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# Clinical Applications of Aerobic Exercise with Adolescents Experiencing Depression and Anxiety

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Running Head: Clinical Applications of Aerobic Exercise with Adolescent Experiencing Depression and Anxiety

# Clinical Applications of Aerobic Exercise with Adolescents Experiencing Depression and Anxiety

By

Sarah P. Mergens, B.A.; B.S.W.; L.S.W

MSW Clinical Research Paper

Presented to the Faculty of the  
School of Social Work  
St. Catherine University and the University of St. Thomas  
St. Paul, Minnesota  
In Partial Fulfillment of the Requirements for the Degree of  
Master of Social Work

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Lukas Campbell

The Clinical Research Project is a graduation requirement for MSW students at St. Catherine University - University of St. Thomas School of Social Work in St. Paul, Minnesota and is conducted within a nine-month time frame to demonstrate facility with basic social research methods. Students must independently conceptualize a research problem, formulate a research design that is approved by a research committee and the university Institutional Review Board, implement the project, and publicly present the findings of the study. This project is neither a Master's thesis nor a dissertation.

# Clinical Applications of Aerobic Exercise with Adolescent Experiencing Depression and Anxiety

## **Abstract**

Despite continued growth and improvements in traditional treatments for adolescent depression and anxiety, the rates at which adolescents are experiencing depression and anxiety continue to increase. Current research indicates that physical activity has a positive correlation with mental health. While staying true to the ethics and values that guide clinical social work practice, how can clinicians use aerobic exercise to treat adolescent depression and/or anxiety? This Systematic Literature Review SLR collected and synthesized findings from similar studies in order to identify specific aerobic exercises that have been successful in treating adolescent depression, common strategies for implementation and tools and strategies used to evaluate the effectiveness of treatment. Aerobic exercise interventions that have been successful in treating adolescent depression involve high levels of support, three 45 minute sessions of preferred exercise intensity per week for 10 weeks. The outcome is a delayed response to treatment and a lasting decrease in symptoms in comparison to traditional treatments, with clients retaining remission one year after the conclusion of the intervention. The findings of this research indicate that aerobic exercise can be successfully and ethically implemented as a treatment for adolescent depression, due to a lack of research on the use of aerobic exercise in treating adolescent anxiety. Clinical social workers and other mental health professionals are invited to consider a number of variables when utilizing aerobic exercise, including supervision, consultation and their own clinical judgment.

### **Acknowledgements**

This research would not have been possible without the commitment of multiple disciplines to the well-being of adolescents and openness to unconventional intervention practices. The three committee members, Katharine Hill, Rachel Coates and Lukas Campbell, and their ongoing support, commitment to quality and patience were truly invaluable throughout the process of the research.

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## Introduction

The health and well-being of America's youngest generations has been an area of concern and topic for research in recent years. Major media outlets and health professionals alike blame a lack of physical activity for America's suffering physical and mental health and propose increased levels of physical activity to improve health and increase overall well-being (Oaklander, 2016). Depression and anxiety, two of the most commonly diagnosed and treated mental illnesses in adolescents are positively impacted by physical activity, according to current research (Gaudlitz et al, 2013; Pickett et al, 2012; Smith and Blumenthal, 2012). Despite widespread acknowledgement of this relationship, physical activity is not a mainstream treatment for adolescent depression and anxiety (Knapen & Vancapfort, 2013; Nauert, 2015; Weir, 2011). We will explore current research on adolescent depression and anxiety, current treatments, and begin to make the case for continued research on the topic of physical activity as a treatment for adolescent depression and anxiety.

There has been a dramatic increase in depression and anxiety rates in American adolescents in recent decades, as evidenced by the tripled adolescent suicide rate since 1960 and that death by suicide is the third leading cause of death for American adolescents today (Mental Health America, 2016). This increase continues despite the continued expansion of mainstream treatment for adolescent depression and anxiety (Brauer, 1999; Lu, 2015). It can be hypothesized that this because the mechanisms why which physical activity improves physical health are well understood, while those why which it improves mental health remains unclear (Oaklander, 2016). Reasoning aside, this is a startling fact for mental health professionals working with adolescents, particularly mental health professions who are not medical doctors.

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Adolescents receiving treatment for depression and/or anxiety tend to do so by working with a mental health professional; a psychiatrist or primary care physician, or a therapist. Most mental health professionals, or clinicians, in practice are trained in clinical social work (NASW, 2016). The NASW Code of Ethics requires all social workers to practice in line with the values of dignity and worth of the person, and competence. The vast majority, if not all, of graduate programs available for social work education do not teach social work students methods for the use of physical activity as a mental health intervention (Weir, 2015). This leaves most clinical social workers without the evidence-based interventions they need in order to ethically and successfully use physical activity in sessions with their clients. Clinical social workers value each client that they work with as a complete human person through a bio-psycho-social lens acknowledging the importance of both their mind and their body. Clinical social workers strive to engage in competent practice through their graduate education and continued education after licensure. Integrating aerobic exercise into the therapeutic relationship could allow clinical social workers to acknowledge and respect the connection between the mind and the body, as well as the value of each individually.

Physical activity holds great potential as a treatment for adolescent depression and anxiety. Physical activity includes a number of activities which can take place in a variety of settings. Depending on the type of activity, physical activity can act as a low-cost, easily accessed and effective mental health intervention that can be used within the therapeutic relationship and after the relationship has ended.

Because of the widespread nature of adolescent depression and anxiety (Mental Health America, 2016) and the ability of physical activity to improve mental health, it is imperative for mental health professionals to have access to current research on physical activity for the



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treatment of adolescent depression and anxiety. This paper seeks to make a case for continued exploration of physical activity as a treatment for adolescent depression and anxiety. The following background will further explore the topic, providing a compelling argument for the further exploration of physical activity as a treatment for adolescent depression and anxiety.

### **Background**

The relationship between the mind and the body – as well as how each can be intentionally impacted by one another - has been the subject of research across disciplines with hopeful outcomes (Berchtold and Cotman, 2013; Van der Kolk, 2014). Defining the body is rather simple, as it is the physical presence of a person. The mind, however, is "the element of a person that enables them to be aware of the world and their experiences, to think, and to feel" (Oxford, n.d.). Current research on the mind-body connection has identified (1) that the relationship between the mind and the body exists, (2) the hypothesis that physical activity positively impacts mental health (Carless & Douglas, 2006; Gaudlitz et al, 2013; Martin Ginis et al, 2013; Perron et al, 2012; Stathopoulou et al, 2006; Sylvester et al, 2012), (3) mechanisms by which physical activity can impact the mind and mental health (Carless & Douglas, 2016; Craft, 2013; Martin Ginis et al, 2013; Strachan & Whaley, 2013; Sylvester et al 2012) and (4) impacts that physical activity has specifically on depression and anxiety (Gaudlitz et al, 2013; O'Dougherty et a, 2012; Perron et al, 2012; Smith & Blumenthal, 2013; Stathopoulou et al, 2006).

"Complementary and Alternative Medicine," or CAM, draws upon the connection between the mind and the body in order to influence health and well-being. Common CAM interventions include aromatherapy, mindfulness, yoga and exercise (McPherson &

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McGraw, 2013). Psychiatrist, psychotherapist and author of *The Body Keeps the Score*, Bessel van der Kolk states:

One of the clearest lessons from contemporary neuroscience is that our sense of ourselves is anchored in a vital connection with our bodies. We do not truly know ourselves unless we can feel and interpret our physical sensations; we need to register and act on these sensations to navigate safely through life (p. 274).

Van der Kolk (2014) demonstrates the importance of the mind-body connection throughout his book. He supports the use of EMDR (Eye Movement Desensitization and Reprocessing), a process by which a therapist physically touches and stimulates a client's senses as a successful intervention with clients who have experienced trauma.

This literature review will provide a background on depression and anxiety in adolescents – what is known about adolescent depression and anxiety and why this issue is particularly important for clinical social workers. We will explore the relationship between physical activity and mental health, current mind-body interventions and the mechanisms by which physical activity impacts mental health, and will conclude with the call for further research regarding how clinicians can use physical activity as an intervention with affected adolescents.

### **Depression and Anxiety in Adolescents**

Adolescents in America continue to experience depression and anxiety at an increasing rate (Gaudlitz et al, 2013; Pickett et al, 2012; Smith and Blumenthal, 2012), despite continued growth and improvement in treatment (Carless & Douglas, 2016; Craft, 2013; Smith & Blumthal, 2012). Adolescents are more likely than their adult counterparts to experience depression and anxiety with 50% of adolescents reporting depressive symptoms alone within a 6 month period in comparison to 20% of adults (Smith & Blumenthal, 2013). Specific

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reasons behind this rise are not indicated in the literature, however it can be hypothesized that this rise is the outcome of a combination of forces. Wilkinson (2012) indicates the signs and symptoms of adolescent depression may be misunderstood by the adults in their lives. As indicated throughout the literature, mainstream treatment for adolescent depression involves the use of a variety of medications and forms of psychotherapy and does not involve mind-body interventions, such as CAM or physical activity (Carless & Douglas, 2016; Craft, 2014; Smith & Blumthal, 2012).

Wilkinson (2012) found that symptoms of adolescent depression and anxiety are often misunderstood as characteristics of normative adolescent development. Adolescents may be stereotyped as lazy, antisocial, oppositional, difficult and moody (Wilkinson, 2012), and it is important to note that according to this stereotype, adolescents exhibit these behaviors somewhat purposefully. Adolescents suffering from depression and/or anxiety may exhibit these behaviors, but not purposefully and at a level that impacts their daily functioning. Adolescents experience depressive and anxiety symptoms that occur across the lifespan, including depressed mood, loss of interest/pleasure in activities they once enjoyed, feelings of worthlessness/excessive guilt, recurring thoughts of death, rumination, avoidance, generalized and specific worries/fears (American Psychiatric Association, 2013).

### **Physical Activity, Aerobic Exercise and Mental Health**

Aerobic exercise is a type of physical activity that has been found to have a positive relationship with mental health (Sharma et al., 2006). An individual is engaging in aerobic exercise when participating in a sustained activity that increases blood flow throughout the body (Merriam-Webster, n.d.). Despite the distinction between the two, physical activity has been used throughout the literature and research to describe the use of aerobic exercises. For the

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purpose of consistency in language, “physical activity” will be used to refer to both physical activity and aerobic exercise through this background.

A number of physical activities have a positive impact on mental health across settings. These variations include work and leisure activities (Gaudlitz et al, 2013; O’Dougherty et al, 2012), group sport (Carless & Douglas, 2016; Hoying et al, 2016; Perron et al, 2012) and individual settings (Craft, 2013; Strachan & Whaley, 2013). Physical activity has been linked to positive mental health within the general adolescent population (Herman et al 2015; Hoying et al, 2016; Smith & Blumenthal, 2013; Strohle et al, 2007) as well as adolescents both diagnosed with anxiety and/or depression and without a diagnosis (Gaudlitz et al, 2013; Smith & Blumenthal, 2013), younger adolescents and children (Perron et al, 2012), victimized children (Perron et al, 2012), and adolescents with varied levels of physical activity and physical health (Carless & Douglas, 2016; Herman et al, 2015). There is a lack of consistency in how the impact of physical activity on mental health is measured, adding to the lack of knowledge and understanding of the relationship between physical activity and mental health, as physical activity is just one of many variables identified when evaluating mental health.

Physical activity impacts aspects of and contributors to mental health including cognitive processing and functioning (Berchtold & Cotman, 2013), quality of life (Carless & Douglas, 2016), social inclusion or connection (Carless & Douglas, 2016; Gaudlitz et al, 2013), sense of meaning in life (Carless & Douglas, 2016), body image (Martin Ginis et al, 2013), self-esteem (Gaudlitz et al, 2013; Martin Ginis et al, 2013), use of both healthy (Stathopoulou et al, 2006) and unhealthy coping skills (Stathopoulou et al, 2006), self-efficacy/feeling competent (Gaudlitz et al, 2013; Sylvester et al, 2012), rumination or worry (Gaudlitz et al, 2013), a sense of well-

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being (Sylvester et al, 2012), sleep quality (Smith & Blumenthal, 2013) and perceived fitness improvements (Martin Ginis et al, 2013).

### **Psychological mechanisms by which physical activity impacts mental health**

There is no single conclusion that explains how physical activity impacts mental health. Several hypotheses have identified psychological mechanisms by which physical activity positively impacts mental health. These psychological mechanisms can be understood as the pathways by which physical activity connects with the mind and mental health. The proposed mechanisms have been classified into four categories: (1) social mechanisms (2) mechanisms of the self, (3) coping mechanisms and (4) well-being mechanisms. The settings in which physical activity occur vary by the number of participants, during leisure time and at work, in the context of competition, exercise and playing games, specific sports or movements in addition to others. Regardless of the context in which physical activity occurs, it is important to identify proposed mechanisms by which any and all physical activity impacts mental health.

#### **Social Mechanisms.**

The social experience that occurs within an individual engaging in physical activity is hypothesized to be a mechanism through which physical activity impacts mental health (Carless & Douglas, 2016). In a group of adults impacted by “Serious Mental Illness” or SMI, qualitative data indicates that by participating in a variety of sports in a group setting, the social structure of the program had a significant impact on their experience and overall feelings of mental wellness. The themes underlying this social experience include experiencing a sense of meaning in life by participating in the activity and relational experiences with other participants and facilitators

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(Carless & Douglas, 2016). By providing a space in which individuals engaging in physical activity are with other people, are interacting with them and are having shared experiences, physical activity can provide an opportunity for individuals to experience a decreased sense of isolation and an increased sense of connection, belonging and purpose (Carless & Douglas, 2016).

### **Coping Mechanisms.**

The use of physical activity as a coping mechanism has been associated with both short-term and long-term improvements in mental health (Stathopoulou et al., 2006). As American teens struggle with depression and anxiety, a common symptom is the use of maladaptive coping mechanisms; including inactivity (Craft, 2013; Stathopoulou et al., 2006), avoidance (Stathopoulou et al., 2006), and withdrawal or isolation from others (Craft, 2013; Stathopoulou et al., 2006). Physical activity has the potential to be used as a healthy or adaptive coping mechanism to improve their mental health (Craft, 2013; Gaudlitz et al., 2013; O'Dougherty et al., 2012; Stathopoulou et al., 2006). Physical activity can be used as a distraction, safe exposure to physical symptoms of anxiety, affect regulation and behavior activation.

Physical activity alone or in a group setting can be used as a method of distraction, to provide individuals with something to focus on other than their symptoms, mood or negative thoughts (Craft, 2013; Stathopoulou et al., 2006). Through physical activity, individuals who are experiencing an anxiety disorder can be exposed to some of the physical symptoms of anxiety, such as sweating and labored breathing without the negative outcomes typically associated with those feelings, such as panic attacks and intense fear (Gaudlitz et al., 2013). In people experiencing depression, physical activity can provide what is called affect regulation, by

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improving affect or mood, immediately following physical activity (Craft, 2013). Additionally, physical activity has been classified by L.L. Craft (2013) as a behavioral activation that, because of its lack of association with depression and association with pleasure, physical activity can stimulate feelings of pleasure and accomplishment within a depressed individual.

### **Mechanisms of the Self.**

An understanding of a person's self-schema can shed light onto why they think, feel and behave the way that they do. A person's self-schema is made up of "cognitive generalizations (beliefs) about the self derived from past experience" (Markus, 1977) which in turn inform future decisions and therefore, behavior. The self-schema is influenced by self-perception, self-efficacy and self-identity and is expressed through self-esteem, each of which have correlations with mental health (Strachan & Whaley, 2013).

Individual perceptions of the self possess great power and influence over the person as a whole. Self-perception is the way that people see themselves and it plays a significant role in the development of opinions, beliefs and feelings about the self. For example, when perceived changes in physical fitness and actual changes in physical fitness are compared, it is the perceived changes in physical fitness that are far more likely to be associated with elevated body image (Martin Ginis et al, 2012; Martin Ginis et al, 2013). Self-perception reaches beyond the way that we each literally see ourselves though. Self-perception applies to the way in which one sees aspects of being, beyond physical appearance. For example, an individual engaging in physical activity may experience a decreased sense of anxiety, meaning that they come to perceive themselves as decreasing their levels of anxiety with physical activity.

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After having repeatedly experienced reduced anxiety by engaging in physical activity, the individual may have a higher sense of self-efficacy as an outcome. Self-efficacy refers to the belief in oneself as being fully capable of completing a task and at a certain level of achievement, as it relates to both physical abilities (Craft, 2013; Gaudlitz et al, 2013) and coping abilities (Craft, 2013; Gaudlitz et al, 2013; Strachan & Whaley, 2013; Stathopoulou et al., 2006) by providing opportunities for mastery experiences and vicarious experiences through practice or watching others, as well as through the affective (or emotional) states experienced during exercise (Craft, 2013). Coping self-efficacy is the most important factor in managing stressful situations (Gaudlitz et al, 2013), as it can result in the belief that an individual can successfully manage their symptoms of anxiety and/or depression because of their past experiences and belief in being able to re-create a positive outcome.

A person's self-efficacy is only a piece of self-identity, as the person derives a piece of who they are from the concept that can do something. For example, an individual who has self-efficacy around their ability to use physical activity to cope with their symptoms may identify as "someone who uses physical activity to cope" and create a role for themselves from that. This person will have a personal understanding of what that role means, internal expectations of what that role looks like, are able to complete the task, as well as setting and reaching related goals (Strachan & Whaley, 2013).

As previously described, perceptions, beliefs and identity form self schema (Markus, 1977). With positive components, it is understood that a positive and healthy self-schema will result. Along with the formulation of self-schema, self-esteem is constructed within the mind of each individual. It is the outcome of an evaluation of self-concept, or schema, (Gaudlitz et al., 2013) and acts as the "way in which an individual is able to express a positive idea about



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him/herself;" (Knapen et al, 2005, p.354). Successful expression of positive ideas about the self through self-esteem is associated with positive mental health. (Martin Ginis et al., 2013).

### **Mechanisms of Well-Being**

Well-being, the sense that one is doing generally well and needs are being met, is a sign of positive mental health. It is suggested that all people share the need for competence, autonomy and relatedness (Sylvester et al., 2012). Whether through sport, group exercise or individual exercise, physical activity provides the opportunity for participation in an intentional activity, one that is committed to, takes effort and is done by choice. By taking part in intentional activities, it is possible for individuals to meet their needs of competence through practice and improvement, autonomy through mastery experiences and relatedness through shared experiences. Meeting these psychological needs results in an increased sense of overall well-being, and, as a result, more positive mental health (Sylvester et al., 2012).

### **Adolescents, Depression and Anxiety**

Just as the mind affects the body, the body can affect the mind, as evidenced by the relationship between physical activity and mental health. Current research indicates a number of reasons why physical activity impacts mental health by identifying potential mechanisms by which the effect occurs. While it would be helpful for clinicians to have an understanding of how physical activity affects their clients' mental health, this research will focus on moving forward from what is known, rather than clarifying past research. Equipped with a toolbox of physical activity interventions, clinicians can work with clients to improve their mental and emotional well-being by use of their own body. In order to develop these tools, clinicians need access to

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research-based interventions and strategies for implementing these interventions with their clients.

A systematic review of the current literature will explore these areas for further research with the goal of providing clinicians the knowledge needed to begin using physical activity as an intervention with their adolescent clients experiencing depression and/or anxiety. The purpose of this research is to begin to answer the question: how can clinicians use aerobic exercise to treat adolescent depression and/or anxiety?

### **Methods**

A systematic literature review is “a method of making sense of large bodies of information” (Petticrew, 2006). The purpose of a systematic literature review is to gather and analyze existing data on a specific topic, for the purpose of furthering comprehension of the existing data and identifying areas for further research. This systematic literature review (SLR) will focus on gathering and analyzing existing data on aerobic exercise interventions for use with adolescents experiencing depression. The goal of this SLR is to identify types of aerobic exercises used to treat adolescent depression, strategies for implementation and treatment outcomes, then present that data in a fashion that is easily accessible to clinicians.

### **Lens and Definitions**

The following research has been gathered and interpreted through a social work lens that is strengths-based and emphasizes the ability of the client to change their own life. According to the NASW Code of Ethics (2008), “The primary mission of the social work profession is to enhance human well-being and help meet the basic human needs of all people, with particular attention to the needs and empowerment of people who are vulnerable, oppressed, and living in

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poverty.” It is with this mission, that this research is approached and with this mission in mind that the outcomes are analyzed.

The language throughout this SLR, including methods, findings and discussion, will be kept consistent in order to avoid confusion. For the purpose of consistent language use, terms that are similar in definition and can be used interchangeably in reference to the same concept will be consolidated into a single term to be used throughout this findings review. The term “client” will refer to an individual who is between the age of 12 and 20 who is experiencing depression. These clients are referred to as “participants” throughout the findings of the literature review. The term “clinician” will refer to clinical social workers and mental health therapists from a variety of educational and occupational backgrounds that engage in therapeutic relationships with depressed adolescent clients. The term “clinician” will not refer to non-clinical social workers or to medical professionals such as a primary care physician, psychiatrist or nurse. The term “symptom” will refer to symptoms and diagnostic features of adolescent depression as described in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) as well as aspects of adolescent depression indicated by research study authors, such as decreased motivation or low self-esteem. The term “intervention” will refer to the use of a specific aerobic exercise or program made up of multiple aerobic exercises used for the treatment of adolescent depression. The term “therapy” will refer to the therapeutic relationship between one adolescent client experiencing depression and the clinician who is working with them. In this context, “therapy” will not refer to medical or therapeutic treatment by a medical professional, therapeutic treatment within a treatment program, group or family therapy. Combination therapy is "the use of more than one method ... to treat a disease" as opposed to monotherapy, or "the use of a single drug to treat a particular disorder or disease"

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(Merriam-Webster, n.d.). Combination therapy will be used to describe the instance in which aerobic exercise interventions were used alongside other treatments for depression during the studies that are included in this research.

### **Inclusion Criteria**

This SLR includes peer-reviewed journal articles that have been published during or after the year 2005, peer-reviewed and available in English. Each article will be a study or review of the use of aerobic exercise as an intervention when treating adolescent depression, adolescent anxiety or adolescent depression and anxiety, rather than a preventative measure, and will describe the treatment outcomes. All participants in the included studies should fall between the ages of 12 to 20 years old, due to ambiguity in the meaning of the term “adolescent.” Studies that are not excluded based on the use of short term or long term results, for the purpose of comparing and contrasting the affects that aerobic exercise can have on depression symptoms over short and long periods of time. Studies are also not excluded based on their sample size in order to demonstrate the use of aerobic exercise interventions with individuals and groups.

### **Search Strategy**

The electronic databases used to locate sources for this SLR include Social Work Abstracts, PsychNet, SocINDEX and SPORTDiscuss. Each search was limited to peer-reviewed articles published since 2005. All searches were completed in a one week period (December 4 – December 10, 2016). Due to interchangeable terms and inconsistent language, a number of related keywords were used in this search. Search terms were used individually and in combination to and applied to title, key words and abstract. Search terms were divided into themes for the purpose of searching. The themes were therapy, symptoms and intervention.

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Therapy terms include: clinical social work, therapy, psychotherapy, and therapist. Symptoms terms include: symptoms, depression, adolescent depression, anxiety, adolescent anxiety, adolescent mental health, teenagers, and adolescents. Intervention terms include: intervention, treatment, recovery, outcomes, aerobic exercise, physical activity, running, jogging, cardio, rigorous exercise, swimming, walking, hiking, biking, and CAM (complementary and alternative medicine). In addition, articles that were referenced in sources found through this search that were included for further review.

The database searches initially yielded 22 articles. SPORTDiscuss and Social Work Abstracts did not yield any articles as a result of the search. PsycNET yielded 17 articles. SocINDEX yielded five articles. Each article's title was reviewed to identify potential relevance to the research topic. Eight studies and one literature review from the PsycNET search and one study from the SocINDEX search were further reviewed for relevance. First, the abstract of each publication was reviewed. If the article was found to be a fit, the entire article was carefully reviewed. Three studies from the PsycNET search were excluded based on lack aerobic exercise intervention and lack of focus on adolescent population and adolescent depression or anxiety. The remaining four studies were included in the findings of this research. The sources included in the literature review were not relevant to current research and, therefore, were not included. The one remaining study from the SocINDEX search was included in the findings of this research. Figure 1 visually demonstrates the process of inclusion and exclusion, and can be seen below.

As articles were collected for review, some inclusion criteria were changed or removed as an outcome of the low number of studies that met basic inclusion criteria. The searches did not yield any studies with the focus of treating adolescent anxiety. One study included the impact of

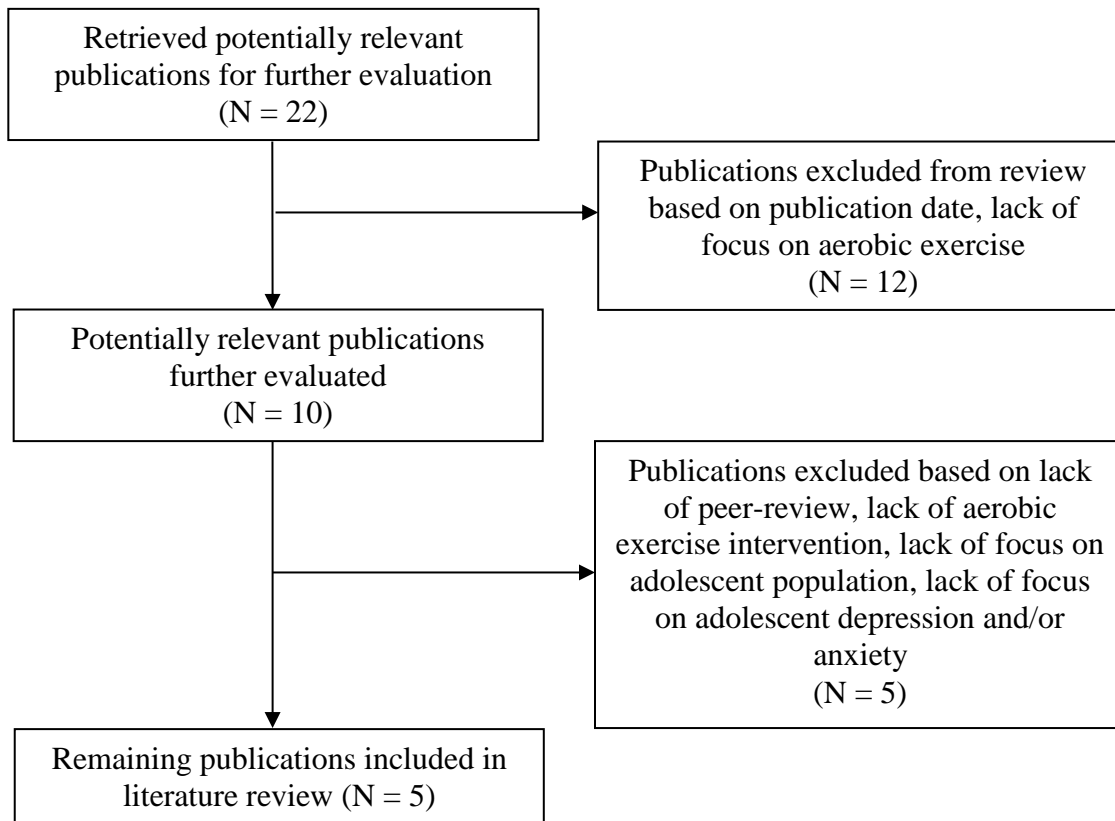
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an intervention on anxiety and depression. Due to the overwhelming focus on adolescent depression, the findings of this research will focus only on the use of aerobic exercise in treating adolescent depression. Studies that took place outside of the United States were initially excluded, in order to focus on the American adolescent population. Due to a lack of recent research within the United States, studies from around the world included. Studies that did not use aerobic exercise within a therapeutic relationship or as part of therapeutic programming were initially excluded, then included due to a lack of research on the use of aerobic exercise within therapy or therapeutic programming. Studies in which aerobic exercise interventions were implemented by doctors, physical education teachers, parents and other disciplines that do not engage in therapy with adolescents were initially excluded, but included due to a lack of studies that explicitly stated that aerobic exercise interventions were implemented by therapists or other mental health practitioners.

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Figure 1.

*Flow chart demonstrating the inclusion/exclusion process*



## Data Abstraction

After thoroughly reading each publication, relevant data is organized and analyzed before being presented in the findings of this SLR. Figure 2 and Figure 3 serve as visual aids for easy reference to each of the five included studies. The findings of this SLR will identify themes and variables across the included studies. Findings will be arranged into a literature review in order to provide an in-depth analysis of included studies.

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Figure 2.

*Data Abstraction: Population, Structure and Setting*

Author, Date	Population	Intervention/Structure	Setting
Carter, et al., 2015	Coed adolescents receiving treatment for depression, living in the UK	Group Circuit Training 2 60 min. Supervised circuit training sessions per week for 6 weeks	Supervised at the research lab in a group setting, preferred pace
Hughes, et al., 2013	Coed adolescents living in the United States of America	Preferred Gym-Based and Home-Based Aerobic Exercise 1 structured, gym-based 30-40 min. aerobic exercise session and 2 30-40 min. unstructured, home-based aerobic exercise sessions per week for 12 weeks	Supervised and unsupervised individually in the research lab and at home or in the community, preferred pace
Jeong et al., 2005	Adolescent females with no history of mental health diagnosis or treatment, living in South Korea	Group Dance Movement Therapy (DMT) 3 structured 45 min. DMT sessions in a group per week for 12 weeks	Supervised and instructed in a group setting
Nabkasorn et al., 2005	Adolescent females living in Thailand	Group Jogging 5 50 min. jogging sessions at preferred pace with a group per week for 8 weeks	Supervised at the research lab in a group setting, preferred pace
Stella et al., 2005	Adolescent females, who are obese, living in Brazil	Cycling 3 40 min stationary cycling sessions per week that gradually increased in length for 12 weeks	Supervised at the research lab in a group setting, preferred pace



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Figure 3.

*Data Abstraction: Treatment model, measures and outcomes*

Monotherapy versus Combination therapy	Depression Measures	Intervention Outcomes
Monotherapy and combination therapy	General symptoms of depression, as measured by: CDI-2.	Delayed response, lasting effect
Monotherapy and combination therapy	General symptoms of depression, as measured by: CDRS-R, CGI-I, QIDS-A-C, QIDS-A-P.	Rapid response, lasting effect
Mono	Specific Symptoms/Aspects of Depression: Fatigue, Muscle tension, Low self-esteem. General symptoms of depression and psychological distress as measured by: SCL-90-R.	Significant decrease
	Specific symptoms/aspects of depression: somatization, interpersonal sensitivity, hostility.	
Monotherapy and combination therapy	Feeling depressed, Feeling unable to cope with depression, Feeling sad, Feeling lonely, Feeling as if others are unfriendly, Crying Spells, Sleep Disturbance	Significant decrease, lasting effect
Unreported	General symptoms of depression ranging from mild to severe, as measured by: BDI.	Significant decrease

## Findings

This Systematic Literature Review (SLR) provides strong evidence that supports previous research findings that aerobic exercise is a legitimate and effective treatment for adolescent depression. Through analysis of the five included studies, this SLR expands upon previous research to identify symptoms and aspects of depression treated with aerobic exercise, intervention strategies, and measures by which treatment effectiveness was evaluated. Reporting of the findings is organized chronologically, in order of treatment planning, intervention and evaluation to facilitate their integration into adolescent depression treatment.

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### **Sample**

A total of 134 adolescents age 12 to 20 participated in the five studies included in this SLR. Clients are homogeneous in terms of their primary diagnosis, physical abilities, gender and experience with aerobic exercise. In order to participate in any of the five studies, clients had to meet diagnostic criteria for depression and were medically cleared to safely engage in aerobic exercises (Carter et al., 201; Hughes et al., 2013; Jeong et al., 2005; Nabkasorn et al, 2005; Stella et al., 2005). Three of the five included studies included adolescent females exclusively (Jeong et al., 2005; Nabkasorn et al, 2005; Stella et al., 2005). This did not impact the inclusion of any articles, as male and female participants were not reported to differ in regards to the impact of the interventions on their symptoms (Carter et al., 2015, Hughes et al., 2013). Most clients had not engaged in regular, aerobic or rigorous exercise within the six months prior to the intervention due to exclusion variables of three studies (Hughes et al., 2013; Jeong et al., 2005; Nabkasorn et al, 2005).

Clients who participated in the included studies are heterogeneous in terms of their secondary diagnoses, current or historical mental health treatment and their country of residence. Participants reported secondary diagnoses of anxiety (Hughes et al., 2013; 5), ADHD (Hughes et al., 2013) and conduct disorders (Hughes et al., 2013). Participants' treatment varied between no history of mental health treatment and current, ongoing treatment for depression and/or other mental health issues. Because each study took place in a different country, clients who participated in the research were living in The United Kingdom (Carter et al., 2015), The United States of America (Hughes et al., 2013), South Korea (Jeong et al., 2005), Thailand (Nabkasorn et al, 2005) and Brazil (Stella et al., 2005) at the time of the respective studies.

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## **Symptoms**

Aerobic exercise can successfully decrease overall levels of and specific symptoms of adolescent depression (Carter et al., 2015; Hughes et al., 2013; Jeong et al., 2005; Nabkasorn et al, 2005; Stella et al., 2005). The presenting symptoms and levels of depression vary throughout the five studies, demonstrating the effectiveness of aerobic exercise in treating adolescents who experience a range of symptoms at different levels of severity. Three studies identify specific emotional, interpersonal and physical symptoms of depression that were reduced with aerobic exercise, including feeling generally depressed (Jeong et al., 2005; Nabkasorn et al, 2005; Stella et al., 2005), unable to cope with depression (Nabkasorn et al, 2005), generally sad (Nabkasorn et al, 2005), lonely (Nabkasorn et al, 2005), as if others are unfriendly (Nabkasorn et al, 2005), as well as interpersonal sensitivity (Jeong et al., 2005), fatigue (Hughes et al., 2013), muscle tension (Jeong et al., 2005), hostility (Jeong et al., 2005), somatization (Jeong et al., 2005) and crying spells (Nabkasorn et al, 2005). The next section will describe interventions used to treat these symptoms of adolescent depression and anxiety. Table 2 illustrates the connection between these symptoms and the intervention(s) they were treated with.

## **Interventions**

Each study found a decrease in adolescent depression, as indicated by a decrease in specific symptoms and/or overall levels of adolescent depression. Each study involved the use of either a singular aerobic exercise (Jeong et al., 2005; Nabkasorn et al, 2005; Stella et al., 2005) or a combination of two or more aerobic exercises (Carter et al., 2015; Hughes et al., 2013). Figure 4 provides a brief overview of each intervention and illustrates the connection between each study's intervention and the symptoms and/or levels of depression that it treated. The subsequent sections will provide a detailed description of each of the included studies' aerobic exercise

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interventions. Interventions are organized alphabetically according to the last name of each study's main author.

Figure 4.

### *Symptoms, Aspects and Levels of Depression Treated with Aerobic Exercise Interventions*

Aerobic Exercise Intervention	Symptoms, Aspects and Levels of Depression	Depression Measure
Group Circuit Training. 2 60 min. Supervised circuit training sessions per week for 6 weeks (Carter et al., 2015)	Overall depression score.	CDI-2
Preferred Gym-Based, Home-Based and Community-Based Aerobic Exercise. 1 structured, gym-based 30-40 min. aerobic exercise session and 2 30-40 min. unstructured, home-based aerobic exercise sessions per week for 12 weeks (Hughes et al., 2013)	Overall depression scores. Fatigue, Muscle tension, Low self-esteem.	CDRS-R CGI-I, C-GAS, F-GAS, QIDS-A-C, QIDS-A-P
Group Dance Movement Therapy (DMT). 3 structured 45 min. DMT sessions in a group per week for 12 weeks (Jeong et al., 2005)	Overall depression score. Somatization, interpersonal sensitivity, hostility.	SCL-90-R
Group Jogging. 5 50 min. jogging sessions at preferred pace with a group per week for 8 weeks (Nabkasorn et al, 2005)	Overall depression score. Trouble concentrating, feeling depressed, inability to cope with depression, feeling sad, lack of motivation/initiative, fear, loneliness, irritability, feeling as if others are unfriendly, crying spells, sleep disturbance, feeling disliked, sadness, appetite/eating changes, social engagement.	Centre for Epidemiologic Studies Depression (CES-D) scale
Cycling. 3 40 min stationary cycling sessions per week that gradually increased in length for 12 weeks (Stella et al., 2005)	Overall depression score.	Beck Depression Inventory (BDI)

***Group circuit training intervention*** (Carter et al., 2015). Adolescents age 14-17 currently receiving treatment for mild depression participated in an aerobic exercise intervention in addition to any ongoing treatment for depression. These adolescents engaged in 1 hour of

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supervised, structured circuit training, twice per week for 6 weeks. During each circuit training session, participants followed a schedule of stretching followed by 8 strength and aerobic exercises in 1 or 2 minute intervals with breaks in between. Participants were closely supervised by a certified exercise therapist interacted with by study staff who also participated in the activity. The circuit training involved the following exercises: abdominal/back exercises in supine and prone positions; two medicine ball arm-based exercises in supine position; bouncing, static and dynamic balance exercises on a trampoline; body-weight squats against a wall; and stationary cycling. Exercises were completed in preferred order, at preferred intensity. Participants were given the opportunity to stretch before and take breaks during the intervention. The effectiveness of this intervention in treating adolescent depression was measured by the Children's Depression Inventory-2 (CDI-2) (Carter et al., 2015).

*Preferred gym-based and home-based aerobic exercises intervention* (Hughes et al., 2013). Adolescents age 12-18 who were not currently receiving treatment for depression participated in an aerobic exercise intervention as an alternative to medication intervention. Participants engaged in 30-40 minute supervised and unsupervised individual aerobic exercise sessions three times per week for 12 weeks. Participants spent the first week learning how to use the equipment in the research lab, treadmills and stationary cycles, and learning various at-home exercises including Jazzercise, Wii Sports/Fit, jogging and weight training. During their second week, participants exercised at the research lab a minimum of three times. During weeks three through twelve of the intervention, participants were required to complete one of the three sessions in the research lab. Adolescents with severe depression that needed immediate intervention were excluded from the study. The effectiveness of this intervention in treating adolescent depression was measured by the Childhood Depression Rating Scale (CDRS-R), the

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Clinical Global Impression Scale (CGI-I), the Children's Global Assessment Scale (C-GAS) and Family Global Assessment Scale (F-GAS), the Quick Inventory for Depressive Symptomology – adolescent version; clinician-rated and self-report (QIDS-A-C, QIDS-A-P and QIDS-A-SR) (Hughes et al., 2013).

***Group Dance Movement Therapy (DMT) intervention*** (Jeong et al., 2005). Adolescent females who were 16 years old and not currently receiving treatment for depression participated in an aerobic exercise intervention as an alternative to other treatments for depression. Participants engaged in 45 minutes of group Dance Movement Therapy (DMT) three times per week for twelve weeks. The DMT sessions incorporated four major themes: awareness of the body, room and the group; movement expressions and symbolic quality of movement; movement, feeling, images and words; and differentiation and integration of feelings. Each theme had subthemes, such as setting limits and out, inner and personal space; body language, the reflecting process, polarity, and inward and outward expression; playing, drawing and verbalization; and the inner sense, quality of movement, and expression of feelings. All participants were 16-year-old females who had no previous diagnosis of or treatment for psychiatric illness, who reported no regular exercise for the six months prior to the intervention and met diagnostic criteria for mild depression. The effectiveness of this intervention in treating adolescent depression was measured by the Symptom Checklist-90-Revision, which clearly indicates the treatment symptoms of depression, although it measured other markers of psychological distress (Jeong et al., 2005).

***Group jogging intervention*** (Nabkasorn et al, 2005). Adolescent females age 18-20 with mild-moderate levels of depression participated in an aerobic exercise intervention as an alternative to medication intervention. Participants engaged in 50 minutes of jogging in a group

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at each participant's preferred intensity, including a 5-10 minute warm up and 5-10 minute cool down, five times per week for eight weeks. None of the participants had a history of treatment for depression with medication or engaged in regular, rigorous sports activity in the six months prior to the intervention. The effectiveness of this intervention in treating adolescent depression was measured by the Centre for Epidemiologic Studies Depression Scale (CES-D) (Nabkasorn et al, 2005)

*Cycling intervention* (Stella et al., 2005). Adolescent females age 4-19 with a Body Mass Index (BMI) ranked at the 95<sup>th</sup> percentile or higher and met criteria for mild to severe depression participated in an aerobic exercise intervention as a treatment for depression. Participants completed three sessions of bicycling per week for twelve weeks. Participants bicycled for 40 minutes for weeks 1-4, 50 minutes for weeks 5-8 and 60 minutes weeks 9-12. In regards to the sample, the authors of this study do not discuss any current or past diagnosis of or treatment psychological disorders. Participants completed their initial session in the research lab, as the study examined physiological and psychological outcomes. The authors use the terms “program” and “session” when describing this structured intervention, implying the participants completed their activities in a research lab as a group. The effectiveness of this intervention in treating adolescent depression was measured by the Beck Depression Inventory (BDI) (Stella et al., 2005).

### **Application Variables**

There are key similarities and differences between the way in which each study used aerobic exercise to treat adolescent depression. These common variables are organized into three over-arching themes: setting, structure, and aerobic exercise as monotherapy or as part of combination therapy. Each theme includes potential explanations for the success of aerobic

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exercise interventions. Figure 5 will briefly identify the most common application variables across the included studies. The following sections will describe the application variables identified in the research, organized by theme.

Figure 5.

### *Application Variables Associated with the Treatment of Adolescent Depression*

Setting	Structure	Monotherapy vs. Combination Therapy
Staff-determined location	Initial sessions reserved for teaching the exercises.	Aerobic exercise intervention are implemented alone
Study staff and other participants are present.	45 minutes of aerobic exercise.	
Participants do not interact with each other.	3 aerobic exercise sessions per week.	
Staff interact with participants to ensure safety.	10 weeks total.	
	Exercises are completed at preferred intensity.	

**Setting.** Aerobic exercises were successfully used across a variety of settings to treat adolescent depression. "Setting" application variables describe the location of intervention activities, individuals present during the intervention, the level of and type of supervision of clients, and social interaction during aerobic exercise interventions. Participants in four of the five studies were required to complete all of their aerobic exercise sessions in location determined by study staff, such as a research lab with appropriate exercise equipment (Carter et al., 2015; Hughes et al., 2013; Nabkasorn et al, 2005; Stella et al., 2005). The remaining participants were allowed to complete about half of the intervention independently, at a location



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of their choice (Hughes et al., 2013). Aerobic exercise sessions completed in researcher-determined settings were supervised by staff and trainers or instructors (Carter et al., 2015; Hughes et al., 2013; Jeong et al., 2005; Nabkasorn et al, 2005; Stella et al., 2005). Due to a lack of uniformity, no general type of supervision can be identified. Type of participant supervision varied between studies by role of study staff members. Staff working out alongside participants (Carter et al., 2015), supervision without interaction (Carter et al., 2015), instruction and assistance with doing exercises correctly (Carter et al., 2015; Hughes et al., 2013; Jeong et al., 2005; Nabkasorn et al, 2005) and maintaining appropriate and required range of intensity (Carter et al., 201; Hughes et al., 2013; Nabkasorn et al, 2005) and check-ins with staff before or after sessions (Hughes et al., 2013). Participants were not reported to have social interactions with other participants during the sessions, as participants exercised at their own pace or level of intensity (Carter et al., 2015; Hughes et al., 2013; Jeong et al., 2005; Nabkasorn et al, 2005; Stella et al., 2005).

**Structure.** All five studies describe the use of structure during the implementation of their aerobic exercise interventions. Each study prescribed specific aerobic exercises for participants to use and varied in their use – either alone, in combination with other prescribed aerobic exercises or in combination with aerobic exercises chosen by the participant. Study staff determined the length of each aerobic exercise session, the number of sessions to be completed per week and the length of the study in weeks, as opposed to engaging participants in the interventions until symptoms improved. Averages of intervention data indicate intervention averages of 45 minutes of aerobic exercise, three times per week, for 10 weeks. Study staff spent time teaching participants the exercises that they were expected to use throughout the intervention, with the one exception being Jeong et al.'s Dance Movement Therapy intervention,

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as participants were with an instructor throughout the intervention (2005). Participants had the ability to choose the pace or intensity at which they completed the interventions and were allowed to take breaks as they pleased, although participants were expected to maintain a minimum level of intensity in order to be exercising at an aerobic level (Carter et al., 2015; Hughes et al., 2013; Nabkasorn et al, 2005; Stella et al., 2005). Study participants received support along with the natural pressure of a structured environment, evidenced by the presence of staff who taught participants how to do a number of exercises, provided assistance during sessions and encouraged participants to engage in the intervention, rather than communicating that they were required to do so (Carter et al., 2015; Hughes et al., 2013; Jeong et al., 2005; Nabkasorn et al, 2005; Stella et al., 2005).

**Monotherapy and Combination Therapy.** The studies included in this research have identified that aerobic exercise is a useful and legitimate treatment alone and in combination with other treatments for depression, referred to as monotherapy and combination therapy. Each study had a different approach to this concept of monotherapy versus combination therapy. Aerobic exercise was found to be effective as monotherapy (Carter et al., 2015; Jeong et al., 2005; Nabkasorn et al, 2005). Types of aerobic exercise combination therapy research that yield a positive impact on adolescent depression are the use of aerobic exercise intervention alongside the following: psychotherapy only (Carter et al., 2015; Hughes et al., 2013; Nabkasorn et al, 2005), psychotherapy and medication management (Carter et al., 2015), medication management for medications prescribed for other diagnoses including anxiety, ADHD and conduct disorders (Hughes et al., 2013). Authors indicated a common goal of identifying the efficacy of aerobic exercise for treating depression in place of antidepressant medications specifically (Carter et al., 2015; Hughes et al., 2013; Jeong et al., 2005; Nabkasorn et al, 2005).

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### **Evaluation**

Each study evaluated the success of their intervention by use of a different evaluation tool, and few followed a similar timeline (Jeong et al., 2005; Stella et al; 2005). Despite these differences, each study reports a statistically significant decrease in participant depression symptoms and overall scores when compared to control groups that received traditional treatment or no treatment for depression and none of the studies report worsening symptoms after the use of an aerobic exercise intervention (Carter et al., 201; Hughes et al., 2013; Jeong et al., 2005; Nabkasorn et al, 2005; Stella et al; 2005). Each study measured the symptoms or levels of depression in their participants at the beginning and end of the intervention, but two studies measured during the intervention (Hughes et al., 2013; Nabkasorn et al, 2005), two studies measured outcomes after six months (Carter et al., 2015; Hughes et al., 2013) and one study measure outcomes one year after the conclusion of the intervention (Hughes et al., 2013). In order to provide an in-depth understanding of the success of each intervention, each study's evaluation measures and process will be further discussed.

Carter et al. (2015) used the Children's Depression Inventory – 2 (CDI-2) to compare depression scores of adolescents who participated in their circuit training intervention alongside “treatment as usual” to adolescents who continued “treatment as usual.” At the end of their six week intervention, there was no statistically significant difference between the depression scores of the two groups. When depression scores were measured six months after the conclusion intervention, the group that received the circuit training intervention reported a statistically significant decrease in depression symptoms.

Hughes et al. (2013) used Children's Depression Rating Scale – Revised (CDRS-R) and Quick Inventory for Depressive Symptomatology - Adolescent Version; clinician-rated, parent

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version and self-report (QIDS-A) to measure depression levels of adolescents from the perspective of the adolescents, a clinician and the adolescents' parents. These measures were used to compare the depression scores of adolescents who participated in a variety of gym-based and home-based aerobic exercise to adolescents who participated in a stretching intervention at baseline, every three weeks of the 12 week intervention, then six months and one year following the completion of the intervention. The authors report adolescents receiving the intervention experienced a rapid decrease in symptoms that the comparison group caught up to at the end of the intervention. When the two groups were compared at six months and one year, the authors found a statistically significant difference in depression scores, favoring the aerobic exercise intervention.

Jeong et al. (2005) used the Symptom Check List-90-Revision (SCL-90-R) to compare the depression scores of adolescent females who participated in a twelve week Dance Movement Therapy (DMT) intervention to adolescent females who did not receive any mental health treatment. The authors report a statistically significant decrease in overall depression scores and specific symptoms of depression at the end of the intervention, indicating the success of DMT in treating depression in adolescent females.

Nabkasorn et al. (2005) used the Centre for Epidemiologic Studies Depression rating scale (CES-D) to compare overall levels of depression and specific symptoms of depression experienced by adolescent females who participated in an eight week group jogging intervention to adolescent females who did not receive, specifically, medication intervention for depression. The authors report a statistically significant decrease in levels and symptoms of depression at the end of the intervention, with a slight rise in symptoms for eight weeks follow the end of the

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intervention that remained below baseline. As a result, the authors conclude that the intervention was effective in treating adolescent female depression.

Stella, et al. (2005) used the Beck Depression Inventory (BDI) to compare the depression scores of adolescent females who participated in a twelve week bicycling intervention with those of adolescent females who participated in leisure physical activity intervention and adolescent females who did not participate in any form of physical activity intervention. The authors report the statistically significant reduction in depression symptoms was found in the bicycling intervention group when compared to the two others, leading them to conclude the intervention was successful in treating adolescent female depression.

The studies included in this research reflect the success of aerobic exercise in treating adolescent depression. Aerobic exercise provides depressed adolescents a rapid decrease in symptoms and a prolonged effect, when compared to other treatments and no treatment for depression (Carter et al., 2015; Hughes et al., 2013; Nabkasorn et al, 2005; Stella et al., 2005). In some cases, it is as effective as traditional treatments, including psychotherapy and medication (Carter et al., 2015). A lack of consistency in depression measures and evaluation methods inhibits the comparison of effectiveness between studies, but demonstrates the effectiveness of aerobic exercise in treating specific symptoms of depression, in addition to overall levels.

### **Conclusion**

Aerobic exercise, in its various forms, is an effective treatment for adolescent depression. This conclusion had stands true as a single treatment and in combination with traditional western treatments for adolescent depression. These findings demonstrate its success in a structured environment in which depressed adolescents receive initial instruction and continued support in

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combination with the ability to make choices during their treatment. Aerobic exercise interventions may up to six weeks to take full effect in clients, but the treatment outcomes may last up to a year following the end of the intervention.

The lack of consistency across the five studies included in this SLR demonstrates the potential for adapting aerobic exercise interventions in treatment planning and opens the door for continued research on this topic. This research indicates the use of various types of aerobic exercise and styles of implementation can be successful in treating adolescent depression. The following discussion will delve into an analysis of these findings as they relate to clinical social work practice with depressed adolescents. We will review strengths and weaknesses of the research, issues of ethics and competence and areas for further research.

### **Discussion**

The purpose of this research is to answer the question: how can clinicians use aerobic exercise to treat adolescent depression and/or anxiety? In short, this SLR answers that question with a “yes, but...” This SLR confirms the success of aerobic exercise in treating adolescent depression and identifies variables for clinicians to be aware of when integrating aerobic exercise into practice. This SLR collected and synthesized findings from five similar studies in order to identify specific aerobic exercises that have been successful in treating adolescent depression, common strategies for implementation and tools and strategies used to evaluate the effectiveness of treatment, in addition to the programs used throughout research. The findings of this research will be conceptualized and discussed through the lens of a clinical social worker in order to further analyze the presented data and discuss the strengths and limitations of this research. We will then look beyond the presented findings, considering issues of ethics in applying research to practice and areas for further research.

### **Strengths and Limitations**

Aerobic exercise interventions are easily generalized and highly adaptable, a true strength for clinicians to be aware of when considering the use of such an intervention with their clients. Aerobic exercise is generally successful in treating adolescent depression, while also holding potential to be successful in targeting specific symptoms of adolescent depression through the use of application variables. Aerobic exercise is not reported to be associated with increased symptoms. It is successful alone or in conjunction with other treatments. Clients can complete the exercises in a variety of settings to achieve positive results. Aerobic exercise interventions are adaptable, allowing the clinician and client flexibility in adapting the intervention to best fit the client's needs. This SLR demonstrates the diversity within the small body of research that is currently available on the subject, indicating that aerobic exercise has the potential to be a successful intervention with adolescents who experience a variety of symptoms of depression at varying levels, so long as they are physically able to participate in the exercises.

Just as the diversity within aerobic exercise interventions is a strength, it is also a limitation. We identified a number of application variables and differences in evaluating treatment outcome and did not come to any conclusions regarding the impact of those differences. Much is left up to individual clinicians and clients to decide. This research does not compare the effectiveness of different aerobic exercises nor the potential for impact of application variables, meaning that clinicians and clients may have to go through a process of trial and error when distinguishing an intervention structure that works best for the client. This can also cause clinicians an unnecessary amount of stress or uncertainty, particularly related to ethics, a topic to be further explored in this discussion.

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Within these research findings, there are areas of ambiguity and of focus that leave potential questions of clinicians unanswered. This research does not draw conclusions on the success of aerobic exercise in treating anxiety in adolescents. At this time, it remains unclear why each study chose not to include anxiety and why no studies that target anxiety specifically were found. This lack of information results in ambiguity around why anxiety was not researched and if aerobic exercise would be successful in treating adolescent anxiety. On the other hand, the included studies targeted adolescents with low levels of physical activity at baseline, resulting in a lack of research on the capability of physical activity to be used as an intervention with adolescents who are already active in their everyday life.

### **Ethical Considerations**

All social workers have an obligation engage in ethical practice, as informed by the NASW Code of Ethics. Because aerobic exercise is not a mainstream treatment for adolescent depression, there is no existing protocol for this treatment. As an outcome, social workers may run into a variety of ethical issues when using an aerobic exercise intervention with a client or clients. It is impossible to predict every potential ethical issue. We will review and discuss a few potential ethical dilemmas of using aerobic exercise interventions.

Social workers have an ethical responsibility to clients and the profession to engage in research-based practice and competent practice (NASW, 2008). When approaching a new intervention, such as aerobic exercise, there is research involved on the part of the clinician to ensure an understanding of the interventions. There is also a responsibility to understand how to implement the intervention before using it with clients. As indicated in research, clients were taught how to do specific aerobic exercises and closely supervised which participating in aerobic exercise interventions. This raises multiple questions for clinicians, whether they will have their



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client use exercises they are already comfortable using or if they involve an exercise that is new to the client. If the intervention includes an exercise that is new to the client, the clinician will have to consider how this client will learn the exercise.

As a clinician, social workers are expected to engage in research-based practice. This ensures proposed interventions have been researched and found to be effective before a clinician implements them with a client. In order to use aerobic exercise as an ethical intervention, aerobic exercise should only be used in a manner in which it has been researched, including specific aerobic exercises and application variables. A question raised by this is how closely the clinician will follow interventions and application variables described in the research.

Ethical dilemmas are not unique to social workers nor aerobic exercise as an intervention for depression. As clinicians trained in social work move forward in their practice, it is recommended that they use supports available to them for ethical decision-making, including supervision, consultation and their own clinical judgment.

### **Areas for Further Research**

Current studies effectively demonstrate the effectiveness of aerobic exercise in treating adolescent depression across settings. As a result of the current analysis, areas for further research have been identified. It is the recommendation that future research continues to build upon research that is currently available to clinicians by controlling for variables discussed in this literature review and comparing outcomes. These variables include types of aerobic exercises, variables in setting, application variables and depression measures. In order to further prepare clinicians trained in clinical social work to use aerobic exercise as an intervention, future

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research should further examine the ethical implications of the use of this intervention and work towards creating a protocol for using this effective treatment with clients.

Aerobic exercise as a treatment for adolescent depression is not a widely-researched topic, but physical activity for mental health is, as indicated throughout this literature review. Social workers who wish to engage in research, but lack access to the resources necessary to run a study are encouraged to review existing research to further identify and clarify themes and application variables that are relevant when using aerobic exercise interventions to treat adolescent depression in addition to other mental illness experienced by their clients.

This research indicates that wealth of data on the use of aerobic exercise in treating adolescent depression exists and the continued analysis of this existing data could be helpful in identifying specific interventions, strategies for implementation, evaluation techniques and even mechanisms by which the improvement in symptoms takes place. This SLR reviewed data from the years 2005 to 2017. By expanding the range from which studies are gathered, future research can expand clinical knowledge on aerobic exercise in the treatment of adolescent depression.

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