

Meta-Analysis of Circuit, Interval, and Conventional Training Methods Towards Motivation and Mental Toughness among Elementary School Hockey Athletes

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Abstract

In high-intensity and high-performance training, athletes sometimes face physical or mental aspects. The observed thing is that there is less or no research on the training method's effect on motivation. Studies linking exercise and its impact on the basis and mental toughness are lacking. This study aims to see the effects of particular training methods, namely circuit training methods, interval training, and conventional training, on motivation and mental toughness in primary school hockey athletes. Based on references from past studies presented in the Literature Highlights, it has been found that most studies that researchers have carried out are in the form of a combination of two research methods, namely the quasi-experimental type and the survey type. Sports Motivation Scale (SMS) or Sports Motivation Scale is widely used in studies related to sports motivation. In addition, another instrument found as a result of references from past studies used by researchers is the Mental Toughness Questionnaire (MTQ). In this pilot study, the respondents chosen by the researcher are students aged 11 to 12 years who are currently in Years 5 and 6 in the Malaysian education system. A total of 20 students involved in the game of hockey who are hockey athletes were selected based on the purposive sampling method. The findings of the pilot study found that the reliability and validity of the research instrument with a Cronbach alpha value >0.7 (excellent and acceptable). Thus, the findings of this pilot study show that this existing instrument can be used in the actual study later.

Keyword: Circuit Training, Interval Training, Motivation, Mental Toughness

Introduction

Sports are all activities that require dexterity or skill and energy (such as swimming, running, football games, tennis, and others) that are performed as entertainment events (competition events, body-healthy activities, and others) (Dictionary Hall Fourth Edition, 2017). Sports or physical activity is one of the essential aspects in life to build and shape a positive individual from a physical and mental point of view (Yahaya et al., 2007). Sports or physical activity has a positive relationship between individual involvement with motivation and mental toughness (Donnelly et al., 2016). Lamsah et al (2018) stated that sports or physical activities

have their role in shaping personality and cognitive abilities that encourage personal change for the better. This makes sport or physical activity one of the methods or ways in building the psychology of individuals, especially athletes, to form a better and positive self through motivation and mental toughness.

Motivation is the determination of individuals to show specific behavior to obtain behavioral results (Nurhasni, 2014). The Fourth Edition of Kamus Dewan (2017) states that motivation is an intense desire or strong passion in a person that drives him to strive or do something to achieve success. Komarudin (2016) says that athlete motivation is the desire, wish, desire, and motivation for the athlete to fulfill the performance that he has achieved himself or the performance achieved by other athletes. Therefore, motivation and sports are very closely related and become a factor for an athlete to achieve his goals. Motivation is categorized into two types, namely intrinsic and extrinsic motivation. Intrinsic motivation is the motivation that comes from the individual or the athlete himself. Extrinsic motivation is the motivation that is driven or stimulated by external factors (Prihartanta, 2014).

Training is a method in a sport that is systematically arranged to improve or/and improve the performance of individuals, groups, or organizations. Improved performance means measurable changes in knowledge, skills, attitudes, and social skills. According to Truelove (1995), training is an effort to increase the knowledge, skills, and behavior required to carry out something related to work. Lazazzara and Bombelli (2011) stated that training refers to a systematic added value in skills, instructions, concepts, or thinking that leads to improved performance. In the context of sports, training is a process where athletes gain knowledge in addition to building skills and gradually improve their knowledge and skills to improve their performance and then achieve the goals that have been set. Systematic and continuous sports can help enhance and improve performance and affect motivation and mental toughness.

Several training methods often become the basis and routine in sports training planning. These methods are seen to help coaches plan training sessions systematically and follow the needs of athletes and sports. These methods also help to affect athletes physically and mentally. Ardiansah and Sugiyanto (2018) stated that specific training methods have certain effects on athletes in terms of performance and motivation. In their study, Martin et al (2018) explained that an intensive training method affects athletes' emotions and requires psychological intervention. Among the training methods in sports are circuit training, interval training, weight training, Long Slow Distance training, fartlek training, plyometric training, pressure training, pyramid training, and parlor training. All these training methods have their characteristics and advantages in shaping and building the athlete's performance, thereby increasing the athlete's motivation and mental toughness.

Circuit training is one of the methods commonly used in planning and implementing any sports training. Circuit training is implemented to build, test, and improve physical fitness. Hardiansyah (2017), in his study, stated that the implementation of circuit training in improving physical fitness is very influential. Circuit training is also seen to produce good changes, especially in overall appearance assessment, health/fitness assessment, health/fitness influence, and reduction of negative affect (Henry et al., 2006). In addition, circuit training is seen to help individuals with Multiple Sclerosis (MS) problems by planning training needs that are appropriate to the sufferer's level (Lyons, 2021).

Next, interval training is a physical training method involving repetitive work pressure interspersed with sufficient rest. Buchheit and Laursen (2013) stated that interval training with high intensity is a well-known and time-efficient training method that helps improve the

cardiorespiratory system and metabolic function, improving the athlete's performance. It is suitable for various sports and can be combined with sports skills. This opinion is also supported by McInnis and Gibala (2017) in their study that high-intensity and supra-intensity interval training impacts the athlete's physiological construction and improves cardiorespiratory abilities. It is clear that this well-known training method affects the athlete's physical and physiological changes and allows the athlete to improve performance. Another study noted that high-intensity interval training helped reduce the potential risk of cardiometabolic disease. It improves cardiovascular health (Kessler et al., 2012).

Hockey in Malaysia is under the management of the Malaysian Hockey Confederation (MHC). The MHC is the national governing body for the sport of hockey for field hockey. Also, it includes indoor hockey for both men's and women's categories. MHC was established in 1957. MHC took a progressive step by offering to host international tournaments to allow national hockey athletes to compete with the main hockey powerhouses in the world and help the national hockey team become the best in Asia. Among them is hosting the World Cup, Sultan of Johor Cup, Sultan Azlan Shah Cup, and the Asian Games, which will allow the national hockey team to qualify automatically for the tournament.

One of the things to pay attention to is the grassroots hockey development process which is the core of national hockey development. Finding talent among students as young as 5 to 8 is the most effective way to unearth and shape personality, especially in physical, psychological, mental, decision-making, and tactical development. This group should be united and given the full attention of the government by providing various facilities, initiatives, welfare, training centers, and infrastructure. Therefore, the actions were taken by the Malaysian government through the Malaysian Ministry of Education (KPM) by placing talented and skilled students with potential through the Talent Identification Test (TID) to continue the success of the national hockey sport at the Malaysian Sports School in Bukit Jalil and Bandar Penawar and State Sports School/Project School, as well as the establishment of District Training Centers (PLD) throughout Malaysia, is a wise move. With this, the quality of hockey can be continued and improved and produce new players to achieve and maintain the success of hockey.

Statement of Problem

In undergoing high-intensity and high-performance training, an athlete will sometimes face physical or mental issues. The issues that arise sometimes have a direct effect and sometimes not, and the effect that exists will usually interfere with athletes' motivation and mental toughness (Grange & Kerr, 2010). This makes the athlete's performance can collapse and the athlete's performance less. The impact on this athlete's motivation and mental toughness can sometimes last and sometimes not, depending on the athlete's desire to continue fighting and engaging in the sport. This can be seen from several aspects directly related to the motivation and mental toughness of the athlete. Among them are the coach's leadership style, the coach's behavior, the coach's role, training methods, and goal setting by the coach or the athlete himself.

The observed thing is that there is less or no research on the training method's effect on motivation. The studies that have been stated clearly do not touch on the effect of training methods on athletes' motivation. In contrast, training methods also affect the motivation and interest of athletes to continue engaging in sports. Blynova et al (2020), in their study, stated that teaching or training methods that can have a positive effect on the psychology of athletes should be practiced. This is because the planning and implementation of training that attracts

the athlete's attention and changes the athlete's performance, and is effective for the athlete's motivation will make the athlete continue training, get involved in sports, and be enthusiastic about competing. However, if, on the contrary, if there is anxiety and a lack of psychological security, there is a training process that is passed and experienced, athletes will slowly reduce their involvement in the sport they engage in (Khan et al., 2011).

Studies linking exercise and its effects on motivation and mental toughness are lacking. Studies on mental toughness and emotional intelligence explain the need for mental toughness in forming the emotional intelligence of athletes who participate in sports individually or in groups. Mental toughness is needed for athletes, especially for individual athletes, to form self-identity, discipline, and good relationships with coaches and other athletes (Nurnadhira & Norlena, 2019). Aida et al (2016) discussed coaching style and mental toughness, which coaching style affects the mental toughness of athletes in sports. A specific coaching style can and cannot make an athlete's mental toughness better or not and shows a significant relationship between the two. According to Dalila and Ariffin (2017), mental toughness has a significant relationship with the academic performance of athletes. Athletes' academic performance is seen to be improved, just like sports performance, by having good mental toughness. Another study on mental toughness explained that high mental toughness could increase an athlete's achievement regardless of level (Ahmad & Ahmad, 2014). The same thing was also stated by Cowden (2016) that athletes with high mental strength will tend to participate in higher-level competitions, and mental strength helps athletes to achieve goals.

Research Objective

This study aims to see the effect of particular training methods, namely circuit, interval, and conventional training, on motivation and mental toughness in primary school hockey athletes. The data collected is related to the circuit, pause, conventional training activities, the effect on motivation, and mental toughness.

The study's general objective is to examine the effect of circuit, interval and conventional training methods on the motivation and mental toughness of primary school hockey athletes. While the specific objectives of the study are as follows:

1. To study the relationship between circuit, interval, and conventional training methods towards motivation of primary school hockey athletes.
2. To study the relationship between circuit, interval, and conventional training methods towards mental toughness of primary school hockey athletes.

Literature Review

Yudiana et al (2012), in their study on Physical Training, explained the crucial elements in physical fitness training, which are (1) Strength, (2) Isometric contraction, and (3) Isotonic contraction. Circuit training is the most efficient training because this training method includes all the necessary training elements, namely muscle strength, endurance, flexibility, agility, balance, and endurance of the cardiovascular system. Interval training is an exercise recommended by most trainers because it can improve the overall endurance and stamina of the athlete. Hardiansyah (2017), in his study on the Influence of Circuit Training Methods on Improving the Physical Fitness of Sports Science Faculty students, explained that in the pre-test, the physical fitness level of the respondents was at a moderate level. After the measurement at the post-test, the respondent's physical fitness level increased and was in a suitable category. The circuit training method can improve the respondent's physical fitness

and emotional intelligence. Physical training methods have a significant influence on the physical fitness of university students. Rengasamy et al (2014), in their study on the Effectiveness of a Fitness Intervention Program on the Flexibility of Form Four Male Students in a School in Malaysia, explained that the ANCOVA analysis after ten weeks showed that the treatment group was significant with $F(1, 83) = 38.82, p < .05$. An additional four minutes in the form of circuit training after five minutes of warm-up activities in 40 minutes of Physical Education teaching and learning for ten weeks has improved the level of flexibility of fourth-grade secondary school students in Malaysia. Martin et al. (2016), in their study on an Enhanced Group Sprint Interval Training Program for Amateur Athletes, explained that there was no significant difference in physiological domains between groups, but there was a significant effect on maximal oxygen increase, time trial performance and anaerobic power; with improved training from baseline for all respondents regardless of condition. In the psychological domain, there is a significant effect on motivation, self-task effectiveness, and self-management effectiveness. Foster et al (2015), in their study on the Effects of High-Intensity Interval Training versus Steady State Training on Aerobic and Anaerobic Capacity, explained that there was a significant increase in VO_{2max} and Peak Power Output (PPO) for each training group. Measurements of enjoyment of the training program showed that the Tabata protocol was less enjoyable than the Mayer protocol and that steady state and enjoyment in all protocols declined throughout the study. Although the High-Intensity Interval Training protocol is time efficient, it cannot outperform conventional/conventional training in less active early adults.

Gardner et al (2017), in his study on Continued Participation in Youth Sports: The Role of Achievement Motivation, described individuals high in different beliefs reported more fun and interest in continuing. This may be due to supporting the goal mastery approach. Individuals who are relatively high in entity trust report relatively less enjoyment. This may be due to supporting performance-avoidance goals. Sari (2015), in his research on Imagery Method Research, Intrinsic Motivation, Self-Efficacy, and Performance in Athletes, explains obtained for any variable by gender and winning medals. Several significant positive relationships were found between imagery, intrinsic motivation, and self-efficacy. In addition, it was found that general mastery of imagery motivation explained 12 percent of the variance in self-efficacy. Also, general mastery imagery motivation and mental imagery explained 31.2 percent of the variance in intrinsic motivation. Nursahaniza et al (2017), in their study on the Combined Effects of Self-talk, Imagery, and Video-modelling on Anaerobic Performance, Pulse Rate Response, and Self-efficacy explain that there is a significant difference only for the instructional group showing an increase specifically their peak power scores as well as the amount of work in two time periods (pre-test and post-test). For the self-efficacy measure, the instructional and motivational groups showed the main effects and increases in self-efficacy scores in the two periods. However, no significant differences were found for fatigue index, maximum heart rate, and average heart rate. Thus, instructional and motivational self-talk combined with imagery and video modeling was found to be beneficial for improving individuals' specific tasks and increasing their level of self-efficacy during the 30-second Wingate test. Zul Fadhli and Norlena (2018) in their study on Intrinsic and Extrinsic Motivation That Affect UKM Student Engagement to Perform Physical Activity, explained that the highest mean value for the intrinsic motivation factor is a factor related to health and fitness while for the extrinsic factor it is a friend factor friends There is a significant difference for engagement motivated by intrinsic motivational factors of health and fitness and motivational factors related to the body based on gender. The intrinsic motivational factor

related to the body (52%) is the motivational factor that contributes the most to the impact of student involvement. In contrast, the extrinsic motivational factor shows that the role of the University (40%) is the factor that contributes the most to student involvement. Ransdell, Lucas, and Pritchard (2011), in their study on Motivation, Goal Setting, Coaching, and Training Habits of Female Ultra Runners described general health orientation and psychological coping as the two most substantial motivational factors. Participants were higher in task orientation (e.g., finishing a race or achieving multiple goals) than ego orientation (e.g., top 3 overall or beating an opponent). Women train an average of 12.49 hours per week and spend 64% of their time on training alone. More than three-quarters of participants (80%) did not use a coach due to cost and lack of need. The female ultrarunners in this study were task-oriented, intrinsically motivated, health and financially conscious individuals.

Crust et al (2014), through their study on Mental Resilience in Higher Education: The Relationship Between Achievement and Progress in First Year University Students, explained that a significant and positive correlation was found between total mental strength, grades, and progress. Linear regression analysis found the subscales of mental strength in life control and interpersonal confidence to be significant predictors of academic achievement. Significantly higher levels of overall mental strength, life control, and interpersonal confidence were found in students who passed compared to those who failed. Nurnadhira and Norlena (2019), through their study on Mental Resilience and Emotional Intelligence Among Team and Individual Athletes, explain that the study shows a relationship between mental resilience and emotional intelligence among athletes as a whole. Next, the study shows no relationship between mental toughness and emotional intelligence among team athletes. However, the results of the study found that the constructs of mental toughness and emotional intelligence have a significant relationship with individual athletes. Joanna and Robert (2018), through their study on the Latent Profile of Mental Resilience in Endurance Athletes, explained that significant differences between the three classes on all eight factors were obtained from the SMTQ, PPI- and RSE. There was an increased likelihood of being in the High MT class compared to the Low MT class for men, athletes older than 55 compared to those aged 18–34, high sport satisfaction, and high division placement. The data show a latent mental strength profile exists in endurance athletes.

In conducting this study, the researcher adopted the motivation model from the (Frederick Taylor Model, 1911). As stated in this model, the trainer determines how the training should be done and provides rewards to motivate and increase the trainee's motivation to continue to work hard and increase productivity. As for motivation theory, the researcher implements Abraham Maslow's Needs Theory (1954) approach. This theory suggests that coaches identify deficiencies in trainees' essential/desired needs, which may influence negative attitudes and behaviors.

Research Design

Based on references from past studies that have been presented in the Literature Review, it has been found that most studies that researchers have carried out are in the form of a combination of two research methods, namely the quasi-experimental type and the survey type. Hardiansyah (2017) stated that the study is a quasi-experimental study combined with a survey method through the Indonesian Physical Fitness Level Test (IPFLT) questionnaire instrument. Rengasamy et al (2014), stated the use of quasi-experimental and survey methods. Martin et al (2016) also used a quasi-experimental and survey method in their study, with a survey method using the Physical Activity Readiness health questionnaire

instrument. As such, the researcher bases this study on past studies that combine two research methods: quasi-experimental and survey.

Research Instruments

An instrument accompanied the survey method to measure and evaluate the targeted respondents' motivation and mental toughness level. Pelletier developed a questionnaire on motivation, Fortier et al (1995) in Mallet et al (2007) to measure intrinsic, extrinsic, and motivation in sports. This questionnaire, called the Sports Motivation Scale (SMS) or Sports Motivation Scale is widely used in studies related to sports motivation.

In addition, another instrument found as a result of references from past studies used by researchers is the Mental Toughness Questionnaire (MTQ) or Mental Toughness Questionnaire. Clough, Earle, and Sewell developed this instrument in 2002 (Gucciardi, Hanton & Mallet, 2012) to present mental resilience.

Respondents

The respondents chosen by the researcher are students aged 11 to 12 years who are currently in Years 5 and 6 in the Malaysian education system. A total of 20 students involved in the game of hockey who are hockey athletes were selected based on the purposive sampling method. According to Chan (2014), purposive or purposeful sampling is a group of subjects with specific characteristics selected as research respondents. Respondents were then divided into three groups as stated in the study design and underwent pre-test (no input), treatment (for the treatment group), and post-test (after being given input).

Before undergoing training method input, each group (R1, R2, and K) will be given a motivation and mental toughness questionnaire to measure their initial level of motivation and mental toughness, and the questionnaire findings will be analyzed using SPSS software version 26. After the pre-test results are obtained, the groups will be given input based on the stated training method; namely R1- circuit training method, R2- interval training method, and K- conventional training method. This input process was carried out for eight weeks, every time during the 1 Student 1 Sports program on Tuesdays, which runs for 2 hours (this time is allocated based on the Sports Policy of the Ministry of Education Malaysia as a sports development process in schools). After completing the training method input for eight weeks, again, these groups will be given the same motivation and mental toughness questionnaire to measure the final level of motivation after undergoing the training method input session.

Validity and Reliability of The Instrument

Before carrying out the actual research for this study, a pilot study was carried out. Chan (2014) explains that a pilot study is a study that is carried out on a small scale before carrying out the actual study. It is done to see the feasibility or reasonableness of a study that will be done. In addition, it was also implemented to test the reliability and validity of an instrument used in the study. The pilot study aims to test and measure the reliability and validity of the instruments used in the study, namely the Sports Motivation Scale and the Mental Toughness questionnaire. This pilot study was carried out on respondents who were not from the sampled respondents, i.e., respondents who have the same characteristics as the actual respondents but are not from the sampled respondent population. The findings of the pilot study confirmed the reliability and validity of the research instrument (Sports Motivation Scale and the Mental Toughness questionnaire) showed Cronbach alpha value >0.7 (excellent and acceptable).

Conclusion

In general, preliminary study is very important before conducting a real study. Circuit, interval and conventional method probably will contribute to the changes of motivation and mental toughness level among elementary school hockey athletes. Pilot studies refer to miniature versions of a full-scale study (also known as "feasibility" studies) and the specific pre-testing of a particular research instrument such as a questionnaire or interview schedule. In this study, the reliability and validity of the research instrument is at acceptable range and applicable to the real study later. However, conducting a pilot study will increase the likelihood of success in the main study but does not guarantee its success. There is a need for more discussion amongst researchers regarding both the procedure and results of pilot studies.

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