Standards to promote deeper-learning competencies essential for success in college, careers, and our global society.

- EVERFI: www.everfi.com

EVERFI empowers educators to bring real-world learning into the classroom

and equip students with the skills they need for success–now and in the future. Thanks to partners who share this mission, EVERFI's online resources for teachers are available at no cost.

- Alabama Champions for Healthy Active Schools: https://www.alabamapublichealth.gov/npa/alabama-champions-schools.html

The Alabama Champions for Healthy Active Schools (ACHAS) statewide initiative is a collaborative effort involving key partners that share a vested interest in improving the health of Alabama students and school personnel. ACHAS helps local educational agencies (LEAs) and schools to develop successful wellness-promotion policies and to become champion schools.

- Alliance for a Healthier Generation www.healthiergeneration.org

The Alliance for a Healthier Generation is an advocate for the health of children. This organization works to improve the conditions and environments to facilitate children's health by partnering with schools, healthcare professionals, and community organizations.

- SHAPE America Health Education Resources for Teacher's Toolbox https://www.shapeamerica.org

SHAPE America is committed to putting all children on the path to health and physical literacy. They offer a variety of tools, products, and services for K-12 health educators. The Teacher's Toolbox includes skills-based learning activity ideas for each of the eight standards in grade levels P-2, 3-5, 6-8, and 9-12.

Conclusion

The positive health, academic, and economic outcomes of effective Health Education are undeniable. The revised COS was approved by the State Board of Education in March 2019. Its newly adopted document provides effective strategies to achieve high quality Health Education through skills-based standards. Be an advocate for implementing these standards in your school and help every K-12 student reach the goal of optimal health.

***Editors Note:** Dr. Toth was a member of the 2018-2019 Health and Physical Education Courses of Study Committee and Task Force.

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Nutrition for Athletes for Enhancement of their Performance

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Introduction

Nutrition is important to athletic performance regardless of the age of the athlete. Appropriate information regarding diet should be provided to athletes so they can make healthy food choices. Adequate dietary intake is important to maintain health, growth, and maturation as well as to minimize injury and optimize sports performance. An appropriate diet will help to develop sound dietary habits that follow through to adulthood and, together with physical activity, reduce the risk for many lifestyle diseases (Bass and Inge, 2006).

Many supplement products can improve performance through improving strength, or increasing tolerance for more intense training, or reduce the chance of injury during training, or assist with recovery after exercise. Studies have demonstrated that the timed ingestion of carbohydrate, protein, and fat may significantly affect the adaptive response to exercise. Dietary supplements can also play a meaningful role in helping athletes consume the proper amount of calories, carbohydrates, and protein in their diet (Kerksick, Harvey et al., 2008). Proper nutrition is a fundamental component of an athlete's training and performance plan.

Proper nutrition ensures that an individual is amassing the fuels necessary for the energy production needs related to activity and recovery. One of the areas needing to be addressed is the unique nutritional needs associated with intense exercise stress. Nutritional requirements for training and competition are determined by the rules of each sport, which vary in playing arena size, duration, and frequency of matches, season length, training phase, number of players, and substitutions allowed. Position-specific tasks and physique requirements, weather characteristics, as well as playing level, gender, and age issues further affect nutrient requirements. This review provides a brief synopsis of currently exists studies on a better understanding of the nutritional needs of the athlete.

Nutrition for training

Sports training is a long-term organized process in which athletes learn the techniques and tactics of their discipline. It also developing physical fitness as well as volitional qualities and personality, and acquire knowledge of their discipline. The

training aims to optimize body functions and develop specific adaptation to the physical effort to obtain maximum results and achievements in a sports discipline (Ważny, 2000).

The energy demands of sportsmen and women in training vary greatly, depending primarily on body mass and the training load. In sports, there is an advantage in maintaining a low body mass and especially low body fat content through following a pattern of restrained eating for very prolonged periods. Nutrition plays an important role in three aspects of training nutrition for strength-power athletes: fuelling of sport-specific and strength training, recovery from training, and the promotion of training adaptations (Lambert and Flynn, 2002; Piehl, 1974) Resistance exercise requires a high rate of energy supply, the contribution being dependent upon the relative power output, the work-to-rest ratio, and muscle blood flow. Sports nutrition is now more about using nutrition strategies to modulate training-induced muscle adaptations. The energy requirements of training are largely met by oxidation of fat and carbohydrate. Protein typically constitutes about 12-15% of the total energy intake (Lemon, 1991). The higher the intensity of exercise, the greater the total energy demand and the greater the reliance on carbohydrate as fuel (Coyle, 1991). The body stores of carbohydrates are small, relative to the amount that can be used during exercise. In prolonged hard exercise carbohydrate can be oxidized at a rate of 3-4 g/min by well-trained athletes (Maughan, 2009).

Recovery of the muscle and liver glycogen stores after exercise is a rather slow process, and complete recovery may not be achieved until 24-48 h after the end of the exercise (Piehl, 1974). A daily dietary carbohydrate intake of 500-600g may be necessary to ensure adequate glycogen resynthesis during the period of intensive training, and for some athletes, the amount of carbohydrate that must be consumed daily is even greater (Coyle, 1991). Although the carbohydrate requirement is determined primarily by training volume and intensity, body size also an important factor. In periods of hard training, which is considered to be simply working as hard as safely possible in each workout while maintaining good physical fitness, a daily requirement of about 8-10 g/kg body mass is likely for endurance athletes (Williams, 1998).

Carbohydrate to maximizing muscle glycogen

The restoration of muscle and liver glycogen is a fundamental goal of recovery between training sessions or competitive events, particularly when the athlete undertakes multiple workouts within a condensed time. Strategies such as altering the timing, pattern, quality, and type of carbohydrate intake can promote better glycogen synthesis when total carbohydrate intake is below the amount needed for maximal glycogen storage. This will often be the case for female athletes and others who restrict energy intake. Carbohydrate has rightfully received a great deal of attention in sports nutrition due to several special features of its role in the performance. Carbohydrate provides a key fuel for the brain and central nervous system and a versatile substrate for muscular work where it can support exercise over a large range of intensities due to its utilization by both anaerobic and oxidative pathways.

Carbohydrates yield more energy per unit of oxygen consumed than fats. Because oxygen often is the

limiting factor in long-duration and high-intensity events, it is beneficial for the athlete to use the energy source requiring the least amount of oxygen per kilocalorie produced (Clifford and Maloney, 2015). Depending on the intensity, duration, and frequency of exercise, in general, athletes should consume between 5-10 grams of carbohydrates per kilogram of body weight per day (Kreider, Wilborn et al., 2010). The majority of dietary carbohydrates should come from complex carbohydrates with a low to moderate glycemic index (named "slow carbs"). Appropriate sources are whole grains, fruit, vegetables, legumes, etc. It is advisable to consume a carbohydrate-rich meal with a low glycemic index approximately 1–2 hours before training (Kreider, Wilborn et al., 2010).

Fat as fuel

Fat is a necessary component of a healthy diet, providing energy, essential elements of cell membranes and facilitation of the absorption of fat-soluble vitamins.There has been a recent resurgence of interest in fat as a fuel, particularly for ultra-endurance exercise. A high-carbohydrate strategy inhibits fat utilization during exercise (Horowitz, Mora-Rodriguez et al., 1997), which may not be beneficial due to the abundance of energy stored in the body as fat. Creating an environment that optimizes fat oxidation potentially occurs when dietary carbohydrate is reduced to a level that promotes ketosis. However, this strategy may impair the performance of a high-intensity activity (Stellingwerff, Spriet et al., 2006). The lack of performance benefits seen in studies investigating "high-fat" diets may be attributed to inadequate carbohydrate restriction and time for adaptation. Research into the performance effects of high-fat diets continues (Kalepwar, 2018). The dietary recommendations of fat intake for athletes are similar to or slightly greater than those recommended for non-athletes. Adequate consumption of essential fatty acids (Broad and Cox, 2008), especially polyunsaturated fatty acids, is of great importance among athletes.

Fats are a source of energy and fat-soluble vitamins, such as A, D, E and K. They contain fatty acids which are very important to the nervous system, skin, and hair. Adequate intake of fatty acid stimulates the synthesis of enzymes in the muscles, which are necessary to metabolize fat during the workout. They should constitute at least 15% of the daily energy intake. This value should increase with the intensity of workouts. Fats can be saturated or unsaturated, and they play a vital role in the human body. Unsaturated fats are considered healthy and come from plant sources like olive oil and nuts. Saturated fats are found in animal products like red meats and high-fat dairy, which are indicated to increase the risk of disease.

Ideally, the minimum amount of fats for an adult with a moderate lifestyle is 10% of daily energy needs. Unfortunately, a large part of the population consumes a lot more fat than necessary (Celejowa, 2008), however, too much saturated fats in your diet can raise LDL cholesterol in the blood, which can increase the risk of heart disease and stroke. Also eating too much fat causes you to become overweight or obese. Athletes have been proven to consume too much fat, for example, Borchers et al. (2009) found that 21 % of their Division 1 college football players (mean age, 20 years) were obese (≥25 % body fat) and had insulin resistance, while 9 % had metabolic syndrome (all obese). Thus, for these athletes, weight loss

could improve performance, relief from metabolic syndrome and prevent the development of serious chronic diseases.

Physically active individuals should consume fat from virgin olive oil, flaxseed oil, pumpkin seed oil, hazelnut oil, sesame oil, and poppy seeds oil. Cold-pressed, unrefined oils are recommended; fish oils are also popular (Celejowa, 2008).

Protein needs

Exercise may increase an athlete's need for protein, depending on the type and frequency of exercise. The latest guidelines for nutrition and athletic performance intakes ranging from 1.2–2.0 g/kg/day. Higher intakes may be indicated for short periods during intensified training or when reducing energy intake (Gigou, Lamontagne-Lacasse et al., 2010). Daily protein intake goals should be met with a meal plan providing a regular spread of moderate amounts of high-quality protein across the day and following strenuous training sessions.

These recommendations encompass most training regimens and allow for flexible adjustments with periodized training and experience (Rosenbloom & Coleman, 2012). Eating protein after an athletic event has been shown to support muscle protein synthesis. However, eating protein over nutritional needs has not been shown to further increase muscle building. Extra protein is broken down for energy or is stored as fat or is not used efficiently by the body and may impose a metabolic burden on the bones, kidneys, and liver.

Protein can either be complete or incomplete. A complete protein contains all the amino acids needed by the body, and include animal sources like meat, fish, poultry, and milk. Incomplete protein sources (typically plant-based proteins) often lack one or more of the essential amino acids.

Excess protein can deprive the athlete of more efficient fuel sources and can lead to dehydration. High-protein diets increase the water requirement necessary to eliminate the nitrogen through the urine. Also, an increase in metabolic rate can occur and, therefore, increased oxygen consumption (Du, 2013).

Fluid to stay hydrated

The purpose of fluid consumption prior & during exercise is primarily to maintain hydration and thermoregulation, thereby benefiting performance. Hydration requirements are closely linked to sweat loss, which is highly variable (0.5–2.0 L/hour) and dependent on type and duration of exercise, ambient temperature, and athletes' characteristics (Sawka, Burke et al., 2007). If the exercise is prolonged, this leads to progressive dehydration and loss of electrolytes.

Dehydration is the process of losing body water, and fluid deficits greater than 2 percent of body weight can compromise athletic performance and cognitive function (Goulet, 2012). Athletes are recommended to use fluid replacement strategies as part of their sports nutrition to maintain optimal body functioning. Beginning exercise in a hypodehydrated state is certainly harmful to the performance of high-intensity exercise (Thomas, Erdman et al., 2016) and endurance performance (Goulet, Lamontagne-Lacasse et al., 2010).

To avoid dehydration, an athlete should drink 5 to 7 mL per kg of body mass approximately four hours before an event (Clifford and Maloney, 2015). American College of Sports Medicine and the International Society of Sports Nutrition recommend that throughout the event, athletes should drink chilled water or electrolyte drinks, consuming

enough to match sweat losses (Kerksick, Wilborn et al., 2018). There are several reasons behind that recommendation, as like chilled fluids are tasted better and appear to slake thirst quicker, absorbed faster, help lower body temperature, passes through the stomach quickly for quicker absorption and hydration. Drinking cold water or chilled sports drinks also helps delay or reduce the rise in body temperature that may hinder endurance or strength training. Rehydration by the administration of water and sports drinks containing sodium results in saving from the depletion of substrate which seems to be the effects of dehydration. Weight loss happens in endurance athletes who lose huge quantities of fluid while exercising which needs to be replaced by drinking fluids as quickly as possible after exercise. An athlete should consume 16 to 24 ounces of fluid for every pound loss in weight (Fink and Mikesky, 2017). By routinely tracking pre- and post-exercise body weight changes, sweat rates can be estimated, allowing for more efficient hydration during athletic events.

An individual should never gain weight during exercise (from pre-exercise to postexercise) unless they begin activity with an unavoidable fluid deficit; this is a sign of excessive hydration, which can lead to electrolyte imbalances, and potentially hyponatremia (Montain, Sawka et al., 2001).

Micronutrients

Maintaining adequate levels of vitamins and minerals is important for bodily function, and therefore, athletic performance. As the activity level of an athlete increases, the need for different vitamins and minerals may increase as well. However, this need can be easily met by eating a balanced diet including a variety of foods.

Exercise stresses may increase the requirement of micronutrients, and training may result in muscle biochemical adaptations that increase the need for some micronutrients (Farajian, Kavouras et al., 2004). Athletes who frequently restrict energy intake, rely on extreme weight-loss practices, eliminate one or more food groups from their diet, or consume nutrient-deficient diets, may consume sub-optimal amounts of micronutrients and benefit from micronutrient supplementation (Farajian, Kavouras et al., 2004). Iron deficiency, with or without anemia, can impair muscle function and limit work capacity.

Vitamin D exerts its principal actions on bone metabolism, so it has important benefits on the skeleton. There is growing evidence that many athletes are vitamin D deficient or insufficient, especially those who train indoors, who wear protective clothing while outdoors or who live at high latitudes (Willis, Smith et al., 2012). Good evidence is unfamiliar on routine vitamin D supplementation is beneficial to athletes or not, hence there is some evidence from cross-sectional studies of an association between circulating vitamin D levels and athletic performance (Thomas, Erdman et al., 2016). It, therefore, seems prudent to recommend that athletes seek professional help to monitor their serum vitamin D status.

Calcium is especially important for growth, maintenance, and repair of bone tissue; regulation of muscle contraction; nerve conduction; and normal blood clotting. The risk of low bone mineral density and stress fractures is increased by low energy availability, and in the case of female athletes, menstrual dysfunction, with low dietary calcium intake contributing further to the risk (Nickols-Richardson, Beiseigel et al., 2006; Otis, Drinkwater et al., 1997). Low calcium intakes are

associated with restricted energy intake, disordered eating and/or the specific avoidance of dairy products or other calcium-rich foods. Calcium supplementation should be determined after a thorough assessment of usual dietary intake (Mountjoy, Sundgot-Borgen et al., 2014). Potassium levels can decline during exercise, though losses are not as significant. Eating potassium-rich foods such as oranges, bananas, and potatoes throughout training and after competition supplies necessary potassium.

Iron carries oxygen via blood to all cells in the body. Needs for this mineral are especially high in endurance athletes. Choosing foods high in iron such as red meat, lentils, dark leafy greens, and fortified cereals can help prevent iron deficiencies, but taking an iron supplement may be advised. It is best to consult a physician before starting iron supplements.

Ergogenic aids

Ergogenic aids are mechanical, nutritional, pharmacological, physiological and psychological tools that athletes use to increase energy, performance, and recovery. The most popular and beneficial supplements for athletes are sports beverages (Rodriguez, Di et al., 2009) and caffeine. Creatine is also popular among athletes but a controversial item to both scientists (Hespel, Maughan et al., 2006) and practitioners. Creatine alone or combined with protein powders are very popular in strength-and-power sports, although some players complain about tight muscles or muscle tears when on creatine, in spite of published evidence to the contrary (Greenwood, Kreider et al., 2003). Studies show that creatine loading enhances the performance of exercise involving repeated high-intensity work bouts with short recovery intervals.

Caffeine is one of the most common supplements used in endurance sports. It is an alkaloid xanthine derivative (1, 3, 7-trimethyl xanthine) found in, and added to, a wide variety of foods, beverages, and sports nutrition products. Caffeine has been consumed in various foods and beverages for centuries due to its perceived work-enhancing (ergogenic) and alertness effects. A large number of studies have reported improvements in endurance performance (Graham, 2001).

Caffeine in relatively small doses, typically 2–4 mg/kg, can improve performance in a variety of exercise tasks, with greater effects generally seen in prolonged exercise. Side effects from high doses may include allergic reactions, central nervous system and gastrointestinal disorders, and kidney damage.

Effect of supplementation in sports performance

Dietary supplement use is popular in sport. A supplement is something added to the diet, typically to make up for a nutritional deficiency. Ideally, it should be used in addition to well-balanced nutrition. Supplements include sports drink, bars gel, electrolyte supplements, multivitamins, minerals, creatine caffeine, and nitrate. On the other hand, supplements can’t be an alternative of a sensible diet or in the course of hard training as it is the time when body requires more energy & nutrients. But a handful of these products do provide real, scientifically proven benefits for athletes such as faster post-exercise recovery, enhanced workout performance and reduced risk of injury.

Discussion

The primary goal of the diet is to provide nutritional support to allow the athlete to stay healthy and injury-free while maximizing the functional and metabolic adaptations to a periodized exercise program that prepares him or her to better achieve the performance demands of their event. While some nutrition strategies allow the athlete to train hard and recover quickly, others may target an enhanced training stimulus or adaptation. Depending on the training schedule and exercise intensity, the estimated energy needs of such athletes are routinely in the range of 50-80 kcal kg^{-1} day^{-1} (Kreider, Wilborn et al., 2010). Unlike endurance athletes, quantification of caloric expenditure is much harder to determine for strength and power athletes (i.e., sprinters, team sport athletes such as American football or rugby, weightlifters, throwing athletes, and bodybuilders), because of the variability in high-intensity bursts and power, varying lengths of recovery periods from training and competition (Widrick, Costill et al., 1992). The total energy requirement depends on age, sex, weight and physical activity. The main rule in every type of nutrition is energy balance.

Athletes need to consume energy that is adequate in the amount and timing of intake during periods of high-intensity and/or long-duration training to maintain health and maximize training outcomes. Low energy availability can result in unwanted loss of muscle mass.

Targets for daily carbohydrate intake are usefully based on body mass and exercise load. Guidelines can be suggested but need to be fine-tuned according to the athlete's overall dietary goals and feedback from the training. Depending on some variables (sport or mode, intensity, duration, and skill of the athlete), average carbohydrate requirements for endurance and strength or power athletes are 6-10 g kg^{-1} day^{-1} and 3.9-8.0 g kg^{-1} day^{-1} respectively (Rodriguez, Di et al., 2009; Otten, Hellwig et al., 2006; Genton, Melzer et al., 2010). During longer recovery periods (24 h) when adequate energy and carbohydrate is consumed, the types, pattern, and timing of carbohydrate-rich meals and snacks can be chosen according to what is practical and enjoyable. Adequate energy intake is needed to optimize glycogen storage; the restrained eating practices of some athletes interfere both with meeting targets for carbohydrate intake and optimizing glycogen storage from this intake.

Depending on some variables (sport or mode, intensity, duration, and skill of the athlete), average protein requirements for endurance and strength or power athletes are 1.2-1.4 g kg^{-1} day^{-1} and 1.2-1.7 g kg^{-1} day^{-1} respectively (Rodriguez, Di et al., 2009; Otten, Hellwig et al., 2006; Genton, Melzer et al., 2010) but have more recently been expressed in terms of the regular spacing of intakes of modest amounts of high-quality protein (0.3 g/kg body weight) after exercise and throughout the day (Kenney, Wilmore et al., 2015). Be cognizant that training time(s) and protein recommendations around training sessions must be accommodated. Such intakes can generally be met from food sources. Distribute the protein evenly throughout the day, likely in three to four main meals plus one to three snacks, but this will be personalized. Several commercial products consisting of combinations of carbohydrates with protein and/or amino acids are now available, but evidence is lacking while considering that these products are likely to be more effective than normal foods. A sandwich made with ham, cheese,

tuna or even jam might be just as good at supplying both carbohydrates to replenish the muscle glycogen stores and amino acids to stimulate protein synthesis.

For most athletes, fat intakes associated with eating styles that accommodate dietary goals typically range from 20%– 30% of total energy intake. Currently, dietary guidelines recommend that 10% of fat intake should come from monounsaturated sources, 10% from polyunsaturated sources and no more than 10% saturated fat (Rodriguez, Di et al., 2009; Otten, Hellwig et al., 2006; Genton, Melzer et al., 2010). It is well recognized that dehydration, resulting in either from sweat losses or inadequate fluid intake, can impair performance in prolonged exercise; thus, appropriate fluid intake before, during, and after exercise is important for health and optimal performance. The goal of drinking during exercise is to address sweat losses that occur to assist thermoregulation. Maintaining body water content at a level close to euhydration is, therefore, a priority for all athletes in competition.

Athletes should consume diets that provide at least the Recommended Dietary Allowance (RDA)/Adequate Intake (AI) for all micronutrients. Most athletes consume adequate amounts of vitamins in the diet and have little need for vitamin supplements. However, some adolescent and adult athletes have dietary intakes that are below the RDA for B6, B12, folate and E. Athletes who chronically restrict energy intake to limit body mass, and especially fat mass may benefit from a broad spectrum of vitamin and mineral supplements.

Athletes should be counseled regarding the appropriate use of sports foods and nutritional ergogenic aids. Such products should only be used after careful evaluation of safety, efficacy, potency, and compliance with relevant anti-doping codes and legal requirements. Caffeine has several unwanted side effects that may limit its use in some sports or by sensitive individuals; these effects include insomnia, headache, gastrointestinal irritation and bleeding, and stimulation of diuresis. The diuretic action of caffeine is often stressed, particularly in situations where dehydration is a major issue.

Conclusion

Nutrition plays several important roles for athletes competing in sports. Athletes are always looking for an edge to improve their performance, and there is a range of dietary strategies available. Dietary recommendations should be individualized for each athlete and their sport and provided by an appropriately qualified professional to ensure optimal performance. A nutritionally complete, balanced diet should provide ample amounts of energy, carbohydrates, and protein to ensure optimal nutrition to support exercise performance.

Sample calorie meal plans for athletes (endurance, strength or power athletes)

There are no vital differences that have taken place in between a sample calorie meal of an endurance athlete and in a meal of strength or power athlete, only need to consider some exceptions which differ them are followed by Table 5 (Rodriguez, Di et al., 2009; Otten, Hellwig et al., 2006; Genton, Melzer et al., 2010) –

Estimating energy needs

In order to determine the energy requirements of an athlete, the individual energy needs at rest (Resting Energy Expenditure or REE) and the level of physical activity should

be assessed. The REE is dependent on weight, height, and age and there are different methods available to calculate this. The level of physical activity is represented by the PAL value, whereby PAL stands for 'physical activity level'. Active athletes have an average PAL value of 1.8 (EFSA, 2013).

The European Food Safety Authority (EFSA) defined Dietary Reference Values (DRVs) for energy in 2013 providing recommendations for average energy requirements for different age groups of individuals. The basis of the average energy requirement is the Resting Energy Expenditure (REE) calculated in accordance with the Henry equation (Henry, 2005). EFSA has calculated average energy requirements for each age group at four different activity levels (PAL values) shown in table 3 (EFSA, 2013).

Physical Activity Level (PAL) factors[a] (EFSA, 2013)

i) 1.4 for Light exercise (1–3 days per week)
ii) ii) 1.6 for Moderate exercise (3–5 days per week)
iii) iii) 1.8 for Heavy exercise (6–7 days per week)
iv) iv) 2.0 for Very heavy exercise (twice per day, extra heavy workouts)

[a]Each factor is associated with a range that is intended to be viewed as a general starting point rather than a specific ending point. Manipulation within each range should be performed and should be performed on a largely individual basis.

The Before, During, and After of Workout Nutrition for Athletes (Endurance & Strength or Power Athletes)

Before training/competition

Consuming a balanced meal containing carbohydrates, proteins, and fats – about 1-2 hours before training/competition is recommended for both the endurance & strength or power athletes. A good example of a larger pre-workout meal would be – 4 oz. of lean meat, 8 oz. of sweet potato, and 2 cups of veggies with olive oil dressing or if this seems like too much, a piece of fruit, a couple of pieces of string cheese, and ½ cup of mixed nuts can work too (Berardi and Andrews, 2017).

During training/competition

Consuming patterns during competition is dependent upon length of the workout and athlete's preference. In general, a recommendation for both the endurance & strength or power athletes can be - a sports drink containing 30 grams of carbohydrate and 15 grams of protein (in 500 ml water) per hour of exercise. With multiple events back to back, a larger amount of this beverage should be consumed throughout the day, along with food meals interspersed between events (Berardi and Andrews, 2017).

Specific considerations for endurance athletes during training/competition (Potgieter, 2013) –

i) Exercise less than 45 minutes: no extra carbohydrates needed.

ii) Exercise between 45-75 minutes: small amounts of carbohydrates as tolerated.
iii) Exercise between 75-180 minutes: 30-60 grams of carbohydrate per hour.
iv) Exercise greater than 180 minutes: 90 grams of carbohydrate per hour.
v) Pre-competition for events greater than 60 minutes: 1-4 grams of carbohydrate per kilogram consumed 1-4 hours before competition.

Specific considerations for strength or power athletes during training/competition (Potgieter, 2013) – General protein guidelines for athletes: 1.0-1.5 grams of protein per kg of weight daily.
General protein guidelines during the day: 20-40 grams of protein per meal, 3-4 meals per day.Advanced training, injury, illness guidelines: 1.5-2.2 grams of protein per kg of weight daily.

After training/competition

Post-workout nutrition for both the endurance & strength or power athletes requires two things: protein to aid in protein synthesis, carbohydrate to replace muscle glycogen. A whole food meal that meets these requirements is ideal. However, some athletes might not want to wait for those nutrients from a whole meal. Athletes generally prefer to consume a liquid form of nutrition that bears 2 carbohydrates: 1 protein ratio which can accelerate recovery, digests quickly and is usually well tolerated (Berardi and Andrews, 2017). Specific consideration for endurance athletes during training/competition (Potgieter, 2013) – Post-competition refueling for events greater than 60 minutes: 1.2 grams of carbohydrate per kilogram per hour for 4 hours, followed by a return to a usual feeding plan. Specific consideration for strength or power athletes after training/competition (Potgieter, 2013) – Post-workout guidelines: 20-25 grams of protein (or 2.3-2.5 grams of leucine provided in an amino acid complex) in the near post-workout window.

Table 1: Carbohydrate requirements for training and match play (Mujika & Burke, 2010)

Situation	Carbohydrate targets per kg of the player's body weight
Light training program (low intensity or skill-based exercise)	3–5 g per kg each day
Moderate exercise program (i.e. approx. 1 h per day)	5–7 g per kg each day
Endurance program (i.e., 1–3 h per day of moderate- to high-intensity exercise)	6–10 g per kg each day
Extreme exercise (i.e., >4–5 h per day of moderate to high-intensity exercise)	10–12 g per kg each day

Table 2: Recommended protein intake depending on sports discipline (Czaja, Lebiedzinska et al., 2008)

Type of workout	**Amount of protein in g/kg**
Average training	1.2–1.5
Endurance sports	1.2–1.8
Strength sports	1.2–1.8
Athletes who limit calorie intake	1.8–2.0

Table 3: Role of Ergogenic Aids in athletes performance improvement (Tarnopolsky, 2010; Carr, Hopkins et al., 2011; Astorino & Roberson, 2010)

Ergogenic Aids	Effect on performance
Creatine	Improves the performance of repeated bouts of high-intensity exercise with short recovery periods. - Direct effect on competition performance. - Enhanced capacity for training.
Caffeine	Reduces the perception of fatigue. Allows exercise to be sustained at optimal intensity/output for longer.
Sodium bicarbonate	Improves the performance of events that would otherwise be limited by acid-base disturbances associated with high rates of anaerobic glycolysis.
Nitrate	Improves exercise tolerance and economy. Improves performance in endurance exercise at least in non-elite athletes.

Table 4: Dietary supplementation practices & primary reason to take

Author & year	Athlete population, country	Use of dietary supplement (DS)	Primary reason to take dietary supplements by type of sport[a]	
			Response	%
(Aljaloud & Ibrahim, 2013)	Professional footballers (male, n=105), Saudi Arabia	93.3% currently took DS Sports drinks – 88.7% Vitamin C - 82.6% Calcium - 68.3%	Performance Improved health Physical appearance	43.8% 32.6% 11.2%
(Kim, Lee et al., 2013)	National judo team members (male, n=107 and female, n=65), Korea and Japan	59% of Korean athletes and 61% of Japanese athletes took DS	Korean: Improved muscle strength Improve energy	 45% 18%
			Japanese: Maintain health Improve performance	 32% 26%
(Lun, Erdman et al., 2012)	Athletes affiliated with Canadian sport centers from 34 sports (male and female, n=440), Canada	87% declared having taken a DS Soft drinks - 24.1% Multivitamins and minerals - 16.1% Carbohydrate sport bars - 11%	Health maintenance Increase energy Exercise recovery	32% 20.5% 15.6%
(Kim, Lee et al., 2011)	National sport university Athletes from 21 sports (male and female, n=479), Korea	46% used DS Multivitamins - 70% Vitamin C - 37.7% Sports drinks - 18.4%	Energy supplement Increase in strength, muscle mass, and muscle power Health maintenance	33.3% 17.4% 14.6%
(de Silva, Samarasingh et al., 2010)	National-level athletes (male and female, n=113), Sri Lanka	93.8% reported using DS Multivitamin Vitamin E Calcium, Creatine	Enhance performance Improve general health status	79.2% 19.8%
(Dascombe, Karunaratna et al., 2010)	State-based sports institution athletes from seven sports (male and female, n=72), Australia	87.5% reported using DS Minerals - 45.8% Vitamins - 43.1% Iron - 30.6%	Maintain health Boost immunity	15.3% 11.1%
(Diehl, Thiel et al., 2012)	Elite adolescent athletes from 51 current Olympic sports (male and female, n=1128), Germany	91.1% consumed at least one DS Magnesium - 68.6% Dextrose - 64%	Enhance performance	46%

[a]Variability in why to take depends on beliefs in DS efficacy.

Table 5: (Rodriguez, Di et al., 2009; Otten, Hellwig et al., 2006; Genton, Melzer et al., 2010) –

Average macronutrient requirements	Endurance athletes	Strength or power athletes
Carbohydrate	6-10 g kg^{-1} day^{-1}	3.9-8.0 g kg^{-1} day^{-1}
Protein	1.4 g kg^{-1} day^{-1}	1.2-1.7 g kg^{-1} day^{-1}
Fat	20%– 30%	20%– 30%

Table 6: Average energy requirements (AR) for athletes (Source: EFSA, 2013)

Age (years)	REE (kcal/day)	AR at PAL = 1.4 (kcal/day)	AR at PAL = 1.6 (kcal/day)	AR at PAL = 1.8 (kcal/day)	AR at PAL = 2.0 (kcal/day)
Men					
18 - 29	1674	2338	2672	3006	3340
30 - 39	1621	2264	2588	2911	3235
40 - 49	1599	2234	2553	2873	3192
50 - 59	1578	2204	2519	2834	3149
60 - 69	1440	2017	2305	2593	2882
70 - 79	1416	1984	2267	2550	2834
Women					
18 - 29	1346	1878	2147	2415	2683
30 - 39	1296	1813	2072	2331	2590
40 - 49	1285	1798	2055	2312	2569
50 - 59	1274	1783	2037	2292	2547
60 - 69	1164	1628	1861	2093	2326
70 - 79	1154	1614	1844	2075	2305

Athlete's information
Age: 29 years old
Gender: Male
Height: 169cm
Weight: 65.1kg
BMI: 22.8 (normal range)
Activity level: Moderate exercise
Henry (Henry, 2005) Average Energy Requirements (AR) Prediction Equation -
AR = 16 x weight in kg + 545
= 16 x 65.1 + 545
= 3173.2 kcal/day
This subject's average energy requirement is 3173.2 kcal per day that he should be able to maintain his current weight in his very active lifestyle category. If this subject not practices his very active lifestyle and becomes sedentary people, his AR is 2221.24 kcal/day.

Meal planning

Based on his Average Energy Requirement (AR), the best meal plan for his daily dietary intake as shown in table below. This plan is based on supertracker software.

Breakfast				
Type of food/beverages	Carbohydrate (g)	Protein (g)	Fat (g)	Calorie (C)
240 ml orange juice	26	2	0	110
1 slice of bread with nuts	21.05	4.13	7.72	163
1 pancake with butter syrup	90.9	8.26	13.99	520
SNACK Banana Sports Drink	 26.95 7	 1.29 0	 0.39 0	 105 30
Total calorie	171.9	15.68	22.1	928

Lunch				
Type of food/beverages	Carbohydrate (g)	Protein (g)	Fat (g)	Calorie (C)
1 cup of fried rice	44.95	12.93	12.25	346
Fried chicken thigh and drumsticks	10	12	8	160
1 cup apple juice	28.97	0.15	0.27	117
SNACK Chocolate cupcake	29.25	1.74	5.38	164
Total calorie	113.17	26.82	25.9	787

Dinner				
Type of food/beverages	Carbohydrate (g)	Protein (g)	Fat (g)	Calorie (C)
100g mix salad	5.8	2.8	8	30
Fish and chips	117	40	49	1080
240ml grape juice	37.85	1.42	0.2	154
SNACK 1 glass of skim milk Whole bread toast	 12.18 12.92	 8.22 2.72	 2.37 1.2	 102 69
Total calorie	185.75	55.16	60.77	885
Total kcal/day				3150
Average (g kg^{-1} day^{-1})	7.23226	1.5		

Note: This calorie meal plan is not only for the endurance athlete but also for the strength or power athlete too as it was followed by Table 5.

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The Importance of Identifying Sickle Cell Trait in the Athletic Population

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Introduction

Sickle cell trait (SCT) is an inherited condition most often seen in the African American population that in some circumstances can result in structural deformity (sickling) of erythrocytes (red blood cells). Although usually a benign condition, certain stressors such as extreme exertion, dehydration, asthma, and/or exposure to altitude can cause sickling to occur. The purpose of this brief review is to educate coaches, parents, and student-athletes on the importance of identifying sickle cell disorder and how to treat it in the youth athletic population.

Methods

A systematic review of the literature using the search term “sickle cell disorder” via the CINAHL, SPORTDiscus, and MEDLINE databases was performed. Information on the causes, physiological effects, management protocols, and risks associated with participation in sports were compiled to determine the need for awareness in high school athletics. All reviewed literature was sourced from scholarly peer-reviewed published journal articles or the NCAA Health Education Center. Additionally, all articles were published between 2005-2017 and were written in English. A total of nine (9) refereed journal articles met the inclusion criteria for this brief review.

Literature Review

Similar to sudden cardiac death in athletes (hypertrophic cardiomyopathy; HCM), sickle cell trait (SCT) can be interpreted as a condition that can lie dormant before presenting itself without warning and cause potentially life-threatening repercussions. If individuals are not properly educated about or made aware of SCT it could lead not only to the end of a sporting career but, in severe cases, a fatality. The term “trait” refers to the fact that this disorder is inherited from an individuals’ parent. Specifically, SCT occurs when an individual inherits one abnormal version of the gene for hemoglobin (often called an allele) and one normal allele (National Athletic Training Association [NATA], 2007). On a related note, sickle cell *disease* (SCD) is a disorder whereby individuals possess *two* (i.e. both) copies of the altered gene for abnormal hemoglobin, resulting in severe, chronic anemia (low number of red blood cells) sickle cell anemia (SCA) (McDonald et al., 2017). Of these conditions, SCT is the most commonly inherited condition, and for that reason will be the primary focus of this literature review.

SCD and SCT have been recognized as a major public health problem by international agencies such as the World Health Organization (WHO), the United Nations Educational Organization, and the Scientific and Cultural Organization (Benson &

Therrell, 2010). SCT is most prevalent in the African American population, with roughly 8% possessing the SCT genotype (Tabor and Rand, 2009). Individuals of Mediterranean, Indian, Middle Eastern, South American, and Central American decent make up an additional 4% of the SCT-carrying population. It is much less prevalent in the Caucasian population, with less than 0.2% of these individuals exhibiting this genotype (McDonald et al., 2017; Tabor & Rand, 2009). Interestingly, males appear to exhibit SCT more often than females (Boyd, Watkins, Price, Fleming, & DeBaun, 2005). In the United States, approximately 3 million people are estimated to have SCT (McDonald et al., 2017).

Although an individual with SCT has structurally abnormal hemoglobin this is not necessarily the cause of sickling of red blood cells; sickling is typically brought on by external stressors (Tabor & Rand, 2009). These stressors include heat, extreme exertion, high altitude, asthma, and/or dehydration (Lawrence, 2014; Tabor & Rand, 2009). Such stressors can cause the cells of an individual with SCT to change into a sickled or crescent shape which can result in blockage of blood vessels resulting in a hypoxic (low oxygen) state in the tissues and organs. Blockage of arteries can lead to further problems such as renal (kidney) failure, splenic infarction (blocking of the spleen), muscle breakdown (rhabdomyolysis), pulmonary embolism (blockage of the blood vessels in the lung), or even sudden death due to a decrease in the amount of oxygen in the blood (Lawrence, 2014; McDonald et al., 2017).

Research has shown that athletes with SCT are also more likely to experience heat-related illnesses that can become life threatening (Tabor & Rand, 2009). Types of heat-related illness include a heat-related rash, heat exhaustion, heat cramps, or heat stroke, with the most severe of these conditions being heat stroke. Heat stroke is a condition described by the cessation of sweat, full body weakness, dry skin, rapid heartbeat, shallow breathing, and a throbbing headache. The resultant sickle cell disorders are especially dangerous in sports settings during which athletes are exposed to multiple stressors at one time. For example, athletes who participate in sports such as football and track and field are arguably at an increased risk due to the heightened intensity and environmental conditions common in such events. In such athletes, a symptom that requires immediate attention is sickling/exertional sickling collapse, an intense syndrome that can occur within minutes. It is important to identify and recognize the signs or symptoms in order to structure efficient policies and procedures for when an event occurs (Eichner, 2010).

Over a four-year timespan it was estimated that 2,147 National Collegiate Athletic Association (NCAA) Division I student-athletes carried and suffered from SCT (see Table 1). It is estimated that approximately 530 athletes are identified with SCT each year across the spectrum of all sports (Tarini, Brooks, & Bundy, 2012). Of those 2,147 SCT positive athletes, it was estimated that one athlete would die each year from some sort of associated complication (Tarini, Brooks, & Bundy, 2012). Over the past decade, SCT has been the leading killer of athletes who compete in NCAA Division I football (Eichner, 2010). Over a ten-year timespan there were 136 sudden non-traumatic sport-

related deaths in both high school and college athletics, seven of which were from exertional sickling (NATA, 2007). Eichner (2010) estimated that only approximately 3-4% of all NCAA Division I football players carry SCT, yet 63% of all deaths during 2000–2010 were attributed to complications of exertional sickling (McDonald et al., 2017; Eichner, 2010). All of these deaths occurred during conditioning and not in a game setting. Sickling related deaths tend to occur more in the earlier portion of the training period during which there is a rapid progression in exercise intensity perhaps placing an excessive strain on the athlete's cardiovascular system (McDonald et al., 2017). These events tend to be associated with high levels of exertion such as short, maximum-effort drills or testing like those frequently seen in football practice where intensities are high and the weather is unpredictable (Tarini et al., 2012). However, sickling has also been seen at the end of a long distance run or conditioning event (NATA, 2007). In either case, it is exertional in nature, so during any exertional activity SCT athletes need to be monitored for symptoms.

Football is not the only sport where SCT may be a concern; signs and symptoms commonly associated with SCT have been observed in other sports such as cross country running, basketball, track and field, and soccer (NATA, 2007). Furthermore, the collegiate setting is not the only setting where SCT-related sudden deaths occur; it is also prominent in settings such as secondary high schools, middle schools, and in rare cases elementary schools. The secondary school athletic population leads the nation in athletic-related deaths (Casa et al., 2013). However secondary schools do not typically screen for SCT. Not identifying this trait within an athlete makes it more difficult for allied medical professionals and coaches to determine if an athlete is suffering from a sickling event or is just overly fatigued (Casa et al., 2013).

Being able to accurately identify a sickling event in SCT-positive athletes is essential in preventing life-threatening complications such as exertional rhabdomyolysis, renal failure, and systemic shock leading to sudden death (NATA, 2007). Exertional sickling often presents with similar symptoms to exertional heat stroke, although it typically occurs in the first few minutes of activity which would tend to rule out heat stroke (Eichner, 2010; NATA, 2007). Sickling events commonly occur in all-out exertional activities such as sprinting, endurance running to fatigue, and conditioning where symptoms can quickly intensify to more dangerous levels (NATA, 2007). An SCT-positive athlete who is struggling to complete a drill and presents with extreme paleness of the skin should be suspected of sickling and removed from activity immediately in order to seek treatment and have vital signs monitored.

Exertional sickling is also often erroneously compared to heat cramping, a condition whereby an athlete is in extreme pain and has visibly contracted muscles. However, heat cramping is likely related to dehydration, electrolyte imbalance, and/or fatigue and typically occurs in the lower leg. An athlete experiencing a true sickling event will likely be pain free and muscles will look and feel normal (NATA, 2007). An athlete may state that they feel weak, lightheaded, fatigued, dehydrated, and in error feel as though they are "cramping" when in fact they are

experiencing a sickling event (Casa et al., 2013).

The National Sickle Cell Disease Control Act was put forth in 1972 and laid the foundation for the screening process of all newborn children in the United States (Boyd et al., 2005); as of 2006 all 50 states were required to provide universal screening of SCT in newborn children (Eichner, 2010; Benson & Therrell, 2010). Since then, the NCAA voted to make SCT screening mandatory for all Division I athletes prior to the beginning of any exertional activity associated with collegiate athletics (Tarini et al., 2012). This mandate was set forth due to the death of a student athlete from Rice University who died during football conditioning (Tarini et al., 2012). This death was determined to be associated with exertional rhabdomyolysis secondary to SCT (Tarini et al., 2012), with the university being sued for wrongful death because it was considered to be a preventable situation. After the lawsuit was settled, the NCAA implemented the mandatory screening (Tarini et al., 2012). The only exception to this rule was if the athlete could either provide proof of prior/newborn screening or signed a release of liability form (Eichner, 2010; McDonald et al., 2017). Soon after this mandate NCAA Division II and III schools accepted the policy of mandatory screening (McDonald et al., 2017). SCT is the only condition the NCAA requires screening for, both pre-participation exams and baseline concussion tests are recommendations of best practice but not yet required documentation (McDonald et al., 2017). One point to note is that there is no current law or mandate requiring SCT testing in the secondary school setting (Tabor & Rand, 2009). Lack of testing in the secondary school setting is a highly contentious topic because most of the sickling related deaths come from the youth population who may be not adequately educated as to the risks of SCT or even know if they carry this trait.

It has recently been advocated to introduce required screening in high school settings, especially in high-intensity sports such as football, track and field, soccer, and basketball (Tabor & Rand, 2009). However, the costs associated with SCT screening has prevented this from being implemented. Actual and billed costs for a hemoglobin electrophoresis test are about $12 and $75, respectively (Tabor & Rand, 2009). Therefore, it is more practical that high school settings try to obtain newborn screening results as part of their pre-participation exam (Casa et al., 2013). However, a concern is that screening may lead to discrimination, confusion, and may not be worth it since the evidence to support that this improves health outcomes are scarce and may not practical at this level (Tarini et al., 2012). Interestingly, the United States military has implemented universal precautionary measures such as aggressive hydration, acclimatization, and temperature monitoring rather than participating in the screening process. By adopting this strategy, the military has been able to prevent all subsequent sudden deaths in recruits with SCT (Tarini et al., 2012).

Given that SCT is a genetic condition, the only current “treatment” for an athlete who is SCT positive is prevention. Prevention via education is the number one way to prevent a sickling collapse (NATA, 2007), and can be implemented by education of coaches, athletic staff, parents, and the student-athlete. It is important that if an

athlete has SCT they are properly educated about the signs and symptoms of sickling, as well as heat illnesses which they are often predisposed to. Identifying a possible sickling event is the first and most important step, and prompt and appropriate treatment is key to preventing a sickling collapse (NATA, 2007). If a sickling event is suspected the athlete should be promptly removed from activity, cooled down, re-hydrated, and vital signs should be monitored until the athlete is stable and asymptomatic (NATA, 2007). If the athlete's vital signs decline emergency medical services should be activated, proper first aid should be given, and the athlete needs to be transported to the hospital as soon as possible in order to seek further treatment (Casa et al., 2013; NATA, 2007).

Other preventative measures that have been put forward to minimize the occurrence of SCT-related deaths include proper hydration, acclimation, and modifications to exercise habits (Casa et al., 2013). The National Athletic Training Association published a consensus statement on SCT stating the prevention strategies athletes can include in their daily routines in order to minimize the risk of an episode (NATA, 2007). This list included allowing for a slow progression of exercise during early season training sessions, allowance for extended rest or recovery periods, and limitation of or exclusion from particularly demanding exertional activities such as wind sprints and timed long distance runs (NATA, 2007). Another recommended practice includes close monitoring of extreme environmental conditions such as temperature, humidity, and altitude, as well as an emphasis on year-round training including that of pre- and post-season monitoring (NATA, 2007). Allowing an athlete to set their own pace along with adequate hydration should be encouraged. Early detection and reporting of symptoms to coaches and athletic training staff is a necessity that SCT-positive athletes need to consider (Tabor & Rand, 2009; NATA, 2007). By following these guidelines SCT-related deaths and events could be minimized and ideally prevented.

Conclusion

It is important for coaches, Athletic Trainers, athletes, and parents to be educated on SCT, especially when dealing with high-intensity sport athletes such as football players. Furthermore, since the African American population is most likely to test positive for SCT, those athletes should be paid special attention to in hot and humid environments. At the high school level SCT screening should be considered and policies put in place to prevent sudden death of athletes who carry this trait. Screening allows for preventative measures to be put into place in order to prevent potentially serious problems for an athlete with SCT. Participation in a mandatory screening program, or providing proof of screening prior to athletic participation, should be the standard in schools. Such mandatory screenings are in the best interest of the student athlete and everyone else involved. Should an athlete be identified as SCT positive they should be provided with modified workouts that limit short, maximum-effort drills, performance testing, or extra conditioning. These concessions during training are especially important when the environmental conditions are conductive to causing sickling events.

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Table 1. Estimated Number of Division 1 NCAA Student-Athletes with Sickle Cell Trait

	Black	*Hispanic*	*Other*	*Total*
Archery	0	0	0	0
Badminton	0	0	0	0
Baseball	43	3	18	64
Basketball	384	1	9	393
Bowling	9	0	0	9
Equestrian	0	0	1	2
Fencing	3	0	1	4
Field hockey	2	0	3	6
Football	833	3	26	863
Golf	13	1	9	23
Gymnastics	5	0	3	8
Ice hockey	1	0	5	6
Lacrosse	6	0	9	16
Rifle	0	0	1	1
Rowing	11	1	12	24
Rugby	0	0	0	0
Sailing	0	0	0	0
Skiing	0	0	1	1
Soccer	68	4	23	95
Softball	28	2	9	39
Squash	0	0	1	1
Swimming/diving	8	1	17	26
Sync. swimming	0	0	0	0
Team handball	0	0	0	0
Tennis	22	2	10	34
Track, outdoor	430	4	29	463
Volleyball	40	1	9	50
Water polo	1	0	2	4
Wrestling	11	1	5	16
All sports	1,918	25	204	2,147*

*This number is multiplied by 0.989 to calculate the number of athletes identified by sickle cell solubility testing = 2,123 athletes.

Note. Reprinted from Tarini, B, A., Brooks, M, A., & Bundy, A, G. (2012). A policy impact analysis of the mandatory NCAA sickle cell screening program. Health Services Research, 47(1), 446-461.

Title: Exercise Benefits and Training Parameters for Young Athletes
Authors/Affiliations: Michael Green, J. Brandon Sluder, Zack Stanaland, & Yorick Hessing. Troy University, Troy Alabama

Purpose: The purpose of this investigation is to provide coaches, parents, and students athletes research on the benefits of youth training and the appropriate types of exercise training for pre-pubescent (age 8-11), pubescent (12-15), and post-pubescent (16+) youth. This information can be used as a guideline for determining the structure of youth training programs and specialization of sport. Different types of exercises with different intensities and volumes should be utilized for each stage of development. **Methods:** The researchers reviewed a large body of research on training types, benefits, intensities, and volumes for youth athletes. These include neuromuscular development, types of exercises, plyometrics, speed training, training loads depending on stage of growth, and age appropriate resistance exercises. **Results:** General exercise and resistance training has been shown to decrease both present and future obesity, cardiovascular risk profiles, and bone related injuries in children and adolescents. Different age groups will need different stimulus from their resistance training program (intensity, volume, frequency) to illicit the most efficient and safest results. Research suggest using pre-Peak Height Velocity and post-Peak Height Velocity as a marker to separate different training emphasis. PHV begins at approximately 12-14 years of age. Physical training programs prior to PHV should be general and broad, including in it as many different sports and movement patterns as possible in order to create neural adaptations and general athleticism. Pre-PHV programs should focus more on training than competition and should be fun for the participants. Strength, power, speed, agility, and mobility can be trained pre-PHV. During and Post-PHV programs become more structured and specialized. Strength, power, speed, and agility are still trained with an emphasis on increased intensity of resistance training as well as hypertrophy. Competition also becomes increasingly important. **Conclusions:** It is important to educate parents, teachers, coaches, and student athletes on the proper exercise training program for the age group of their child. Additionally, parents and students need to be aware of the injury risks associated with different training modalities at each age level and how to adjust resistance and work load to get the most effective training results. Different training programs should be implemented for different age groups by a qualified instructor.

Title: Benefits of Mental Health First Aid in Health Education
Authors/Affiliations: Candice Howard-Shaughnessy[1], Serena Bishop[1], Brandi Rolling[2], & Jessica Boutwell[3]. [1]Troy University, Troy Alabama, [2]Auburn University, Auburn, Alabama, & [3]Opp Middle School, Opp, Alabama.

Purpose: The purpose of this investigation is to provide health educators, parents, and students research on the benefits of mental health first aid in secondary health education. The investigation will explore stigmatizing attitudes and behaviors as well as adolescent help seeking behaviors. **Methods:** The researchers reviewed a large body of research on mental health first aid and adolescent mental health. The current Alabama state standards for health education and the Youth Mental Health First Aid

manual were reviewed. **Results:** Mental health first aid has been shown to significantly reduce mental health stigmatization and attitudes in adolescents. It has also been shown to significantly increase help seeking behaviors in adolescents. **Conclusions:** It is important to educate health educators, parents, and students on mental health recognition, management, and prevention. It is important to understand the stigmatizing attitudes around mental health and how they can be overcome.

Title: Hydration and Energy Drink Usage in Primary and Secondary Students
Authors/Affiliations: [1]J. Brandon Sluder, [1]Michael Green, [1]Michele Moore, & [2]Lisa Hayes. [1]Troy University, Troy Alabama & [2]The Academy for Classical Education, Macon, Georgia.

Purpose: The main purpose of this study is to focus on the hydration of school children during and after their physical activities as well as the impact of energy drinks used during their schooling. **Methods:** The researchers reviewed a large body of research on the topic of hydration for children in primary and secondary education. Also, the researchers evaluated literature concerning the effects of energy drink usage among middle schoolers and teens. **Results:** The results suggest drinking plenty of water before exercise, during exercise, and after exercise is the best way to hydrate the body. Sport drinks also play an important role in adequate hydration for those teenagers performing vigorous exercise for long periods of time, but it is not required for those children performing routine or daily exercise. Additionally, energy drinks pose adverse effects on the health of children and adolescents. **Conclusion:** It is important that coaches, physical education teachers, and students incorporate hydration intervals before, during, and after their physical activity. Also, being mindful of the duration of their physical exertion is crucial in choosing the correct hydration fluids. Furthermore, staying away from energy drinks as a source of hydration is essential to children's and adolescents' health.

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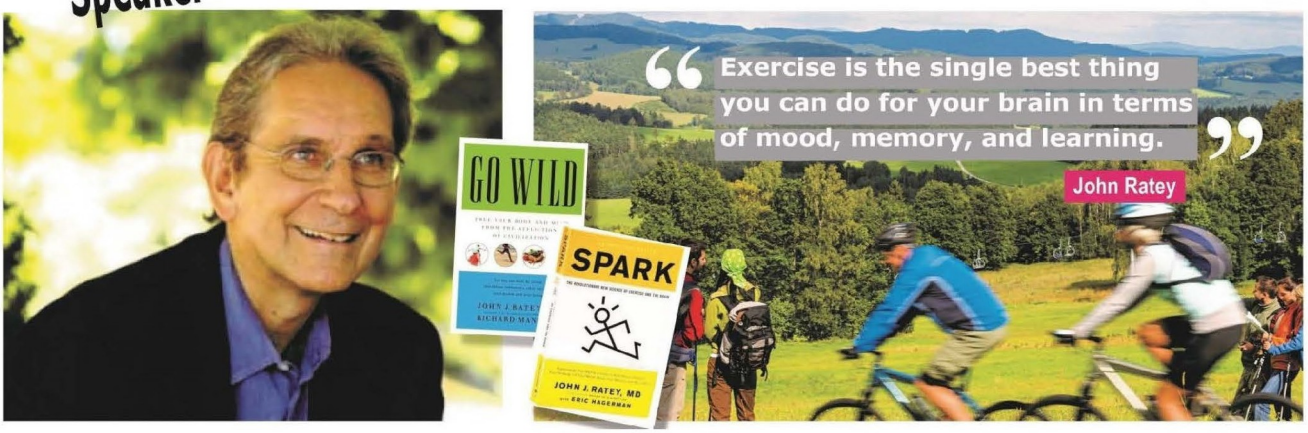

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