Adolescents' Decisions to be (In)Active: Relationships between Automatic Associations,

Affective Reactions, and Deliberate Reflections

by

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A thesis submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

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Abstract

It is well understood that the majority of adolescents today do not meet the current physical activity (PA) recommendations of 60 minutes of moderate-to-vigorous activity every day. In exploring adolescents' motivation to engage in PA, previous research has mostly taken an explicit approach by asking adolescents to reflect on their thoughts and feelings about PA. This method of questioning, however, is unable to capture adolescents' automatic associations about PA and their immediate affective reactions to PA at the moment when they are required to make a decision to either engage in or opt out of PA. The purpose of this thesis, therefore, was to explore adolescents' automatic associations with PA using an implicit approach, and to investigate how those automatic associations along with self-reported social cognitive variables (e.g., attitudes, outcome expectations, self-efficacy, body image) relate to adolescents' existing PA behavior and further predict their impulsive decisions to either opt into or out of a hypothetical PA program.

The first study explored older adolescents' automatic associations between health-related and social- or appearance-related outcomes and PA; and the relationships between those associations and participants' self-reported attitudes, body image, and PA behavior. One hundred and forty-four undergraduate students aged 17-19 years completed an implicit task and questionnaire. Participants demonstrated a positive automatic association between PA and social/appearance outcomes, but there was no difference in participants' automatic associations between PA and desirable or undesirable health outcomes. Analyses showed that instrumental attitudes towards PA was the only predictor of self-reported PA. These results suggest that older adolescents implicitly attend to the social/appearance outcomes of PA more so than the potential

health outcomes; and that social and/or appearance gains may be key PA motivators for older adolescents as they enter higher education institutions.

Study two employed a quasi-experimental design to examine whether adolescents' automatic health and social/appearance associations with PA and their self-reported outcome expectations, self-efficacy, and positive body image predicted their impulsive decision to opt into a hypothetical PA program. Eighty high school students completed two automatic association tasks followed by a questionnaire. Cluster random assigned participant groups received a presentation about a hypothetical PA program that emphasized either individualized, health-focused PA ($n = 39$) or group, social-focused PA ($n = 41$). Participants were pressured to provide a rapid, impulsive response regarding interest in participation. Results showed that participants automatically associated positive health words and positive social/appearance words with PA. Participants who received the health-focused PA description were 3.59 times more likely to opt into the program than those who received the social-focused PA description. Furthermore, positive automatic health associations and higher expectations of stress management outcomes predicted impulsively opting into the PA program. These results suggest that adolescents automatically associate positive health, social, and appearance outcomes with PA; and that presenting PA as an opportunity to focus on individual fitness goals and health benefits may help increase adolescent PA participation.

The idea for the third paper was formed after excessive barriers made it too difficult to pursue the originally conceived experimental text-messaging study with high school students. In recognizing that the issues experienced in the current thesis are common within research, the purpose of the third paper was to comment on the challenges that arise when attempting to conduct quality PA research with youth populations and to explore why these challenges persist.

The findings pointed to four main contributory factors: 1) a lack of resources (e.g., funding), 2) time pressures and/or constraints on researchers, 3) difficulty gaining access to youth populations, and 4) issues getting youth to engage in (and adhere to) research. Ideas for how to mitigate these issues were discussed.

The original research in this thesis showed that adolescents' positive automatic associations with PA and the affective reaction those associations produce are important factors for whether or not adolescents decide to engage in PA at the moment they are presented with an opportunity to do so. The research further amplified the importance of the PA environment, both social and physical, and the need to identify what environmental conditions are most conducive to PA participation for each individual adolescent. Further exploration of the motivational impact of positive mental health outcomes from PA, particularly PA under ideal environmental conditions for the individual, was recommended.

Preface

This thesis is an original work by Kimberley I. McFadden. It includes two original research studies with high school and undergraduate student participants and one commentary paper that incorporated perspectives from existing literature.

Study one received ethics approval from the University of Alberta Ethics Board (Pro00055350). The manuscript from this study (Chapter 3 of this thesis) is published in the *Journal of American College Health*. I was responsible for the conceptualization, methodology, software programming, analysis, data curation, writing of the original draft, editing, and project administration. My coauthors T.B., T.M., and W.R. helped with the conceptualization, provision of resources, reviewing, editing, and general supervision. A special thank you to Cassandra Husband for her voluntary assistance with data collection.

Study two received ethics approval from the University of Alberta Ethics Board (Pro00069461) and from the Department of Research and Innovation for Student Learning at Edmonton Public School Board. The manuscript from this study (Chapter 4 of this thesis) is currently under review for publication in the *International Journal of Sport & Exercise Psychology*. I was responsible for conceptualization, methodology, software programming, data curation, formal analysis, writing of the original draft, editing, and project administration. My coauthors T.B., T.M., and W.R. contributed to the conceptualization, resources, reviewing and editing, and general supervision.

The third paper of this thesis (Chapter 5) was a commentary paper that explored challenges that researchers frequently encounter when attempting to conduct experimental or quasi-experimental PA research with youth. The research conducted for this paper was purely a review of the literature and, thus, did not require ethical approval.

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Chapter 1. Introduction

There exists a plethora of literature regarding the benefits of physical activity (PA) for individuals' physical, emotional, and psychological health. Within adolescent populations, engaging in PA has been linked to increased cognitive function and academic performance (e.g., Li et al., 2017; Tilp et al., 2019), improved sociability and emotional intelligence (e.g., Ruiz-Ariza et al., 2019), reduced symptoms of depression and anxiety (e.g., Biddle et al., 2019; Kliziene et al., 2018; Ma et al., 2020; Melnyk et al., 2015; Pascoe & Parker, 2018), decreased risk of overweight and obesity (e.g., Crowe et al., 2020; Gaya et al., 2020; Saunders et al., 2016), and an increase in healthy cardiometabolic biomarkers (e.g., cardiorespiratory fitness, higher insulin sensitivity, balanced hormone levels; Agostinis-Sobrinho et al., 2019; Plavsic et al., 2020). Despite the overwhelming amount of information regarding the positive outcomes of PA, the majority of adolescents do not engage in sufficient levels of activity to achieve positive health outcomes. A recent report from the World Health Organization states that 81% of youth between the ages of 11 and 17 years (sampled from 146 countries worldwide) fail to accumulate the recommended 60 minutes of moderate to vigorous PA every day (Guthold et al., 2020). Specific to Canadian youth, current data indicate that only 10% of adolescents achieve the recommended amount of daily PA (Colley et al., 2017).

Furthermore, research has shown that time previously spent engaging in PA increasingly gets replaced by sedentary time as individuals progress from childhood through adolescence (Dalene et al., 2018; Telama et al., 2014), putting those individuals at risk of leading predominantly inactive lifestyles during their adult years. Despite research efforts focused on increasing PA behavior in adolescent populations, their time spent being inactive still far exceeds their time being active. Therefore, it is crucial that researchers continue to search for what factors

motivate adolescents to either engage in PA, intentionally avoid PA, or simply opt for other, more sedentary, pursuits (e.g., playing games online, scrolling through social media, streaming television shows or movies, etc.) on a daily basis. Specifically, what outcomes (e.g., appearance, social, health) do adolescents associate, both automatically and explicitly, with being physically active and what individual, social, and environmental factors contribute to impulsive decisions to engage in, or avoid, PA within this population? These questions are explored across two studies in this thesis. The first study employs an automatic association task and questionnaires to explore reflective and impulsive thoughts regarding health and social/appearance outcomes and PA in an older adolescent sample (i.e., first-year undergraduate students under 20 years of age). The second study applies a similar automatic association task and questionnaire in high school-aged adolescents and further includes two experimental conditions (health vs social) to explore personal and social factors that may contribute to participants' impulsive decision to opt into a hypothetical PA program.

The third paper, which takes the form of a commentary, came about after the originally proposed third study involving a randomized text messaging and activity-tracking experiment was revised to accommodate changes in the researcher's circumstances and access. The subsequent idea for a qualitative study exploring motivational PA text messages for youth in Northern Canada (a majority of whom are Indigenous) was also met with excessive barriers and proved to be too costly and time-consuming to successfully execute. Therefore, that research project also ended up having to be abandoned. Thus, after several unsuccessful attempts to pursue an experimental study and then a qualitative study that would have built on the findings of study two, the third and final paper of this thesis became a commentary on difficulties researchers commonly experience throughout the process of conducting quality PA research with

youth. These challenges include issues gaining access to potential participants so that an adequate sample is accrued and difficulties garnering sufficient interest in research to the degree that potential participants commit and adhere to the entire research process.

Following this introduction, the second chapter consists of a literature review of several topics including adolescent development, the theoretical approaches used for the research studies in this thesis (i.e., Reflective-Impulsive Model, Affective-Reflective Theory, and Social Cognitive Theory), the expected outcomes of PA on which adolescents might focus, measurement of psychological constructs, the philosophical approach taken to conduct this research, and some of the challenges involved in the pursuit of quality PA research with youth. The second chapter will conclude with an overall purpose statement about the goals of this thesis. Chapters three, four, and five include the afore-mentioned two research studies and one commentary paper. The sixth and final chapter provides a general discussion of the implications and contributions of this thesis.

Chapter 2. Review of the Literature

Characteristics of Adolescence

Adolescence is a developmental period of time that is recognized as spanning the years from the onset of puberty until adulthood. On average, puberty begins between the ages of 11-13 years, although it can start as young as eight years old or as late as 15 years old in some individuals (Kipke, 1999). The transition from adolescence to adulthood is recognized societally as the biological age of 18, although developmentally it can extend into the early 20s (Hendry & Kloep, 2012). Due to the ambiguity of exactly when one has shifted out of adolescence, Arnett (2000) proposed a theory of development called "emerging adulthood". This theory applies principally to youth in industrialized nations who have greater opportunity and privilege to explore possible life directions without necessarily having to take on the same number of adult responsibilities (e.g., stable employment, mortgage, bills, marriage, children) as people their age from previous generations (Arnett, 2000). It is suggested, however, that emerging adulthood does not begin until the individual has at least reached the age of majority, usually 18 years of age (Arnett, 2000). Thus, adolescence as a distinctive developmental stage separate from childhood and emerging adulthood is recognized here as spanning from 12 to 18 years of age.

The transition from childhood to adolescence and the continued growth through to emerging adulthood involves a variety of physical, cognitive, and social changes. Physically, adolescents develop overt sex characteristics that contribute to greater attention toward their appearance, self-identity, and social image (Ricciardelli & Yager, 2016). The experience of these physical changes increases adolescents' feelings of vulnerability as they try to determine how and where they fit into their social environment. Furthermore, fluctuations in hormones that coincide with these biological changes can create turbulent emotional experiences that contribute

to this life period being described as one of 'storm and stress' (Hall, 1904). Psychoanalysts (e.g., Freud, 1958, 1968) extended upon the idea of 'storm and stress' to create a stereotypical image of an adolescent as being miserable, hyperemotional, obstinate, and hostile towards any and all authority. In reaction to the harshness of this depiction, psychologists later modified this stereotypical image to one that depicts adolescents as, on average, content individuals, having healthy and respectful relationships, and even displaying optimism and resilience (Offer, 1969). It is now widely accepted that adolescents, in general, engage positively with their world, while periodically experiencing times of stress that often include having to navigate turbulent emotions.

Some of the stress and personal adversity adolescents experience can be related to perceptions of themselves and how they fit into their social world. Self-consciousness and insecurity are commonly experienced as adolescents' developing cognitive capacity allows them to think abstractly and view the world from an 'allocentric view', or third-person perspective (Steinberg, 2005). This perspective, in combination with their established egocentric view, contributes to adolescents making assumptions about how others might perceive them and being hyper-aware of the image of themselves they project to the world (Steinberg, 2005). This is further impacted by the perception of the 'imaginary audience', a theory that suggests adolescents believe they are under constant observation and judgement by others (Elkind, 1967; Vartanian, 2000). Adolescents' behavior, thus, often corresponds with what they believe is most likely to result in them being seen in a positive light (i.e., desirable) by those around them. Additionally, the theory of the 'personal fable' suggests that adolescents consistently believe they are uniquely special and different from others such that nobody else is capable of truly understanding their own experiences (Elkind, 1967). This belief contributes to adolescents

perceiving they are invulnerable to the same (often negative) outcomes that have befallen others (Elkind, 1967; Vartanian, 2000). Combined, these theories on adolescent perspectives have been postulated to account for the increased susceptibility to social pressures and peer group conformity, and more frequent engagement in risk-taking or impulsive behaviors that are often observed in adolescents (Alberts et al., 2007).

The afore-mentioned cognitive developments in perspective-taking and imagination are indicative of the extensive brain growth that occurs during the adolescent years. Studies have found that sections of the brain related to intelligence and responsible for emotional, cognitive, and behavioral regulation develop primarily throughout adolescence (Choudhury et al., 2006). Specifically, major physiological changes (e.g., increased grey matter) occur in the area of the brain responsible for executive function (e.g., inhibitory control, emotional regulation, decision making, goal setting, etc.) during this period of development (Choudhury et al., 2006). Adolescent risk-taking and impulsive behavior is directly linked to underdevelopment of this brain region and, therefore, can be attributed to why these types of behaviors are more common in the earlier years of adolescence (ages 12-16) and are less pervasive in later adolescence and emerging adulthood when the brain is more developed (Crone et al., 2016). The combination of heightened social awareness (which may include peer pressure), high reward sensitivity, strong emotions resulting from naturally occurring hormonal fluctuations, and lowered ability to regulate emotions and behavior can often result in rash decisions and socially deviant or undesirable behavior (Fino et al., 2014).

Adolescence is primarily characterized by the drive for increased autonomy and a desire to develop one's own identity while also cultivating a social network outside of the family unit (Kloep et al., 2016). The influence and control previously exerted by parents/guardians or other

adults during childhood becomes less powerful as individuals progress through the adolescent years. Parents may be seen as a controlling force within an adolescent's life and there is a strong desire to free oneself from these external pressures or controls. Concurrently, friendships and romantic interests take precedence over family relations and are more influential on adolescent beliefs, attitudes, and behaviors (Oudekerk et al., 2015). As such, adolescents are more likely to rebel against enforced rules set by adults or those seen as authority figures in an attempt to establish independence and engage in activities that feel good to them in the moment and/or provide them with social gain. Therefore, adolescents' decisions regarding what behaviors to adopt are more likely to be influenced by social norms within their peer group or within their immediate social environment and relate to the type of identity they wish to portray. Risky or delinquent behaviors, in particular, have been found to be conducted primarily within the context of peer influence and conformity (Albert et al., 2013).

In recent years, influences on identity development, social feedback, and information regarding social norms have been increasingly sought and obtained via communication technology, particularly social media sites. These sources of information have become so enmeshed within the lives of adolescents that they take a dominant role in their social networking, relationship development, and communication (Roth et al., 2019; Sirriyeh et al., 2010). Recent data suggests that 95% of American adolescents have access to a smartphone or other device that connects to the internet and social media applications (Pew Research Center, 2018). Furthermore, of those young individuals who have access to a device, 45% indicated that they are online almost constantly (Pew Research Center, 2018). Some problems arising from this level of technology usage among these privileged adolescents are an underdeveloped capacity for empathy and a decreased ability to recognize facial and body cues necessary to understand the

intentions and feelings being communicated during real life social interactions (Ammaniti & Cerniglia, 2019). The result is a growing trend of adolescents experiencing loneliness and, in some ways, disconnect from others even as they expand their online network, while also having less success in creating and maintaining real-life, genuine relationships.

The heavy consumption of social media makes online contacts, particularly 'friends', 'followers', 'content creators', and 'influencers' on social networking sites, key sources of information and influence for the modern, privileged adolescent (Goodyear et al., 2019). The ability of social media users to engage in tailored self-disclosure (i.e., filtering content to display and amplify only the positive and desirable aspects of oneself and environment) tends to increase their audience's engagement in social comparison (Roth et al., 2019). In many cases, increased comparison behavior results in dissatisfaction with one's own appearance, environment, and/or circumstances (Roth et al., 2019). It is not surprising, therefore, that media internalization and social comparison have been found to predict negative outcomes in adolescents, such as eating pathology, favorable opinions of tobacco and alcohol use, and increased symptoms of anxiety and depression (Dakanalis et al., 2015; Gibbons et al., 2010; Pitts, 2012). It has been found, however, that adolescents who are taught to be cognizant of the "highlight reel" lens of social media are better equipped to avoid excessive comparisons and the negative affect that tends to accompany such behavior (Weinstein, 2017).

When considering PA behavior and its predictors in adolescents, it is important to account for the afore-mentioned aspects of cognitive, physical, and behavioral development as well as adolescents' social environments (both in person and on-line). Specifically, hormonal fluctuations and their influence on adolescents' capacity to self-regulate their emotional responses will impact how they interact with their physical and social environments (Somerville

et al., 2010). Those who have a less developed prefrontal cortex and, therefore, are less able to engage in reflection or execute control over their emotions may be more reactive and engage in more impulsive actions (Crone et al., 2016). In other words, adolescents' cognitive development will impact their level of engagement in reflection and deliberate decision-making and will affect how well they are able to circumvent highly emotional reactions and impulsions. Furthermore, adolescents' ability to adopt different perspectives and their ego- and allo-centric views tend to boost the importance of social surroundings, feedback from others, and perceptions of their social reputation (both in real life and virtually). Finally, physical changes draw adolescents' attention to their bodies and increase their perception of, and sensitivity to, what is considered a desirable physical image (Forney et al., 2019; Voelker et al., 2015). This also impacts thoughts and beliefs about how they might be able to achieve that image (e.g., via healthy methods, such as PA, or via unhealthy methods, such as use of diet pills or steroids). Therefore, emotion-driven impulses, the degree to which adolescents engage in deliberate reflections about their behavior, desired social and appearance outcomes, beliefs (self-generated and/or influenced by others in real life or on-line) about what behaviors will optimize achievement of those social and appearance outcomes, and perceptions of their own bodies, may all contribute in varying degrees to whether adolescents care to engage in or avoid PA.

Affective and Reflective Cognitions

When considering adolescent thought processes and decision-making prior to behavior, it is important to examine the dynamic between affect and cognition. Specifically, it is necessary to determine whether adolescents will engage in cognitive reflection prior to action or, instead, act impulsively based on their affective reaction to the behavior, the environment, and/or the circumstances under which the behavior is to be performed. What are frequently referred to as

"dual-processing theories" propose that human behavior is guided by two evaluative response systems – one which is explicit (assessed via self-report measures that provide deliberate, reasoned responses) and one which is implicit (assessed via performance measures that provide unintentional, uncontrollable reactionary responses) (Gawronski & Brannon, 2018). These theories suggest that implicit automatic associations, such as those between PA and negative outcomes (e.g., muscle pain, fatigue) or PA and positive outcomes (e.g., increased strength, feeling energized, improvements to body composition), can affect behavior outside of individuals' deliberate intentions and may be discrepant from what those individuals explicitly indicate they think about a given behavior (Carlston, 2010). Furthermore, dual-processing theorists propose that the degree to which these two evaluative response systems influence behavior is dependent on contextual elements, such as the physical or social environment (Hofmann et al., 2008; Loewenstein et al., 2015). In situations that are emotionally charged and demand a quick response, an individual may be more influenced by their affective reaction or 'gut feeling' regarding engaging in the behavior itself or engaging in the behavior within the immediate physical and social contexts (Hofmann et al., 2008). Alternatively, if an individual is presented with a situation in which there is time to reflect and they are motivated to do so, they may be more likely to deliberately evaluate all factors that would contribute to them engaging in a behavior or not (Hofmann et al., 2008). Social pressure and the desire to belong or connect with others may contribute to adolescents perceiving the need to make quicker decisions and feeling pushed toward a specific action, whether or not engaging in that action is congruent with their deliberate reflections on it. Thus, while adolescents have the capacity to engage in reasoning and deliberation (provided they are given sufficient time and have the desire to do so),

their decision-making process may be more affectively driven, pressured (particularly by peers), and, therefore, impulsive.

In recent years, there has been a suggested shift away from the duality of cognitive processes. For example, Melnikoff and Bargh (2018) caution researchers that reducing the way in which behavioral decisions are made to only two distinct neural pathways that operate separately is overly simplistic. Instead, the authors urge researchers to consider the many nuanced ways in which people's emotions and reflections both interact and operate under situational circumstances to result in a behavioral decision (Melnikoff & Bargh, 2018). It is not whether or not an individual will react affectively to, and/or make the effort to think critically about, engaging in a behavior, but rather to what degree those affective and cognitive elements are activated in any given context to impact one's final decision. Therefore, it could be suggested that decision-making processes are more likely attributed to a complex network of multiple neural pathways that are activated to varying degrees depending on the individual's previous experiences, their immediate affective response, their motivation and/or ability to reflect, and their attention to specific elements of the current behavior-in-context situation they are facing.

Various models and theories have been developed in an effort to explain how the implicit-explicit evaluative process systems operate. For example, the elaboration likelihood model of persuasion (ELM; Petty & Cacioppo, 1981) proposes that persuasion variables (e.g., source, message, context) can influence one's attitudes by serving as simple cues, biasing generated thoughts, affecting one's confidence in their thoughts, serving as persuasive evidence, and/or affecting the amount of information processing that occurs (Petty & Briñol, 2010). The amount these persuasion variables influence one's attitudes is dependent on the level of cognitive engagement one is willing and able to execute as well as relevance and timing of the information

(Petty & Briñol, 2010). The motivation and opportunity as determinants (MODE) model (Fazio, 1990) assumes that attitudes are represented as object-valence associations in one's memory and those attitudes can be automatically activated, influencing behavior under circumstances where one lacks motivation to reflect upon or evaluate the target object (Fazio, 2007). Yet another model, the associative-propositional evaluation (APE) model (Gawronski & Bodenhausen, 2006) suggests that implicit evaluations are the behavioral outcomes of activated mental associations whereas explicit evaluations are the behavioral outcomes of propositional validation of those mental associations (Gawronski, 2012). When the evaluation of activated associations is congruent with other salient information, it is usually regarded as valid; however, if there is inconsistency between activated associations and other information, one might reject the evaluation in favor of restoring cognitive congruency (Gawronski & Strack, 2004).

For the current thesis, two models were used to explore adolescent thought processes as they relate to PA behavior – the reflective-impulsive model (RIM; Strack & Deutsch, 2004) and the affective-reflective theory (ART) of physical inactivity and exercise (Brand & Ekkekakis, 2018). The RIM was selected due to its inclusion of impulsivity in decisions and actions and its discussion of the varying presence of reflection prior to engagement in a behavior. This model is appropriate to apply to adolescent behavior considering adolescents may not have the fully developed cognitive capacity to overcome behavioral impulses, particularly when there is real or perceived pressure to conform with others by engaging in a specific behavior. The ART of physical inactivity and exercise, a newly developed dual-process theory, was included because it elaborates on the influence and importance of affect in encouraging or discouraging reflective processes specifically regarding PA/inactivity and/or PA/sedentary behavior. Considering adolescents experience heightened affective states and may have difficulties recognizing,

processing, and/or regulating their emotions in response to environmental stimuli, it is important to consider how their affective responses impact their decisions to engage in, or avoid, PA. These two models are explored in greater detail in the following sections.

Reflective-Impulsive Model

The RIM (Strack & Deutsch, 2004) suggests that social behavior is dictated by two distinct systems that operate parallel to one another. The reflective system involves reasoning, decision-making, and intention in order to produce a behavior, or reasoned action. Behavior resulting from reflective cognition is the consequence of a deliberate decision made based on the assessment of future outcomes, the value placed in those outcomes, and the probability of attaining those outcomes. The impulsive system involves associative stores in an individual's memory. Environmental cues and/or motivational orientations contribute to an automatic spreading activation of these associations, resulting in a behavior that may be independent of an individual's explicitly expressed behavioral intention or goal. If sufficient time is provided for an individual to engage in reflection and the individual is inclined to do so, then a reasoned response will occur. However, if an individual is faced with time constraints or has a strong affective reaction that disrupts reflection, then impulsive action will occur. The reflective system requires higher cognitive effort and employs executive functioning (e.g., inhibitory control, emotional regulation, decision making), while the impulsive system is quick, with little deliberate thought, if any, put towards potential consequences (good or bad) of action prior to engaging in the behavior.

Strack & Deutsch (2004) propose that the impulsive system is always engaged in information processing while the reflective system may be disengaged due to it being a more cognitively demanding system and more prone to operational interference from distraction or

extreme levels of arousal. In other words, the automaticity of the impulsive system initiates a

behavioral schema based on associative stores in long-term memory that could result in

impulsive action. The reflective system may fail to inhibit the impulsive action if an individual's

reasoning is congruous with that of the impulsive system (i.e., upon reflection the individual

decides that the action is worth pursuing) or the reflective system is inhibited itself. Cognitive

impairment from alcohol consumption is an example of one way in which the reflective system

could be inhibited, thus resulting in an individual engaging in more impulsive behavior.

Similarly, if an individual is distracted (e.g., texting) or cognitively preoccupied (e.g., ruminating

on a previous event or conversation), they may be cued by their physical or social surroundings

to engage in a habitual action without realizing it, or intending to do so.

The way in which an individual construes a situation is influenced by many factors

ranging from the more automatic constructs of reflexes, motivational orientations, habits,

schemas, and scripts to more reflective constructs, such as goal pursuit and careful consideration

of possible outcomes or consequences (Deutsch & Strack, 2010). Depending on the degree to

which each of the reflective and impulsive systems is activated and whether the two systems are

concordant or discordant, engagement in, or avoidance of, a behavior will ensue. Motivational

orientations, which frequently involve affective outcomes (e.g., what feels or looks good), may

play a key role when the impulsive and reflective systems are divergent because, in the heat of

the moment, individuals may be more likely to pursue a behavior focused on achieving "feel

good" outcomes even if, upon reflection, the behavior is detrimental to their health or considered

socially deviant (Hofmann et al., 2008).

Affective-Reflective Theory

Emphasizing the importance of situational affect in the uptake or avoidance of PA behavior, Brand & Ekkekakis (2018) developed the Affective-Reflective Theory (ART) of physical inactivity and exercise. This theory proposes that automatic affective valuation (i.e., assignment of positive/negative feelings) of PA or a less active/sedentary alternative creates an action impulse that will drive the individual to either change or maintain their current activity level. The automatic affective response serves as the basis for further reflective cognitive evaluation of the behavior and the circumstances surrounding the behavior, provided there is no interference or pressure that prevents deliberate reflection. The automatic response is triggered by affective associations with the behavior and/or social situations in which the behavior is performed. These associations are activated instantaneously and result in either an approach or avoid action impulse to change one's activity level or not. Following the automatic affective valuation, cognitive evaluation of the behavior and the environment in which the behavior is to be performed may or may not occur depending on available time and self-control resources. If activated, cognitive evaluation may involve reflecting on previous experiences, mental simulation of anticipated experiences, evaluation of one's needs and values, perceived pros and cons of the behavior, and subjective beliefs. The result of cognitive evaluation involves a deliberate action plan to either engage in or avoid the behavior (Brand & Ekkekakis, 2018).

The combination of automatic affective valuations and, if subsequently activated, the reflective evaluations of the behavior may or may not be in agreement, resulting in an action impulse and action plan that is either harmonious or discordant. For example, if an individual has an automatic positive affective response to a PA situation and, upon reflection, engaging in the PA is appropriate and aligns with their reflections on engaging in the PA, they will likely pursue the activity. Similarly, if an individual has an automatic negative response to a PA situation and,

upon reflection, engaging in PA is deemed disadvantageous or unnecessary, they will likely decline engaging in the activity. Both of these previous scenarios involve concordance between the affective valuation and reflective evaluation. In a situation where there is discord, such as a negative automatic affective valuation (e.g., dislike of the PA), but a positive reflective evaluation (e.g., PA will be good for me) and/or a positive automatic affective valuation or reflective evaluation regarding an opposing behavior (e.g., desire or perceived need to scroll through social media), it is suggested that the affectively-driven action impulse – in this case, avoidance of PA – will prevail (Brand & Ekkekakis, 2018). It is unclear, however, if this result could be assumed in a situation whereby there is a positive automatic affective valuation (e.g., enjoyment of the PA), but a negative reflective evaluation (e.g., social environment is deemed overly competitive), especially if there is also a positive affective valuation and/or reflective valuation of an opposing sedentary behavior. In this case, the initial positive impulse action may be thwarted by a desire to avoid a less than optimal social environment and/or the attractiveness of the alternative behavior.

The ART of physical inactivity and exercise is still new within PA research, however a few studies (e.g., Phipps et al., 2021; Schinkoeth & Brand, 2020) have provided preliminary evidence for the cognitive processes proposed by the theory, particularly the influence of the automatic affective valuation on PA behavior. Schinkoeth and Brand (2020) found that negative automatic associations with exercise were linked with a physiological response (increased heart rate variability) triggered by images of exercise. The authors suggest the somatic reaction observed in their study may be evidence of automatic affective valuation that instantaneously occurs when faced with reminders of previous exercise behavior. Phipps and colleagues (2021) found that automatic affective associations predicted PA behavior independent of explicit

affective attitudes and deliberate action plans. These results highlight the importance of considering impulsive and immediate affective responses to PA cues and behavior alongside evaluative beliefs and intentions regarding PA (Phipps et al., 2021).

Further research is needed to fully explore the ways in which automatic affective and evaluative cognition interact to influence behavioral decision-making. However, researchers (e.g., Phipps et al., 2021) have used these preliminary findings to encourage development of PA interventions that improve affective reactions to PA by decreasing or minimizing unpleasant PA experiences. Considering that PA experiences, both positive and negative, accumulated throughout childhood and adolescence can leave lasting impressions that influence PA behavior later in life (Ladwig et al., 2018; Miller & Siegel, 2017), interventions should focus on improving PA experiences during this time period. Specifically, interventions could focus on increasing experiences of positive affect in physical education (PE) classes, in physical games during free time (e.g., recess, after school), and within organized sport.

Implicit Cognitions and Adolescent Behavior

Research using implicit measures to understand adolescents' thought processes and behavior is still relatively new. The majority of studies thus far have focused on negative or antisocial behaviors, such as racism or ethnic discrimination (e.g., Corenblum, 2014; Mahonen et al., 2011), alcohol consumption (e.g., Glock & Krolak-Schwerdt, 2013; Pieters et al., 2014), smoking (e.g., Czyzewska & Ginsburg, 2007; Sherman et al., 2009), unhealthy food consumption or disordered eating (e.g., Chen et al., 2018; Guidetti et al., 2014; Smith et al., 2014), violence and self-harm (e.g., Jouriles et al., 2013; Knowles & Townsend, 2012), and impulse buying (Thürmer et al., 2020). In terms of PA behavior, a recent review by Chevance and colleagues (2019) highlights that the majority of studies examining associations between

implicit attitudes toward PA and PA behavior have been conducted with emerging adult (e.g., undergraduate students) or adult/older adult samples, thus demonstrating a dearth of research in the area of adolescents' automatic associations and affective reactions to PA behavior.

Two studies (Craeynest et al., 2008; ten Hoor et al., 2020) have used implicit measures to determine how automatic associations impact PA behavior in young people, focusing specifically on youth 8-18 years old being treated for obesity. Craeynest and colleagues (2008) found a change in negative implicit attitudes towards moderate and high intensity PA was related to decreased weight from initiation of an inpatient obesity treatment program to completion of the program six months later. The authors recommended exercising caution in interpretation of these results as the effects were not found on both measurement levels (reaction times and accuracy) of the implicit task (Craeynest et al, 2008). Sampling from an outpatient obesity treatment program at the same facility as the previous study, ten Hoor and colleagues (2020) found no differences on an implicit association test of thoughts about PA and physical inactivity between youth with different weight statuses (i.e., normal weight vs overweight/obese). The implicit tasks in both these studies used words or images of types of PA (e.g., aerobic exercises and strength exercises), but did not assess positive/negative outcomes or motives adolescents might associate with PA. Therefore, the results of those studies were limited to approach or avoidance of specific PA tasks (e.g., running, swimming, and doing push-ups) and were not able to provide insight on positive and negative outcomes adolescents might associate with engaging in those PA tasks.

There have been a few studies conducted with young/emerging adults that incorporated motivation with automatic associations, looking at implicit autonomous versus controlled motivational orientations towards PA. For example, Banting and colleagues (2011) implicitly primed individuals participating in a cycling session to either an autonomous (e.g., I feel

interested) or controlled (e.g., I feel pressured) motivational orientation prior to exercise. They found that those who received the autonomous prime enjoyed the exercise more, exercised at a greater intensity, and reported lower perceived exertion. In contrast, those who received the controlled prime exercised for less time and reported lower intentions to exercise (Banting et al., 2011). Keatley and colleagues (2012) determined that implicit autonomous motivation (e.g., being active for health reasons) as compared to implicit controlled motivation (e.g., being active to look good) better predicted PA behavior. The authors further suggested that individuals who experience intrinsic, or autonomous, motivation both implicitly and explicitly, are more effective in initiating and maintaining PA behavior than those who experience extrinsic, or controlled, motivation (Keatley et al., 2012). Oliver and Kemps (2018) examined the effect of motivational and implicit processes on bouts of incidental PA. They found that higher levels of both autonomous and controlled motivation in combination with positive implicit attitudes toward PA contributed to greater amounts of incidental PA.

The findings from these studies suggest that automatic thoughts can influence engagement in PA and that exercise adherence may be increased if strong intrinsic automatic associations are developed. Furthermore, positive automatic associations along with any type of motivation (e.g., intrinsic or extrinsic) can contribute to increased daily movement. Similar outcomes have yet to be examined in youth populations. Considering the significant developmental changes that occur throughout the adolescent years, it is important to clarify how physical, emotional, and cognitive changes during this life stage and the varying rates at which they occur depending on age and gender might affect adolescents' health- and social/appearance-based outcome expectations or motives for PA.

Social Cognitive Theory

Social Cognitive Theory (SCT; Bandura, 1986) is a theory of human agency (i.e., ability to make choices) stating that individuals' purposive action is based on the beliefs they have about what they can do, the actions they believe will lead to achieving the outcomes they desire, the goals they set for themselves, and the consequences they anticipate will result from pursuing the action (Bandura, 1991). Bandura (1986) proposes a triadic reciprocal determinism in which personal, environmental, and behavioral factors interrelate to affect an individual's goal-directed or intentional behavior (see Figure 2.1). Thus, an individual's behavior may be influenced by their confidence to engage in the behavior (self-efficacy) and other personal factors (e.g., affect, beliefs), elements of the social or physical environment (e.g., familiarity, comfort, support), and the behavior itself (e.g., prior or anticipated experience).

Figure 2.1. Interplay of determinants in the causal model of SCT (Bandura, 1986)
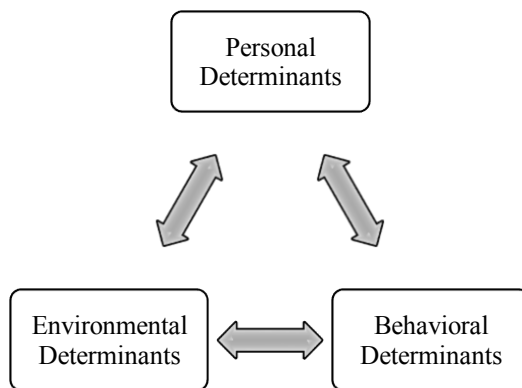
These factors independently and jointly influence an individual's impetus to act such that changes occurring in one area can affect the other two and subsequently encourage or discourage action. An example of this would be comparing the way in which an individual engages themselves, relates with others, and participates in activities on the first day of soccer practice as compared to their level of engagement at the end of the season (provided their initial experiences did not dissuade them from continuing with the sport). Over time, the individual will

have presumably developed a sense of self on the team, increased their skill within this specific

context, become more accustomed to the environment (both physical and social), and engaged in

the behavior under increasingly more familiar physical and social circumstances. In this

example, the assumption would be that the behavior and the effort put into the behavior would

persist, if not increase, with continual improvements to the individuals' perceptions of self,

environment, and behavior. However, if a negative change were to occur (e.g., loss of confidence

in one's ability, decrease in social cohesion among teammates, unwanted changes to the format

of practices, etc.), then the individual's desire and/or ability to persist in the behavior may be

threatened.

Self-Efficacy

Self-efficacy is defined as "beliefs in one's capabilities to organize and execute the

courses of action required to produce given attainments" (Bandura, 1997; p.3). It is considered a

foundational element of SCT that directly influences outcome expectations, socio-structural

factors, goals, and behavior and has indirect effects on behavior via outcome expectations, socio-

structural factors, and goals (see Figure 2.2). This construct can be divided into three distinct

aspects of execution: task, coping, and scheduling (Rodgers & Sullivan, 2001; Rodgers et al.,

2008). Task self-efficacy refers to confidence in one's ability to perform the skills and subskills

of a specific behavior (Maddux, 1995). Task self-efficacy refers not only to an individual's

beliefs in their physical abilities to perform the behavior itself (sometimes referred to as physical

literacy or fundamental movement skill in youth [Lubans et al., 2010]), but also to the

individual's confidence to perform the behavior across environmental contexts (Bandura, 1997).

Therefore, simply possessing the skills and subskills one needs to engage in a complex behavior,

such as PA, does not automatically result in the individual being sufficiently confident to engage

in the behavior. Knowledge of the specific activity (e.g., rules, format of play) will also impact

an individual's task self-efficacy such that they will have less confidence performing a behavior

in which they have no previous experience or frame of reference (Bandura, 2004). Furthermore,

lack of knowledge and/or underdevelopment of the required skills (e.g., low emphasis placed on

physical literacy development during childhood) may lead to feelings of self-doubt and self-

consciousness when asked to engage in a behavior that requires those skills (Barnett et al., 2008).

Considering how attentive adolescents are to their appearance and social reactions to their

behavior, a lack of physical skill or understanding of the PA they are being asked to perform,

could result in detrimental effects on motivation and participation.

Figure 2.2. Structural paths of influence SCT (Bandura, 2004; 2012)
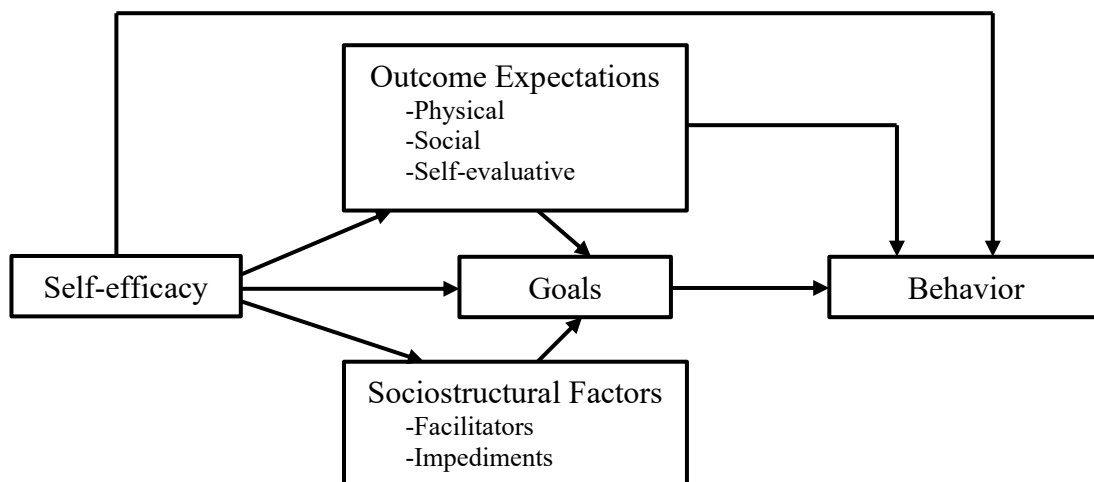
Coping self-efficacy involves confidence in one's ability to adapt to challenges that might

arise while attempting to engage in the behavior (Maddux, 1995). Previous research with

adolescents uses the term 'barrier' self-efficacy to refer to one's confidence to overcome

challenges prior to or during action (Dwyer et al., 2012). These barriers may be time-related or

consist of other personal, social, or environmental factors. Personal challenges might include

physical difficulties (e.g., illness, injury, etc.) or psychological difficulties (e.g., lack of

motivation, anxiety, depression, etc.) that disrupt the pursuit of a task. Social barriers might include lack of instrumental or emotional support from family, friends, and peers, as well as pressure from others to engage in or prioritize alternate activities (e.g., schoolwork, socializing with friends). Environmental or socio-structural barriers might include physical aspects, such as lack of facilities and/or equipment, lack of transportation to facilities, inclement weather, etc. As has been shown in several studies (e.g., Hill et al., 2020; Hsu et al., 2011; Martins et al., 2015; Rosselli et al., 2020), the many barriers adolescents face can vary across individuals and contexts as it is difficult to provide the resources necessary to accommodate each individual's needs.

Finally, scheduling self-efficacy refers to confidence to regularly incorporate the behavior into one's life, potentially in the face of competing interests or priorities (Rodgers & Sullivan, 2001). Previous research has shown that perceived lack of time contributes to lower PA participation, even among individuals in early adolescence (Petosa et al., 2005). Increased academic demands and workload as teens transition from elementary school to high school, responsibilities at home, and even the undertaking of part-time jobs, can result in adolescents dropping out of sport or recreational PA in which they had previously been involved. This is particularly true if those previous PA pursuits are not valued among those in an adolescent's immediate social circle (Hsu et al., 2011). Still, the act of intentionally scheduling activities may be a more common practice among older adolescents as they transition to a more independent adult lifestyle. Therefore, scheduling self-efficacy may not play as large a role in young adolescents' PA engagement as compared to task or coping self-efficacies. Furthermore, younger adolescents may be inclined to drop out of activities that have previously been selected or scheduled for them by parents and, therefore, opportunities for incidental bouts of activity may be more common among this age group than intentionally planned pursuits.

Individual factors and the physical and social environments within which one engages are very dynamic, constantly changing over time. Therefore, a high level of all types of self-efficacy is required to maintain PA in the long term (Rodgers et al., 2009). As previously mentioned, increasing physical ability in one context does not generalize that ability to other contexts and the barriers one experiences in one environment could be vastly different from the barriers one experiences in another. Furthermore, motivation for an activity fluctuates within the individual and across contexts such that an individual may have higher or lower motivation for PA on any given day and those levels may change over time (e.g., Conroy et al., 2011; Conroy et al., 2013). The degree of fluctuations could be due to individuals' own energy levels, their perceptions of the social environment (e.g., supportive/unsupportive), the availability of equipment/facilities, etc. – all of which can, and often does, vary over time. It is important, therefore, to account for the interaction between the person and the environment when examining immediate motivation for PA behavior.

Even when one possesses the physical skills and perceives minimal barriers to participation, they still might not be intrinsically motivated to engage in the behavior. For example, one might be highly skilled at all the physical elements of soccer (e.g., running, kicking, dribbling the ball) and have lots of opportunity and encouragement to participate, but might not enjoy the sport itself or might have another activity that they prefer. Enjoyment is a key aspect of motivation to engage in PA in adolescence (e.g., Burns et al., 2017; Butt et al., 2011; Dishman et al., 2005; Kelso et al., 2020; Yungblut et al., 2012). Individuals in this age group are likely to engage in activities in which they possess a strong positive affective attitude, as opposed to planning and engaging in behavior in which they feel obligated. Furthermore, the barriers experienced during adolescence are not the same as those that individuals face when

they reach adulthood (Gyurcsik et al., 2004). Thus, in terms of long-term adherence to PA, the goal might not be to maintain a specific activity from adolescence into adulthood, but rather to maintain the desire to be physically active, in general, and allow the individual to transition into a similar activity or explore new physical activities. For example, an individual who plays competitive soccer in high school might look to continue playing soccer in college, either on a competitive team or in a recreational league. Alternatively, they might decide that they no longer want to engage in the same sport (or perhaps they do not wish to play at either a higher or lower competitive level) and, therefore, might look for an alternative sport or activity, or simply stop playing sport altogether.

While self-efficacy can impact behavior directly, it can also affect behavior indirectly via other SCT constructs. For example, how confident an individual is in performing a behavior will impact the outcomes they expect will result from the behavior (Bandura, 1991; 1997). If they lack confidence in performing a specific PA well, they most likely will not expect any advantageous personal or social outcomes from engaging in the PA. Whereas, if they consider themselves to be highly efficacious in the activity, then any negative outcomes or failures will be attributed to low effort on their part and/or external factors (Bandura, 1991). The interaction between self-efficacy and the attainments individuals believe they can accomplish from engaging in PA will influence the PA goals they set for themselves and subsequent PA action (see Table 2.1). Research suggests that PA interventions that target enhancement of at least two psychosocial factors from SCT (e.g., self-efficacy, outcome expectations, and/or socio-structural support for exercise) will likely increase the chance of students meeting the recommended levels of PA (Farren et al., 2017). Furthermore, it has been found that greater exercise self-efficacy indirectly leads to greater aerobic fitness after three months via more positive outcome

expectations among adolescents with obesity (Tulloch et al., 2020). Therefore, it is important to not just explore adolescents' self-efficacy for PA, but also what outcomes of PA they consider personally relevant, valuable, and attainable.

Table 2.1. Potential influences of self-efficacy, outcome expectations, and goals on PA behavior

Self-efficacy	Outcome Expectation	Goal	Behavior
High	Positive (e.g., feel energized)	Set higher goals	Most likely to engage in PA
High	Negative (e.g., feel tired)	Set low-moderate goals	Might not engage in PA; dependent on other immediate sociostructural factors
Low	Positive (e.g., feel energized)	Set low-moderate goals	Might not engage in PA; dependent on sociostructural factors (e.g., lots of social support, low perception of judgment from others)
Low	Negative (e.g., feel tired)	No goals set	Most likely to not engage in PA

Outcome Expectations

As noted, outcome expectations can have both direct and indirect effects on behavior. They are defined as the consequences that one anticipates will result from performing a specific action (Bandura, 1997). Outcome expectations can be divided into three types: physical, social, and self-evaluative (Bandura, 2004). Physical outcomes include the pleasurable or aversive feelings experienced when engaging in the behavior as well as the tangible gains or losses that result from the behavior. For example, anticipated outcomes from exertion during PA might include pain (e.g., build-up of lactic acid in muscles) or increased energy (e.g., runner's high). Individuals might also anticipate that PA will result in desired or undesired visible changes to body composition (e.g., decreased fat, increased lean muscle mass). Social outcomes include acceptance or criticism of the behavior from one's social circle as well as the potential increase or decrease of social connections by engaging in the behavior. For example, one might decide

against participating in a particular activity if their friends express negative opinions about it. However, PA might be perceived as a good way to meet people and make friends, particularly among those who are new to an environment (e.g., new city, new school) and trying to find their social milieu. Finally, self-evaluative outcomes involve meeting the personal standards individuals set for themselves, such that the behaviors in which they engage give them feelings of self-satisfaction and self-worth and do not result in negative self-appraisals. For example, self-evaluative PA outcomes could be positive for those who gain a feeling of self-worth when engaging in an activity but may be negative for those who do not feel confident, or self-efficacious, executing the skills required for success in an activity or do not perform to the standard they had previously set for themselves.

Outcome expectations have been described as providing the endpoint to which individuals strive and, thus, have been linked closely with goals (e.g., Deci and Ryan, 2000). Goal-directed behavior can be seen as the pursuit of a desirable expected outcome, however not all outcomes of a behavior are desired nor expected (e.g., an outcome could be a pleasant or unpleasant surprise). Bandura (2004) states an individual's motivation (particularly toward health-related behavior) can be enhanced when emphasis is placed on how the behavior will contribute to positive changes in personally relevant outcomes and highly valued overarching goals. However, long-term goals are less likely to impact an individual's immediate behavior since there are often too many competing interests and priorities in the here and now (Bandura, 2004). This is particularly relevant among adolescents who are more inclined to focus on proximal outcomes of PA (e.g., social acceptance, immediate enjoyment) rather than long-term health goals (e.g., avoiding chronic illness; Lubans et al., 2012). Therefore, focusing on short-term attainable goals that are perceived as likely to result in positive changes to outcomes of

interest to adolescents may be more likely to increase PA participation compared to long-term goals or outcomes that are considered less relevant, and therefore of little immediate interest, to adolescents.

The role outcome expectations play in influencing adolescent PA behavior has been explored in various studies. Plotnikoff and colleagues (2013) conducted a review of studies that explored the relationship between SCT constructs and PA behavior among youth. Only one study in their review (Taymoori et al., 2010) explicitly measured outcome expectations. The study showed that outcome expectations correlated with PA behavior in adolescents and the authors further suggested that fitness and weight loss outcomes may be important motivators for PA among youth (Taymoori et al., 2010). Sterdt and colleagues' (2014) systematic review of reviews on PA behavior in adolescents also found outcome expectations to be positively associated with PA. Petosa and colleagues (2005) found social outcome expectations predicted PA behavior in ninth and twelfth grade adolescents and suggest that adolescents' main concerns around PA participation could involve the social costs and benefits. Dewar and colleagues (2013) found that outcome expectations predicted intentions for PA but not PA behavior directly among adolescent girls from low-income communities. Morghen and Motl (2020) found that exercise outcome expectations were associated with PA in a sample of adolescents with pediatric multiple sclerosis. It is also important to consider gender differences in expected outcomes of PA as one study has shown that girls tend to focus on stress reduction and fitness outcomes while boys are more interested in outcomes related to the competitive aspects of PA, particularly receiving social recognition for playing well and positive affect related to winning (Elkins et al., 2015). These studies suggest that providing information on, and/or having discussions about, the

positive outcomes of PA could be beneficial in increasing adolescent PA. The first step in accomplishing this task, however, is determining what outcomes are important to adolescents.

Expected Outcomes of PA. The most common outcomes anticipated from engaging in PA can be divided into four categories: physical health, psychological health, appearance, and social (Farren et al., 2017). Within these categories, frequently reported expected outcomes include increased muscular strength, improved resistance to disease, improved mood, increased self-esteem, greater muscle tone, decreased body fat, weight loss, increased social connections, and more social attention (Farren et al., 2017). While it is common to hear about the positive expected outcomes of PA, it is equally important to consider the negative outcomes that can impact an individual's desire to commence or continue being physically active (Lindheimer et al., 2020). Outcomes such as pain, injury, bullying, peer judgment, social-physique anxiety, and embarrassment experienced while engaging in PA can have lasting impressions, particularly on youth, that affect an individual's desire to be active for years and even decades to come (Ladwig et al., 2018). The most impactful positive and negative outcomes among youth tend to be those involving appearance and/or social feedback (e.g., Petosa et al., 2005; Taymoori et al., 2010), thus those outcomes warrant particular attention.

Appearance and Social Outcomes. As was previously mentioned, proximal outcomes and goals (e.g., looking and feeling good, receiving positive attention [i.e., admiration, recognition of skill]) take precedence among young people (Lubans et al., 2012). A recent study by Wiklund and colleagues (2019) highlights how important the pursuit of a desirable physical appearance (i.e., a strong *and* skinny body) is among high school students. The authors explored how adolescents are currently navigating the onslaught of health and PA trends, also known as 'fitness hype', in their everyday lives (Wiklund et al., 2019). It was discovered that those who

desire social recognition and value are most susceptible and more likely to follow and engage in hyped up fitness trends (Wiklund et al., 2019). Furthermore, social media not only serves as the most prominent source of information in the pursuit of elevated social recognition and value – offering users copious amounts of information on methods for achieving the physique that will lead to an increase in social attention and status – but also provides users with a platform for instantaneous social feedback on one's appearance (Wiklund et al., 2019). Therefore, adolescents' perceptions of their bodies and what changes they wish to see in their physical appearance may play a prominent role in either pursuing PA (e.g., to gain social acceptance and status) or avoiding PA (e.g., to circumvent any judgment of how their current body looks or functions).

Concerns about body image, defined as a multidimensional construct focused on both the body's appearance and function (e.g., Cash & Smolak, 2011; Sabiston et al., 2019), are frequent throughout adolescence as each individual's body size and shape change in a variety of ways and at different rates. PA often draws attention to one's body, positively and/or negatively, by virtue of requiring bodily movement, performance of specific actions and, in some instances, a certain physical aesthetic. This can impact adolescents' self-perceptions positively (if they perceive themselves to be physically competent and/or attractive) or negatively (if they perceive themselves to be inadequately skilled and/or unattractive). Research has shown that an individual's evaluation of his/her physical appearance and functionality are complex, such that an individual can appreciate one area or ability of their body while disliking another and these feelings can fluctuate over time (Golan et al., 2014). Furthermore, discrepancies between perceptions of oneself (e.g., current body size) and the ideal image one would like to possess (e.g., a smaller or larger body size) can contribute to various negative outcomes, such as

depression, low self-esteem, and reduced PA (Solomon-Krakus et al., 2017; Solomon-Krakus et al., 2020). It has been found that adolescents who report congruent perceptions of their actual and ideal bodies on the smaller and larger sides of the spectrum report lower PA (Solomon-Krakus et al., 2020). The authors suggest that those who are smaller and whose ideal size is the same as their actual size may not perceive the need to engage in PA (especially if PA is only valued as a way to attain a smaller body size). Similarly, those who are bigger, and their actual size matches their ideal size, might not engage in PA in order to avoid decreasing their body size and/or to avoid any criticism about having a larger body (Solomon-Krakus et al., 2020). These findings signal the importance of educating adolescents about the worth and benefits of PA outside of its ability to affect body weight and size.

It is common for body image research to focus on individuals' negative self-perceptions, such as body dissatisfaction and body preoccupation, and the pathology (e.g., eating disorders, body dysmorphia) that could arise from frequent self-criticism of one's body (Tylka & Wood-Barcalow, 2015a). In recent years, research has emerged that explores the concept of positive body image and encompasses body appreciation beyond basic concepts of appearance and functionality (Tylka & Wood-Barcalow, 2015b). Positive body image is defined as a love and respect for one's body that is derived from, 1) appreciating the unique beauty of one's body and the functions it performs, 2) admiring one's body, even the parts of it that deviate from idealized images that are portrayed in media, 3) feeling beautiful, comfortable, confident, and happy with one's body, 4) refusing to dwell on perceived imperfections, and 5) internalizing body positive information while rejecting negative feedback (Tylka & Wood-Barcalow, 2015a). The authors further emphasize that positive body image is not on the same continuum as negative body image and should not be compared with it (i.e., high levels of positive body image do not equate low

levels of negative body image). Research that incorporates positive body image measures, therefore, will allow for a more holistic and balanced examination of how individuals perceive their bodies. In doing so, it may also provide insight into the types of thoughts and feelings about the body that act as a buffer to ill-being (Seligman, 2002; Holmqvist & Frisén, 2012).

In terms of adolescents' experiences of positive body image, research has shown that adolescents with positive body image possess unique perspectives that are different from those expressed by adolescents with negative body image (Frisén & Holmqvist, 2010). Specifically, while adolescents with positive body image admitted to perceiving their own physical flaws, they also discussed how they have accepted and learned to live with their body's imperfections (Frisén & Holmqvist, 2010). Other aspects of positive body image expressed by adolescents included a focus on the functionality of their body (as opposed to strictly their appearance) and the assumption that family and friends perceived them as good-looking even in the absence of direct feedback about their appearance (Frisén & Holmqvist, 2010). These perspectives put adolescents in a good position to reject internalizing any negative feedback they received about their appearance. Furthermore, it was found that adolescents with positive body image are able to critically analyze media portrayals of appearance ideals, are less susceptible to internalizing appearance-related information, and are less likely to make negative comparisons (Holmqvist & Frisén, 2012). These same adolescents also discussed beauty and attractiveness in terms of being oneself and having a good personality, taking the focus off of physical appearance (Holmqvist & Frisén, 2012).

Certain PA environments may cause adolescents to experience a heightened awareness of their body than others. For example, physical education (PE) classes, while providing the most consistent opportunity for PA throughout the adolescent years, can be a source of negative

psychological outcomes. Specifically, PE classes have been shown to cause adolescents to feel anxious and/or self-conscious as differences in body shapes and abilities can be wide-ranging among peers and opportunities for comparison are high (Kerner et al., 2018a; Lodewyk & Sullivan, 2016). Research has shown that those who have more negative body shape perceptions expressed less interest and enjoyment in PE class (Ryan et al., 2009). Furthermore, it has been found that those with lower perceived competence in PE tend to also report lower body satisfaction (Kerner et al., 2018b). Kerner and colleagues (2018a; 2018b) suggest that PE could be an ideal setting to enhance adolescents' body image provided more research is conducted to discover how the classes need to be designed and formatted in order to decrease stimuli and cues that trigger negative feelings about the body.

   Physical and Psychological Health Outcomes. While the most salient expected outcomes of PA among adolescents are likely to revolve around improved appearance and positive social interactions/feedback, there is evidence that some physical and psychological health outcomes, particularly those that can be perceived immediately or in the short-term (e.g., improved mood, stress reduction, improved physical skill), are also valued among this age group. For example, Elkins and colleagues (2015) found that relaxation was a key outcome expectation of PA, particularly among older adolescents (i.e., 12th graders) and female participants. They also found that self-efficacy for exercise predicted higher outcome expectations in adolescent boys, indicating that development of physical skill and sport- and PA-specific knowledge may be a key factor for PA participation among this population (Elkins et al., 2015). Other research has shown that benefits, such as positive feelings related to achieving goals, having fun, emotional release, and increased confidence, are recognized by adolescents as desirable outcomes that can be attained through PA participation (e.g., Willis et al., 2018; Yungblut et al., 2012). Therefore, it is

important to include measurement of physical and psychological health outcomes of PA as well as expected appearance and social outcomes of PA in adolescent populations. In doing so, it is important to consider not just the type of outcome that adolescents might expect, but the timeframe in which they anticipate it will occur. The use of different types of measures might be effective in capturing the impact of that timeframe. For example, a short-term outcome of PA could be having fun with friends, whereas a longer-term outcome might be the physical benefit of increasing one's strength. The short-term outcome might factor more into one's impulsive decision to participate because it will apply to them immediately, whereas the long-term outcome might be one that individuals are more likely to deliberately reflect on when considering why they engage (or plan to engage) in PA.

Measurement of Psychological Constructs

Explicit Measures

Explicit psychological measures, sometimes referred to as direct measures, include self-report questionnaire or interview methods whereby the participant is asked directly about their thoughts, feelings, and experiences (Eccles, 2012; Gawronski & Hahn, 2019). Questions can be open-ended allowing participants to generate their own answers using personal vocabulary and terminology or they can be closed-ended with a pre-determined set of responses upon which participants provide a numerical rating (Eccles, 2012). In general, individuals answer these questions with evaluative intention, awareness, and control (Gawronski & Brannon, 2018). This means individuals can intentionally respond with what they perceive is the desired, or a desirable, response even if it differs from what their "true" response would be. Furthermore, the provision of fixed alternatives can be restrictive as they may not capture what the participant actually thought, felt, or experienced, or is capable of remembering (Eccles, 2012; Gawronski &

Hahn, 2019). In other words, these types of measures are susceptible to human error and biases, including misinterpretations of questions, memory limitations, social desirability bias, acquiescence bias, central tendency bias, and errors in inference (Streiner et al., 2015).

Recommendations for resolving issues of misreporting include questioning participants during a behavior or decision-making process (concurrent reporting) or immediately after completing a behavior or decision-making process (immediate retrospective reporting) (Eccles, 2012). In the absence of immediate access to participants, using questions that draw participants back to the moment of decision-making or action and then broadly asking about their thoughts/feelings/experiences at that time (undirected probe) is preferable as compared to cuing participants to report on a specific thought they may or may not have had in a certain situation (directed probe) (Eccles, 2012). Thus, immediate retrospective reporting or minimally delayed retrospective reporting should be used whenever possible. There are many challenges, however, to executing these recommendations within PA contexts, particularly with adolescent participants, considering it means capturing a bout of PA as it organically unfolds and disrupting the individual's natural decision-making and behavioral processes.

When employing explicit measures with youth populations, researchers need to take further care particularly if the measures being used were originally developed and validated using an adult sample. Developmentally, adolescents and adults are not the same and there is greater possibility of misinterpretation or misunderstanding of concepts that may only be appropriate for, or apply to, adults (Smith et al., 2012). Important cognitive capacities developed throughout adolescence include the ability to plan, reason in an abstract way, and acquire relevant information (Smith et al., 2012). There may be varying degrees to which adolescents are aware of or attentive to their own thoughts and actions, others' possible thoughts and actions,

and the influence of their surroundings. Furthermore, the speed at which one can access information, their perceptual sensitivity, and their memory capacity change with age and experience (Smith et al., 2012). Considering that individuals, when asked directly, may not want or be able to provide an accurate, complete, or true account of their cognitive processes, participants might only answer direct questions with responses that are based on existing knowledge of or assumed common/acceptable responses (Gawronski & Hahn, 2019). To address some of the limitations posed by direct questioning, researchers have developed a set of measures said to access automatic cognitions and decrease participant's ability to respond differently from their true thoughts, feelings, or attitudes.

Implicit measures

Also referred to as indirect measures, this type of evaluation seeks "to provide an estimate of the construct of interest without having to directly ask the participant for a verbal report" (Fazio & Olson, 2003, p. 300). Implicit measures include tasks that load the brain (e.g., by splitting focus on multiple target and distractor categories) and restrict response times in such a way that one is, theoretically, less able to provide an answer that is incongruent with their true reactions to a stimulus (Gawronski & Brannon, 2018). The main assumption when interpreting output from implicit measures is that individuals will be slower and/or less accurate when trying to associate two or more items or concepts that are automatically perceived as incompatible or incongruent (Brownstein et al., 2019; Gawronki & Brannon, 2018). Another interpretation is that implicit measures assess people's performance, providing data on the speed and accuracy of a behavioral task (e.g., categorization) and then infer psychological processes/outcomes (e.g., underlying and enduring thoughts, feelings, attitudes) based on that data (Brownstein et al., 2019).

There are currently more than 20 different implicit tasks available for researchers to use when assessing individual's automatic thoughts and feelings (Gawronski et al., 2020). Two prominent and foundational measures include the evaluative priming task (EPT; Fazio et al., 1986) and the implicit association task (IAT; Greenwald et al., 1998). The EPT involves briefly presenting participants with an attitudinal prime stimulus followed by a positive or negative target word and asking them to indicate as quickly as possible whether the target word is positive or negative (Gawronski & Brannon, 2018). Though this task is still widely used, it has been criticized for its low reliability (Gawronski & De Houwer, 2014). The IAT asks participants to complete blocks of two binary categorization tasks (e.g., pictures of PA/sedentary behaviors and positive/negative words) that are combined in a manner that is either congruent (e.g., PA-positive and sedentary-negative) or incongruent (e.g., PA-negative and sedentary-positive) with the psychological construct being assessed (Gawronski & Brannon, 2018). The main issue with this task involves the fact that scores are relative such that they conflate four conceptually independent constructs (Gawronski & Brannon, 2018). Using the above PA-sedentary example, a participant's performance on the task would be jointly determined by positivity towards PA, positivity towards sedentary behaviors, negativity towards PA, and negativity towards sedentary behaviors. Therefore, it is difficult to determine separate, nonrelative scores for each of the four target objects (Gawronski & Brannon, 2018).

The go/no-go association task (GNAT; Nosek & Banaji, 2001), the implicit measure used within the current thesis, allows scores to be calculated for individual target objects, thus removing the issue of relative scores (Gawronski & Brannon, 2018). The task involves participants pressing a button (go) in response to certain stimuli while refraining from pushing the button (no-go) in response to other stimuli (Nosek & Banaji, 2001). The task includes one

target category (e.g., PA), one distractor category (e.g., generic), and two evaluative categories (e.g., positive and negative). Participants complete four blocks, or category combinations (e.g., PA-positive, PA-negative, generic-positive, generic-negative), within a single trial. As with other implicit measures, participants are given a short time deadline (e.g., < 800 ms) to correctly indicate the proposed categorization of the presented stimulus (e.g., either go or no-go). Data is recorded as either "hits" (correct go responses), "correct rejections", (correct no-go responses), "false alarms" (incorrect go responses), or "misses" (incorrect no-go responses) with the reaction times recorded for hits and false alarms (Nosek & Banaji, 2001). Participants' automatic evaluations regarding the target category are inferred from accuracy scores (e.g., ratio of hits to false alarms and misses) and/or response times.

As youth mature, they become increasingly aware of what is considered socially acceptable and are also more likely to censor opinions that are less popular within their social environment (McKeague et al., 2015). Therefore, the biases that arise with explicit measures will be increasingly present throughout adolescence. Implicit measures may be a method to access responses adolescents feel they need to filter when directly asked questions about their thoughts and feelings. McKeague and colleagues (2015) reviewed the use of implicit measures to examine social attitudes in youth. They found many instances where implicit measures, especially the IAT and EPT, were effective in assessing youths' racial attitudes (e.g., Degner & Wentura, 2010; Newheiser & Olson, 2012), gender attitudes (e.g., Cvencek et al., 2011), attitudes towards bullying (e.g., Van Goethem et al., 2010), and attitudes towards peers with mental health problems (e.g., O'Driscoll et al., 2012). In terms of the appropriateness of using implicit measures with youth, previous research indicates that young participants have shown little difficulty accurately using standard "adult" implicit measures (e.g., Castelli & Tomelleri, 2008;

Van Goethem et al., 2010). Main considerations when employing such measures include use of age-appropriate language throughout the task (e.g., simple to read and understand) and choosing an appropriate response deadline in order to force a quick response while not being so restrictive as to cause excessive errors via random or chance responding. Thus, careful and thorough pilot testing of existing implicit measures is highly recommended prior to use with youth (McKeague et al., 2015).

Philosophical Approach

Reflecting on one's own philosophical or paradigmatic approach is a key part of the process for determining what methods and measures will be most appropriate and effective in answering one's research question(s). A paradigm is defined as a set of beliefs or a worldview that explains the nature of the 'world', the individual's place in it, and the range of possible relationships to that world and its parts (Guba & Lincoln, 2005). A paradigm contains philosophical assumptions regarding ontology (i.e., the nature of reality) and epistemology (i.e., what can be known about reality) (Phoenix et al., 2013). These philosophical viewpoints play a crucial role in informing a researcher's purpose, methodology, and inferential procedures (Kuhn, 1962). Spackman and Williams (2001) emphasize the importance of understanding one's epistemological and ontological perspective when first approaching a research question. Specifically, they suggest that "prior consideration of the ontological status of the subject of study is essential to any attempt at matching methods to questions" (Spackman & Williams, 2001; p. 397). Thus, researchers are encouraged to identify their research perspective and approach and where it is positioned along the paradigmatic continuum as they engage in the conceptual development stages of their research.

My worldview, and subsequent research approach, falls within the postpositivist paradigm. Postpositivism involves the belief that a singular truth (or reality) exists, however one can never really know truth in its entirety due to natural variability that occurs within individuals and across contexts (Phoenix et al., 2013). This singular reality exists externally to the individual as opposed to it being a constructed reality occurring within each individual that results in different conceptions of reality across all individuals as is endorsed within the interpretivist/constructivist paradigm. Instead, postpositivists recognize variability across individuals as being attributed to the different effects a single reality can have on multiple individuals. The postpositivist ontology differs from the positivist approach by recognizing the complexity of relationships between variables and allowing for observation of multiple effects, rather than trying to control for all possible confounders until a single cause-effect relationship (i.e., *the* singular truth) can be observed (Phoenix et al., 2013).

The epistemology involved within postpositivism places the researcher as a neutral observer who tries to maintain distance from their participants, however it is recognized that research can never fully be free of researcher bias (Corry et al., 2019). Postpositivists try to reduce error and obtain a broader picture of reality within their research by applying multiple methods to answer a research question. For example, in order to measure adolescent PA, a researcher might use accelerometry as a direct and objective measure to reduce the potential for participant bias or error in reporting. However, the researcher might also request participants keep a daily activity diary for the duration they are wearing the accelerometer. This will act as a qualitative account of the same variables measured via the accelerometer, while also providing unique additional data on the type of activities the participant engaged in during his/her times of activity, which is information that the objective device is unable to identify and record. The

layering of data through multiple measures allows for data triangulation, which provides a more complete picture of what is occurring within and around the participant in a specific context (Phoenix et al. 2013). Mixed method approaches are often adopted by postpositivist researchers (as is the case in the example above) in order to obtain data that is representative of both the objective and subjective perspective. It is important to include the participant's own self-reported account (e.g., questionnaire, activity logs, etc.) of the variables being measured as well as objective measures (e.g., heart rate monitors, accelerometers, pedometers, etc.) to garner a holistic view of how the cause-effect relationship within and across individuals in a naturalistic setting.

Postpositivists recognize that human behavior occurs outside of the laboratory (or other highly controlled environments) and stimuli do not always exert their effects independently. Recognizing that there is a certain amount of variance that cannot be accounted for, researchers within this paradigm place value in the probability of observed effects and pay heed to the amount of error that occurs within their research. The postpositivist research agenda encompasses the goal of generalizing findings to a larger population and informing policy in much the same way as the positivist researcher agenda. Therefore, a strong emphasis is placed on objectivity and rigor during the process of data collection and analysis, which for the postpositivist may result in an experimental or quasi-experimental design occurring in a field setting (Cook & Campbell, 1979). Implementing this type of research design, however, can be difficult for researchers, particularly early career academics, who may have limited access to resources. Various challenges of conducting experimental or quasi-experimental research, specifically with youth, are explored in the next section.

Challenges of Conducting Experimental PA Research with Youth

There are many challenges that can arise when pursuing experimental PA research, particularly in field settings (e.g., schools) with youth. Aside from the general, well-known challenges of experimental research, including high financial burden, labor-intensiveness, and lengthy time commitment (Frieden, 2017), it is often difficult to gain access to youth populations and generate interest among potential participants. PA researchers will often pursue a non-experimental design due to its ability to reach larger numbers of participants relatively quickly, avoid or decrease the impact of loss to follow-up, and reduce participant burden that is frequently associated with longer and/or more complex research protocols (Wang & Cheng, 2020). There may also be ethical concerns, particularly when youth are involved, with the strict randomization or assignment to conditions that is employed in experimental research (Burden, 2015; Hanley et al., 2016).

When the population of interest is considered vulnerable, as is the case with youth, gaining access often involves first connecting with those who are responsible for the vulnerable individuals, sometimes referred to as "gatekeepers" (Abrams, 2010). The networking required is time-consuming and effortful, often requiring various levels of ethical approval, permissions, and safety verifications (e.g., police background check) prior to the researcher being allowed to start the process of contacting potential gatekeepers. Furthermore, there is very little assurance that gatekeepers (e.g., teachers, coaches) will facilitate research, particularly if they perceive the research to be disruptive of their schedule or requiring too much of their time and effort. Even if access is obtained via gatekeepers, there is no guarantee that potential participants will be interested in participating and/or follow through with obtaining parental consent and completing the research. Reports of successful recruitment strategies, in terms of what has previously gotten

adolescents to participate in research, range from parental coercion (Robbins et al., 2012), money-driven incentives (Nguyen et al., 2014), persistent communication via personal phones (e.g., texting and calling) and/or social media messaging applications (Baxley & Daniels, 2014), and extensive relationship-building (e.g., socializing) between the researcher and potential participants (Scherer et al., 2005). Similar to the afore-mentioned issues with experimental studies, these strategies (some of which are ethically questionable) require a considerable amount of time, effort, and money, which may not be available to researchers, particularly early career academics. Within the current thesis, all of these challenges arose to some degree and proved to be insurmountable to conduct the originally conceived third research paper. Instead, it provided an opportunity to write a commentary on current research issues and to present some ideas for how to resolve those issues. The overall purpose of this thesis, therefore, became divided into two distinct sections that first involved exploring adolescents' automatic associations with PA, explicitly measured responses about psychological constructs relating to PA, and impulsive decisions to approach or avoid PA (studies one and two); and secondly, explored the challenges of, and potential solutions to, producing quality PA research with youth (paper three).

Purpose Statement

The purpose of this research was to 1) determine what health, social, and appearance outcomes older adolescents (i.e., 17-19 years) automatically associate with PA, 2) investigate how automatic health and social/appearance associations and self-reported psychosocial variables relate to older adolescents' existing PA behavior, 3) determine what health, social, and appearance outcomes adolescents (i.e., 14-18 years) automatically associate with PA, 4) investigate how adolescents' automatic associations with PA and outcome expectations of PA predict their impulsive response to opt into a hypothetical PA program, 5) explore the various

barriers that researchers face when attempting to conduct quality PA research with youth and the reasons why these barriers persist, and 6) reflect on how the nature of research and the current academic culture may need to adjust in order to acknowledge and address barriers to PA research with youth.

Chapter 3. STUDY 1: What Older Adolescents Expect from Physical Activity: Implicit Cognitions Regarding Health and Appearance Outcomes

It is well documented that physical activity (PA) levels decline as individuals progress through childhood and adolescence (Sterdt et al., 2014). Recently reported PA levels in the United States indicate that less than 3 out of 10 high school students meet the PA recommendation of at least 60 minutes every day (Centers for Disease Control and Prevention [CDC], 2014). As adolescents approach adulthood and pursue post-secondary education – a transitional period commonly referred to as "emerging adulthood" (Arnett, 2004) – low activity rates established in their youth put them at risk for leading an inactive lifestyle during their adult years (Sollerhed et al., 2005). Considering the well-known health benefits of PA behavior at all ages, such as decreased potential for illness and increased mental and physical fitness (Carson et al., 2014; Skrove et al., 2013), it is critical to determine how adolescents perceive PA and why they may be more inclined to choose less active pursuits in place of PA. Adolescents' behavioral choices may involve reasoning and deliberation, while at other times they may be impulsive, with little thought or reflection. These cognitive and affective pathways to action reflect dual-processing theories, which are of increasing interest in health research (Sheeran et al., 2013).

Implicit and Explicit Cognition

Dual-processing theories involve the study of human behavior as a product of both explicit (deliberate, controlled) and implicit (automatic, uncontrolled) cognitions (Evans, 2008).

Thoughts and opinions that are intentionally expressed by an individual are explicitly measured

via questionnaires or interview methods but may be influenced by intrapersonal, social, or

environmental cues (De Houwer, 2005). Other thoughts and feelings toward a subject may exist

that are reflexively activated and, therefore, require a more automatic method of measurement

than can be achieved through individual reflection (Bohner & Dickel, 2011). Emotion-driven

thoughts or implicit associations, such as those between PA and negative outcomes (e.g.,

boredom, muscle pain) or PA and positive outcomes (e.g., increased strength, improved body

composition), can affect behavior outside of individuals' deliberate intentions; these automatic

associations may be discrepant from what they explicitly indicate they think about a given

behavior (Carlston, 2010).

The Reflective-Impulsive Model (RIM; Strack & Deutsch, 2004) suggests that social

behavior is dictated by two distinct systems that operate parallel to one another. The reflective

system involves reasoning, decision-making, and intention in order to produce a behavior, or

reasoned action. Behavior resulting from reflective cognition is the consequence of a deliberate

decision made based on the assessment of future outcomes, the value placed in those outcomes,

and the probability of attaining those outcomes. The impulsive system involves associative stores

in an individual's memory. Environmental cues and/or motivational orientations contribute to an

automatic spreading activation of these associations, resulting in a behavior that may be

independent of an individual's explicitly expressed intention or goal.

Outcome Expectations and PA

The outcomes one associates with a stimulus (e.g., PA) can influence that individual's

impulsive or reflective decision to approach or avoid the stimulus. Outcome expectations, which

are defined as the consequences that one anticipates will result from performing a specific action

(Bandura, 1997), therefore, contribute to individuals' motivated, or goal-driven behavior. Motivation to engage in a particular behavior can be driven by the expectation of attaining a desirable outcome. Alternatively, motivation to avoid a behavior can be directed by the expectation of the behavior producing an undesirable outcome. Research has shown that explicitly measured outcome expectations, specifically those regarding social image or physical appearance, have a moderate positive association with adolescents' PA (Plotnikoff et al., 2013; Taymoori et al., 2010; Petosa et al., 2005).

The explicit measurement of outcome expectations can only give access to what the individual deliberately thinks he/she might attain from performing the behavior and does not account for automatic and affective reactions. Specifically, adolescents may not explicitly reflect upon what they expect, and/or how much value they place in what they do expect, prior to engaging in a specific behavior. Instead, they may impulsively decide to act (or not) depending on quick affective reactions to the stimulus and automatic associations they possess between desirable or undesirable outcomes and the stimulus. It is important, therefore, to examine outcome expectations both in terms of adolescents' reflections on what they believe they can gain, or lose, from PA as well as what types of outcomes (e.g., appearance, social, health) they automatically associate with PA.

Adolescents' Explicit Perceptions of PA

While implicit thoughts regarding PA have yet to be extensively researched in adolescents, many researchers have explored adolescents' explicit attitudes toward PA using qualitative inquiry. These studies have shown that physically active adolescents value social aspects of PA (e.g., inclusion, expanding social network), appearance (e.g., thinness, muscularity), and immediate health outcomes (e.g., increased energy, elevated mood) of PA

(Bélanger et al., 2011; Yungblut et al., 2012). Experiencing satisfying social and appearance outcomes during PA or as a result of having engaged in PA increases adolescents' enjoyment of PA and desire to continue being physically active. Alternatively, it was found that inactive adolescents, or those who perceive themselves as having an unfit body, are more likely to experience anxiety regarding social interactions and their appearance during PA (Lindelof et al., 2012; Whitehead & Biddle, 2008). Therefore, it is important to examine adolescents' thoughts about both the instrumental or practical effects of PA and the affective or emotional responses they might have regarding PA.

Hypotheses

What adolescents expect to gain from PA might influence their deliberate behavior but their automatic associations with PA (positive or negative) could be what contribute to their initial impulsive reaction when having to make a quick decision as to whether they will participate or not. Therefore, the purpose of this study is to explore older adolescents' (e.g., college-aged or emerging adults) reflective and impulsive thoughts about health- and social/appearance-related PA outcomes and investigate how those thoughts relate to their PA behavior. Considering the afore-mentioned perceptions adolescents' have expressed regarding PA (e.g., Bélanger et al., 2011; Lindelof et al., 2012; Whitehead & Biddle, 2008; Yungblut et al., 2012), the following hypotheses were made regarding both implicit and explicit thoughts about PA in first-year college or university students:

H1. Participants will have faster response times on the implicit task when associating desirable health and social/appearance outcomes with PA compared to associations between undesirable outcomes and PA, indicating positive associations of PA with health, appearance, and social gain.

H2. Implicit associations between social/appearance outcomes for PA will be positively related to PA behavior.

H3. Explicitly measured appearance-related outcome expectations for PA will be positively related to PA behavior.

Methods

Participants and Procedures

First-year undergraduate students were recruited from a psychology course and were awarded credit for their participation in either this research study or an optional alternate task. Inclusion criteria specified that they had to be younger than 20 years. Participants indicated their age and gender. They also responded to a question regarding their primary language spoken at home. This was included to check validity of the implicit word association task between those who specified English as their primary language and those who specified a different language.

After obtaining ethics approval from the University of Alberta ethics board, students were invited to a computer laboratory in order to participate in the computer task and questionnaire. The Go/No-go Association Tasks (GNAT; Nosek & Banaji, 2001) took 20 minutes to complete after which participants were given a questionnaire containing measures of PA behavior, attitudes, outcome expectations, and body image. Following completion of the questionnaire, participants were invited individually to a private room to have their height and weight recorded as a measure of body mass index (BMI).

Measures

Implicit Task

The Inquisit 4 web program by Millisecond Software was used to administer the GNAT. The task was programed to measure implicit associations between PA words and a set of

evaluative words divided into two categories: desirable and undesirable. A category of generic words was included as the control category. A single trial block consisted of two target categories (e.g., PA and desirable) and the participant was instructed to press the space bar as quickly as possible any time a word from either of those two categories appeared on screen. The other two categories of words were included as distractors (in this case, generic and undesirable) so that the participant had to inhibit their response and refrain from pressing the space bar when those types of words appeared on screen. The response deadline was set at 650ms, thus forcing a fast action response ('go') or inhibitory response ('no go'). Participants also received immediate feedback (a green "O" for a correct response and a red "X" for an incorrect response) prior to the appearance of the next word. There were seven words in each of the four categories, resulting in 28 response trials for each block (all words for each category are listed in appendix A). Participants were asked to complete two different tasks – one in which the evaluative words were health-related and one in which the words were social or appearance related. In both tasks, the PA words and the generic words remained the same. The words were presented in a random order and the tasks were counter-balanced across groups of participants.

Questionnaire

Participants' explicit thoughts and feelings toward PA were measured using an 11-item semantic differential scale as has been used in previous research examining the attitudes construct (Hagger & Chatzisarantis, 2005). Following recommendations published by Ajzen (2006), the scale included items for both instrumental (e.g., useful/useless, healthy/unhealthy) and affective (e.g., fun/boring, pleasant/unpleasant) attitudes. Cronbach's alpha values (Cronbach, 1951) were high for both the instrumental and affective scales, $\alpha = .87$ and .89, respectively.

Outcome expectations were measured using the Exercise Motivations Inventory-2 (EMI-2) adapted for adolescents (Ingledew & Sullivan, 2002), which includes 54 items, grouped into 14 subscales, that assess reasons for engaging in PA (e.g., affiliation, appearance, enjoyment, weight management). This scale was chosen as a measure of outcome expectations due to the synonymous use of outcomes (i.e., the endpoint to which individuals strive) and goals or motives (Deci & Ryan, 2000). The scale uses the anchor statement "Personally, I do physical activity (or might do physical activity)..." and provides reasons for PA participation. The stem was changed from "exercise" to "physical activity" with the explanation that physical activity encompasses more than just planned exercise; it could also include sport, active transportation, physical education, or play. The scale ranges from 0 (Not at all true for me) to 5 (Very true for me). Cronbach's α ranged from .75 to .94 for all subscales.

PA behavior was measured using the short form of the International Physical Activity Questionnaire for Adolescents (IPAQ-A; Hagströmer et al., 2008). The IPAQ-A is a 7-day recall questionnaire that asks how many days, hours, and minutes of vigorous PA, moderate PA, and walking has been performed over the previous week. Each type of activity has an assigned MET level (walking = 3.3, moderate PA = 4.0, and vigorous PA = 8.0). A MET value is calculated for each of these three types of activities by multiplying the associated MET level by the number of days and minutes the participant reported they performed the activity over the course of the previous week. A participant's total MET value is calculated by summing these calculated METs for all three types of activities (walking, moderate PA, and vigorous PA).

Data Analysis

Following analysis procedures outlined by Nosek & Banaji (2001), GNAT data were screened and any errors or response latencies < 250ms were excluded from analysis. Mean

response times were calculated for physical activity when paired with desirable and physical activity when paired with undesirable words for both the health-related and social/appearance-related trials. Repeated measures analysis of variance (RM ANOVAs) was conducted to examine whether response times (RTs) were faster (lower) for desirable- physical activity word associations or undesirable- physical activity word associations for each of the trials. Correlations were conducted to explore relationships between automatic associations, and explicitly measured attitudes, outcome expectations, and PA behavior. Multiple regressions were used to examine whether any automatic associations or explicitly measured constructs predict PA participation.

Results

One hundred and forty-four adolescents (109 female; 35 male) between the ages of 17 and 19 years ($M = 18.11$, $SD = 0.65$) participated in the study. Eighty-eight participants (61.1%) indicated English as their primary language spoken at home. No differences were found between language groups for RTs on both the implicit health task, $t(135) = .546$, $p = .586$, and the implicit social/appearance task, $t(135) = .636$, $p = .526$. Body mass index (BMI) ranged from 16.41 kg/m^2 to 36.81 kg/m^2 ($M = 22.79$, $SD = 3.64$) with 77% of the sample being within the reportedly normal (healthy) range (between 18.5 and 24.9 kg/m^2) (Pescatello, 2014). Based on their self-reported PA, 70.8% were categorized within the 'low activity' group using the IPAQ protocol, which states that individuals who achieve less than 3,000 MET-minutes/week are insufficiently active to achieve health benefits.[27]

Implicit Tasks

RM ANOVAs showed a significant difference in RTs between desirable and undesirable social/appearance associations with PA, $F(1,136)=4.403$, $p=.038$, $\eta^2=.031$, indicating that older

adolescents have a positive automatic association between desirable social/appearance outcomes and PA. There was no significant difference in RTs between desirable and undesirable health-related words when associated with PA words, $F(1,136)=2.405$, $p=.123$, $\eta^2=.017$, suggesting that older adolescents have similar automatic reactions when associating both positive and negative health outcomes with PA, albeit with small effect sizes.

Correlations and Regressions

Pearson correlations were conducted to determine how implicit and explicit measures relate to PA behavior (i.e., METs). As shown in Table 3.1, there were significant positive correlations between PA and the explicit constructs of instrumental attitudes, affective attitudes, affiliation, challenge, competition, enjoyment, revitalization, and stress management. The correlations between METs and both the implicit health and social/appearance tasks were non-significant. Correlations were also non-significant between METs and BMI as well as METs and the remaining eight subscales from the EMI-2 (appearance, ill-health avoidance, nimbleness, positive health, social pressure, social recognition, strength & endurance, and weight management).

PA was regressed onto the afore-mentioned constructs that were significantly correlated with PA. A significant regression equation was found, $F(8, 143) = 2.97$, $p = .004$, with an R^2 of .15. Instrumental attitudes were a significant predictor of adolescents' METs, $\beta = .292$, $p = .014$. Results are displayed in Table 3.2.

There was insufficient data from the male cohort to allow for gender comparison analyses on implicit and explicit measures. However, an ad hoc analysis that included the female sample only ($N=109$), indicated implicit social/appearance associations were significantly correlated with PA behavior, $r = .22$, $p < .05$.

Comment

The purpose of this study was to examine older adolescents' reflective and impulsive thoughts about PA outcomes and determine how they relate to their self-reported PA behavior. As suggested in our first hypothesis, results from the implicit task showed that participants had faster RTs when relating desirable social/appearance outcomes as opposed to relating undesirable social/appearance outcomes with PA words. These findings coincide with research that suggests individuals may focus on the potential of *achieving* positive external outcomes of PA, such as an attractive physique and social desirability or admiration, as opposed to focusing on *avoiding* negative outcomes when considering engaging in PA (Ritzert et al., 2016). Furthermore, these results suggest that older adolescents may be impulsively drawn to activities that have the potential to enhance their physical and social appeal and may be less influenced by the long-term benefits to their physical and mental well-being.

Mass media frequently displays athletes and physically active people as attractive and desirable. Considering the heavy media usage by adolescents (Lenhart, 2015), as well as their increased focus on being desirable to others (Benowitz-Fredericks et al., 2012), these images may contribute to their associations between positive social and appearance outcomes from engagement in PA. Furthermore, the abundance of sexualized images of athletes in the media, as opposed to performance-based images (Daniels, 2009), may lead to greater positive associations of social and appearance outcomes with PA. Research has shown that adolescents who are exposed to sexualized images of athletes describe those athletes in terms of attractiveness and beauty, whereas when adolescents view images of athletes engaging in sport, they are more likely to use instrumental descriptors (e.g., confident, skilled, talented) (Daniels, 2009; Daniels & Wartena, 2011). Increasing media representations of athletes engaging in sport, therefore, may

help shift adolescents' attention away from the potentially unattainable appearance outcomes of PA and create stronger associations between instrumental outcomes (e.g., strength, skill) and PA.

The emphasis on social and appearance outcomes rather than health outcomes may also relate to adolescents' tendency to focus on proximal outcomes, such as immediate enjoyment, socializing with friends, and feeling good about their body shape and size, compared to distal outcomes, such as positive or ill-health in future (Lubans et al., 2012). In this case, impulsive actions of either engaging in or opting out of PA would relate to immediate feedback as opposed to reflecting upon the long-term benefits or costs of the behavior. Considering adolescence is characterized by increased focus on the self, how others perceive oneself, and a desire to be viewed positively by others (Steinberg, 2005), social and appearance outcomes are more likely to take precedence in predicting behavior compared to instrumental outcomes, such as health and well-being.

Contrary to our second and third hypotheses, implicit and explicit measures of social and appearance outcomes of PA were not predictive of PA behavior. This suggests that despite adolescents' implicit associations and explicit views regarding the social and appearance outcomes of PA, positive thoughts or beliefs alone are not sufficient to translate into PA behavior. This has been shown in other research whereby adolescents acknowledged the benefits of PA and recognized positive aspects of being active, however they still struggled to engage in PA due to lack of enjoyment (Lindelof et al., 2012).

Instrumental attitudes, however, did arise as a significant predictor of PA behavior in this study. Reflective thoughts surrounding the practical benefits of PA as well as older adolescents' cognitive capacity to rationalize and self-regulate their behavior to coincide with what they *should* do in the face of competing interests (Choudhury et al., 2006) may contribute to the

importance of instrumental, as opposed to affective, attitudes predicting adolescents' PA behavior. These findings oppose previous research that suggests affective attitudes are more likely to impact adoption of health behaviors than instrumental attitudes (Lawton et al., 2009; Conner et al., 2011). However, if the current research study was conducted with younger adolescent populations (e.g., ages 13-16), affective attitudes might play a stronger role in influencing PA behavior.

Limitations

The study's limitations included using a self-report measure of PA, having an uneven sample of females and males, and an insufficient representation of male participants to conduct certain statistical comparisons. Low effect sizes for all significant results suggest caution should be taken when generalizing to the larger older adolescent or emerging adult population. Future research is needed to investigate what specific environmental cues might activate automatic associations when adolescents impulsively decide to engage in or avoid PA. Furthermore, considering the current research was conducted with first-year undergraduate students, similar research is needed in younger adolescents to determine whether the same associations exist and how PA behavior might differ depending on strength of outcome associations.

Conclusion

This research provided unique insight to the automatic cognitive associations that older adolescents, or emerging adults, possess between outcome expectations and PA behavior. Results showed that participants hold positive associations between social/appearance outcomes and PA, indicating that desirable social and appearance outcomes may be most salient when adolescents are making impulsive decisions regarding PA participation. Explicit measures indicated that instrumental attitudes were predictive of adolescents' PA behavior.

The current research may be helpful for college health promotion initiatives by providing information about how to make PA messages relevant to campus populations. For example, emphasizing social aspects (e.g., inclusion) and immediate health benefits (e.g., feeling good) rather than long-term health benefits or outcomes of PA in promotional materials may be more effective in increasing both planned and incidental bouts of PA among college-aged individuals. Further research with a representative male sample should be pursued to determine how these constructs relate to PA behavior in males and to illuminate any gender differences that may exist for implicit and explicit outcome expectations and PA between male and female adolescents.

Table 3.1. Pearson correlations (n = 144) from study one

	1	2	3	4	5	6	7	8	*M*	*SD*
1. METs	-----								2482	2201
2. Inst Att	.31**	-----							7.31	1.32
3. Aff Att	.22**	.73**	-----						6.37	1.64
4. Affil	.25**	.28**	.31**	-----					2.24	1.30
5. Chall	.25**	.39**	.46**	.49**	-----				2.89	1.18
6. Comp	.18*	.33**	.44**	.47**	.51**	-----			2.14	1.59
7. Enjoy	.24**	.56**	.72**	.43**	.63**	.51**	-----		3.23	1.18
8. Revit	.24**	.49**	.63**	.34**	.62**	.39**	.81**	-----	3.10	1.12
9. Stress Mgmt	.25**	.25**	.35**	.37**	.47**	.30**	.60**	.57**	3.18	1.23

Note. Inst Att = instrumental attitudes; Aff Att = affective attitudes; Affil = affiliation; Chall = challenge; Comp = competition; Enjoy = enjoyment; Revit = revitalization; Stress Mgmt = stress management
*p < .05, **p < .01

Table 3.2. Multiple linear regression for PA behavior (n = 144) in study one

	b	*SE B*	*β*	*p*
Constant	-1857.45	1039.59		.076
Instrumental Attitudes	486.59	195.05	.292	.014*
Affective Attitudes	-100.16	189.33	-.529	.598
Affiliation	206.06	164.06	.122	.211
Challenge	105.28	214.63	.056	.625
Competition	33.04	139.37	.024	.813
Enjoyment	-242.84	311.28	-.130	.437
Revitalization	136.09	279.44	.069	.627
Stress Management	298.32	185.34	.167	.110

*p < .05

Chapter 4. STUDY 2: Relationships of Automatic Associations, Affect, and Outcome Expectations with Adolescents' Impulsive Decision to Opt into Physical Activity

This study is under review: McFadden, K., Berry, T., McHugh, T.-L., & Rodgers, W. (under review). Relationships of automatic associations, affect, and outcome expectations with adolescents' impulsive decision to opt into physical activity. *International Journal of Sport & Exercise Psychology*

The majority of adolescents aged 11 to 17 years (i.e., youth) worldwide are insufficiently active to achieve health benefits (Guthold et al., 2020). Current guidelines recommend youth engage in 60 minutes of moderate to vigorous physical activity (PA) per day (e.g., Okely et al., 2019; Tremblay et al., 2016), however in some areas of the world as few as 10% of adolescents meet these recommendations (e.g., Colley et al., 2017). Current low PA levels and decreasing PA participation throughout adolescence may be linked to increases in chronic physical and mental illnesses in youth (Janssen & Leblanc, 2010; Poitras et al., 2016). Therefore, it is imperative that researchers and those who interact with youth on a regular basis (e.g., parents, teachers) work to engage adolescents in a more active lifestyle. It is particularly important to determine what individual and environmental factors influence adolescents' immediate decisions to participate (or not) when opportunities to be physically active arise.

Much of the existing PA research assumes that PA is a deliberate and purposeful behavior that is intentionally engaged in based on rational and reflective decision-making (Zenko et al., 2016). While part of the PA behavior process does involve deliberate thoughts such as reflection on what activity to engage in and planning/scheduling the activity, there is also an impulsive, situational component to PA behavior that is influenced by automatic affective reactions to the immediate behavior-in-context. The Affective-Reflective Theory (ART; Brand &

Ekkekakis, 2018) of physical inactivity and exercise was developed to include both deliberative and automatic processes. The ART suggests that human action is partly intuitive and therefore, an individual's process for engaging in a behavior will involve both affective valuation and cognitive evaluation of the action within the immediate context. The affective valuation is exhibited through one's action impulse whereas any subsequent cognitive evaluation can result in the development of action plans (Brand & Ekkekakis, 2018). The ART asserts that situation-specific external and internal stimuli activate an individual's automatic associations, which are mental representations based on previous experience, observation, or knowledge of the behavior (Carlston, 2010). This activation of automatic associations produces an affectively-driven action impulse to either approach or avoid the behavior, which could then be followed by intentional reflection and planning around whether or not the individual will follow through with pursuing the behavior (Brand & Ekkekakis, 2018). In other words, individuals may only deliberate on engaging in PA if they have either had a strong positive affective response (from their existing automatic associations) that drive them toward the activity and/or the environment in which it is to be performed, or if they have not first experienced a strong negative affective response (from their existing automatic associations) that urge them to refrain from the activity itself and/or avoid the social and physical environments in which the activity is performed.

Adolescents, in particular, may be more susceptible to affectively-driven action impulses due to underdevelopment in the area of the brain responsible for emotional regulation, inhibitory control and rational decision-making (Choudhury et al., 2006; Crone et al., 2016). Adolescents are not, however, completely without ability to deliberately reflect, assess situations, consider options, and make informed decisions. Therefore, it is important to explore what psychosocial constructs may influence adolescents' decisions to approach or avoid PA, provided they have the

opportunity and motivation to reflect prior to making a decision. Social Cognitive Theory (SCT; Bandura, 1986, 1997) proposes a triadic reciprocal relationship between individual, environmental, and behavioral factors. In terms of adolescents' participation in PA, individual factors may include their current emotional state or mood, confidence in their ability to successfully perform the behavior (self-efficacy), and physical factors that might impede their ability to perform the behavior well, such as fatigue, illness, or injury. The physical and social environment may be perceived as encouraging (or not) depending on the individual's comfort and familiarity with the physical space and people present, perceptions of support, and perceived level of competition or social comparison. Finally, the behavior itself may, or may not, be appealing depending on the individual's previous experiences engaging in the PA or, in absence of prior experience, suppositions of what engaging in the activity could be like.

Outcome expectations, a SCT construct defined as the consequences one anticipates will result from performing an action (Bandura, 1997), may also contribute to PA behavior. Outcome expectations can be physical, social, or self-evaluative in nature (Bandura, 2004). Therefore, adolescents may anticipate positive or negative PA outcomes, such as physical invigoration or fatigue, admiration or criticism from friends or peers, and self-satisfaction or self-doubt. Outcome expectations have also been described as providing the endpoint to which individuals strive and thus, have been used synonymously with goals (e.g., Deci & Ryan, 2000). Research has shown that adolescents are more likely to engage in PA when enjoyment and skill development outcomes are emphasized (Goguen Carpenter et al., 2017) and when the proposed PA is perceived as acceptable, appealing, or trendy within their social circle (Mandic et al., 2017).

Adolescence is a time when individuals place greater emphasis on their appearance, self-identity, and social image (Ricciardelli & Yager, 2016); therefore, a desirable appearance and proficient physical skill might encompass some of the expected outcomes or goals that adolescents prioritize in relation to PA. Research on adolescents' self-perceptions and body image has traditionally focused on negative behaviors (e.g., disordered eating, excessive exercise practices, steroid use) and outcomes (e.g., depression, extreme weight loss). However, shifting the focus to positive body image may provide a more holistic picture (Wood-Barcalow et al., 2010; Holmqvist & Frisén, 2012). Positive body image includes appreciating, loving, respecting, nurturing, protecting, and seeing beauty in the body while rejecting external representations of, and comparisons to, ideal bodies (Tylka & Wood-Barcalow, 2015a). Research has shown positive body image to correlate with PA behavior in young adolescents (e.g., Frisén & Holmqvist, 2010) and even relate to an increase in PA engagement among female adolescents (Andrew et al., 2016).

It is important to consider what individual, social, and environmental factors are most salient and, thus, more likely to automatically elicit an affective response and/or be deliberately reflected upon when adolescents are faced with a decision regarding PA participation. One study in older adolescents found positive automatic associations between social and appearance outcomes and PA, and neutral or equally positive and negative automatic associations between health outcomes and PA (McFadden et al., 2018). Their sample, however, consisted of first-year undergraduate students; therefore, their results may not be applicable to younger adolescents (e.g., high school students). The study was also limited in the social cognitive constructs they explicitly assessed (i.e., attitudes and outcome expectations only), lacked assessment of positive body image, and only related participants' automatic associations and explicitly measured

attitudes to self-reported PA. No studies to date have examined how automatic associations, prominent social cognitive constructs (i.e., self-efficacy, outcome expectations), and positive body image relate to adolescents' immediate decisional reaction to either approach or avoid PA behavior.

The purpose of this research, therefore, was to determine whether automatic associations with PA, outcome expectations towards PA, self-efficacy, and positive body image would predict adolescents' impulsive decision to opt in or out of a hypothetical PA program. As defined in the Oxford Advanced Learner's Dictionary, "impulsive" means the participants were given very little time to respond and thus made decision without forethought or ability to think carefully about outcomes or consequences (Oxford Advanced Learner's Dictionary, 2020). The program description focused on either the health outcomes of PA (e.g., increased strength, improved heart health) or the social outcomes of PA (e.g., social inclusion, fun with friends). Based on previous research, it was hypothesized that 1) participants would have positive automatic associations between PA and social/appearance outcomes of PA; 2) participants would have equally positive and negative automatic associations between PA and health outcomes; 3) participants presented with the social-focused PA program would be more likely to impulsively opt in to the PA program than those presented with the health-focused PA program; and, 4) positive automatic social/appearance associations, outcome expectations, self-efficacy, and positive body image would significantly correlate with, and predict, adolescents' impulsive decision to opt in to the PA program.

Materials and Methods

Participants

Ninety-four high school students (Grades 10-12) were recruited from seven physical education (PE) classroom clusters at three different high schools in Edmonton, Alberta. The cluster random assignment to intervention conditions (i.e., receiving the health-focused or social-focused PA program description) was implemented for feasibility and efficiency purposes – randomization could not occur at the individual level because individuals were a part of a group during the presentation of the hypothetical PA program (i.e., the intervention). The delivery of the intervention and the measurement of the intervention outcome occurred as a single event (researcher presentation of the PA program followed immediately by participant's anonymous and confidential response) after all the data for the predictor variables (e.g., GNAT and questionnaire data) had been collected. These data were collected before the PA program option was offered. Therefore, the clustering was not a "contextual variable" (Field, 2013, p. 815) that could affect messaging group differences in the intervention outcome and did not need to be included as a part of the analysis. Using Optimal Design Plus software and following Cohen's (1992) recommended power of .80 and an alpha of .05, it was determined that a sample size of 80 participants would have sufficient power to detect a small to medium effect (0.2 - 0.5) for our analyses. In anticipation of low return rates for the consent forms, the final recruitment goal was to present the research study to 200-250 students with the aim of obtaining, at minimum, 80 participants.

Fourteen participants were exchange students who did not meet inclusion criteria regarding English as their first language, therefore the final sample had 80 participants (M_{age} = 15.84, SD_{age} = 1.12; 47.5% female). The current sample would be considered highly active based on their self-reported moderate-to-vigorous PA (MVPA; $M_{MET\text{-}mins}$ = 3362.71, $SD_{MET\text{-}mins}$ = 2750.37), which indicated that, on average, participants engaged in 60-90 minutes of MVPA

every day. Participants' PE classrooms were cluster randomly assigned via random number generator (1 = health; 2 = social) to receive either the health-focused program description (i.e., health group; $n = 4$ classroom clusters, 39 participants) or the social-focused program description (i.e., social group; $n = 3$ classroom clusters, 41 participants). T-tests and chi-square analyses were conducted to determine differences between groups on all predictor variables. There was a significant difference in age, $t(78) = 3.01$, $p = .003$, $d = .67$, with those in the health group ($M = 16.21$, $SE = .18$) being older, on average, than those in the social group ($M = 15.49$, $SE = .16$). There was a significant difference on the appearance outcome expectations scale, $t(78) = 2.66$, $p = .008$, $d = .58$. Those in the health group ($M = 3.90$, $SE = .16$) reported higher scores than those in the social group ($M = 3.17$, $SE = .23$). There was also a significant difference on the ill-health avoidance outcome expectations scale, $t(78) = 2.14$, $p = .035$, $d = .48$, with individuals in the health group ($M = 3.17$, $SE = .19$) reporting higher scores than those in the social group ($M = 2.57$, $SE = .21$). There were no significant differences between groups on any of the other predictor variables.

Procedure

Ethics approval was obtained from Institutional Review Boards and informed parental/guardian consent was obtained for all research participants. Eight schools were contacted in Edmonton, Alberta to participate, of which three agreed. During the initial visit to the schools' PE classes, the researcher explained the study and distributed a letter of information and parental/guardian consent forms to all students in attendance. A subsequent visit to collect consent forms and conduct the research study was scheduled for a week later. Participant groups completed a Go/No-Go Association Task (GNAT; Nosek & Banaji, 2001) and questionnaire individually in their school's computer lab under the supervision of the researcher and a PE

teacher. Once everyone had completed the GNAT and questionnaire, the researcher presented the

group with the hypothetical PA program and asked each participant to quickly and confidentially

write down "yes" or "no" on the back of their questionnaire as to whether they would participate

if the program existed at their school. Questionnaires were collected immediately in order to

pressure participants into responding impulsively (i.e., acting without forethought or careful

consideration of possible consequences; Oxford Advanced Learner's Dictionary, 2020). To

further clarify, participants were granted extremely minimal time to respond (i.e., less than ten

seconds to write "yes" or "no") and, thus, had no opportunity to accrue additional information

regarding the PA programme nor engage in reflections that could have contributed to a more

deliberate and purposeful response.

Self-Report Measures

Physical Activity

The short-form of the International Physical Activity Questionnaire for Adolescents

(IPAQ-A; Hagströmer et al., 2008) was used to determine participants' metabolic equivalents

(METs) for MVPA for descriptive purposes. MET-minutes for moderate PA were calculated by

multiplying 4.0 x moderate-intensity activity minutes x moderate days. MET-minutes for

vigorous PA were calculated by multiplying 8.0 x vigorous-intensity activity minutes x vigorous

days. A total MVPA MET-minutes/week score was then computed by summing each

participant's moderate and vigorous scores.

Outcome Expectations

The Exercise Motivation Inventory-2 (EMI-2) for adolescents (Ingledew & Sullivan,

2002) assessed outcome expectations for PA. This scale includes 54 items that are grouped into

14 subscales describing adolescents' potential motives for participating in PA: affiliation,

appearance, challenge, competition, enjoyment, ill-health avoidance, nimbleness, positive health, revitalisation, social pressure, social recognition, strength & endurance, stress management, weight management. The scale uses the anchor statement "Personally, I do physical activity (or might do physical activity)…" and uses a Likert scale ranging from 0 (not at all true for me) to 5 (very true for me). Mean scores and Cronbach's alphas were calculated for each of the subscales. All of the subscales except for revitalisation were within an acceptable alpha range of .70 to .95. The revitalisation subscale was removed from analyses due to a low alpha score of .56.

Self-efficacy

Rodgers and colleagues' (2008) Multidimensional Self-efficacy for Exercise Scale (MSES) was included to assess confidence in PA participation within three domains (task, coping, and scheduling). The scale consists of nine items that ask participants to provide a percentage value (0% = no confidence; 100% = complete confidence) of their confidence to participate in at least 30 minutes of continuous PA according to the questionnaire statements. For example, an item measuring task self-efficacy asks participants to indicate how confident they are performing PA using proper technique. Cronbach's alphas were good for all three subscales: task α = .88; coping α = .75; scheduling α = .87.

Positive Body Image

Body image was assessed using the Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015b). Participants were asked to rate ten items on a scale of 1 (never) to 5 (always) as to how often the written statement is true about them. Example statements include, "I respect my body" and "I am comfortable in my body". Mean scores were calculated across all ten items. Cronbach's alpha was very good, α = .95.

Opt-in/opt-out of Physical Activity

Participant classroom groups were randomly assigned to receive information about one of two hypothetical PA programs to be offered at their school. Both programs involved a group setting, however descriptions differed in terms of the format and focus of the program. The health-focused PA program described a format whereby everyone in attendance would be given an individual exercise program related to their personal health and fitness goals (e.g., increased strength, improved cardiovascular health). The social-focused PA program described a format whereby everyone would participate together in group activities and partner exercises in order to be physically active in a fun and supportive environment. The emphasis of the health-focused program was on each individual working toward their own health and fitness goals whereas the emphasis of the social-focused program was on having fun together while working as a group to be more active. Appendix A contains the detailed program descriptions.

Automatic Associations Task

The Inquisit 4 by Millisecond Software web program was used to administer the GNAT. This tool was used to assess individuals' automatic associations between words belonging to a target category (e.g., physical activity) and words belonging to evaluative categories (e.g., desirable, undesirable). A generic category was also included as a contrast to the target category. During a single trial, participants completed four blocks, or combination of categories (which each had seven words for a total of 28 word presentations in each block): physical activity-desirable, physical activity-undesirable, generic-desirable, generic-undesirable. When a word appeared on screen, participants were given 700 milliseconds to indicate whether it belonged to one of the two target categories (e.g., physical activity and desirable) by pressing the space bar (a "go" response) or whether it belonged to one of the distractor categories (in this case, generic and undesirable) by refraining from pressing the space bar (a "no go" response). The quick

response deadline forced participants to make a reactionary response rather than a deliberate, thoughtful decision. Participants were given immediate feedback regarding their accuracy, with a green "O" for a correct "go" or "no go" response and a red "X" for an incorrect response.

Participants completed two tasks, one in which the evaluative categories referred to positive and negative health outcomes (e.g., strong, happy, healthy, weak, sad, unhealthy), and one in which the evaluative categories referred to positive and negative social or appearance outcomes (e.g., popular, beautiful, muscular, unpopular, ugly, scrawny). These words were selected based on previous research exploring descriptors adolescents use when discussing physically active people and athletes in terms of movement functionality outcomes and attractiveness outcomes (Daniels & Wartena, 2011; Daniels, 2012). The generic category included words that did not relate to any of the other categories (e.g., book, desk, chair). Appendix B contains a complete list of words used for the GNAT. For each trial, the words appeared in random order and the tasks were counterbalanced across groups of participants. Split-half reliability was good for activity-desirable [r (80) = .91] and activity-undesirable [r (80) = .87] trials in the health task. Split-half reliability for the social task was acceptable for both activity-desirable [r (80) = .73] and activity-undesirable [r (80) = .76] trials.

Data Analysis

The GNAT data were analyzed using d-prime (d') sensitivity values, which assess participant accuracy. The assumption is that individuals will be less accurate (i.e., make more errors) when trying to associate items that they automatically perceive as incompatible (Gawronski & Brannon, 2018). Applied to the current research, participants who possesses positive automatic associations with PA would have more correct responses when asked to associate positive words (e.g., healthy) with PA words (e.g., exercise) and would make more

errors when asked to associate negative words (e.g., unhealthy) with PA words. The opposite would be true for those who possess negative automatic associations with PA, and no difference in the number of correct responses and errors would be calculated for someone who possessed equally positive and negative automatic associations with PA.

A d' score is calculated by examining the ratio of correct "go" responses (hits) in relation to incorrect "go" responses (false alarms) and incorrect "no go" responses (misses). Following analysis protocol outlined by Nosek & Banaji (2001), d' scores were screened for excessive errors (d'<0) and value corrections were made for empty cells (i.e., no false alarms or misses) and perfect scores (i.e., no errors on hits). Repeated measures analysis of variance tests (RM ANOVA) was conducted to determine whether participants had positive, negative, or equally positive and negative automatic associations between social/appearance outcomes and PA (H1) and between health outcomes and PA (H2).

A Pearson's chi-square test was conducted to test the third hypothesis that participants' decision to opt into PA depends on which PA program description they received. Post-hoc analyses were pursued in order to explore differences between those who impulsively decided to opt into the PA program and those who impulsively decided to opt out of the PA program in both the health group and social group. Bonferroni corrections were employed to address the increased familywise error rate produced by the high number of independent difference tests conducted. Finally, point-biserial correlations and a binary logistic regression were conducted to examine whether any automatic associations or self-reported psychosocial constructs correlated with, and subsequently predicted, participants' impulsive decision (dichotomous outcome variable) to engage in PA (H4).

Results

Automatic Associations

The results of the RM ANOVA for the social/appearance GNAT, showed a significant effect for d', $F(1,79) = 72.51$, $p < .001$, $\eta^2 = .48$, indicating positive automatic associations for PA and social/appearance outcomes. For the health GNAT, there was also a significant effect for d', $F(1,79) = 99.79$, $p < .001$, $\eta^2 = .56$, indicating positive automatic associations for PA and health outcomes (see Figure 4.1). Overall, participants automatically associated both positive health words (e.g., strong, happy, healthy) and positive social/appearance words (e.g., attractive, popular, winner) with PA.

Participants' Impulsive Responses to PA

There was a significant difference between groups for their responses to the hypothetical PA program, $\chi^2(1, N = 80) = 7.47$, $p = .006$, Cramer's $V = .31$. The majority (78%) of those in the health group opted into the PA program compared to only 42% of those in the social group. Based on the odds ratio, those in the health group were 3.59 times more likely to opt into the hypothetical PA program than those in the social group.

Additional analyses were conducted to explore differences between those who opted in and those who declined to opt into the PA program within each group (see Table 4.1). Within the health group, there was a significant difference in d' for the health GNAT, $F(1, 38) = 4.97$, $p = .032$, $\eta^2 = .12$, with those opting into PA having stronger positive automatic associations between health and PA. There were also significant differences in nimbleness expectations, $F(1,38) = 5.36$, $p = .026$, $\eta^2 = .13$, social pressure expectations, $F(1, 38) = 6.21$, $p = .017$, $\eta^2 = .14$, and social recognition expectations, $F(1, 39) = 5.61$, $p = .023$, $\eta^2 = .13$. Those who opted out of the PA program scored higher on all three constructs.

Within the social group, there was a significant difference for the outcome expectations of ill-health avoidance, $F(1, 40) = 6.54$, $p = .015$, $\eta^2 = .14$, nimbleness, $F(1, 40) = 4.22$, $p = .047$, $\eta^2 = .10$, positive health, $F(1, 40) = 9.03$, $p = .005$, $\eta^2 = .19$, strength and endurance, $F(1, 40) = 4.35$, $p = .044$, $\eta^2 = .10$, stress management, $F(1, 40) = 13.26$, $p < .001$, $\eta^2 = .25$, and weight management, $F(1, 40) = 4.29$, $p = .045$, $\eta^2 = .10$. Those who opted into the PA program had higher scores on all six outcome expectations subscales. Post-hoc Bonferroni corrections to control for family-wise error rate indicated that higher scores for stress management among those who opted in compared to those who declined to opt into the PA program in the social group were statistically significant.

Correlations and Regressions

Point-biserial correlations were conducted to explore what predictor variables were significantly correlated with opting into the hypothetical PA program (see Table 4.2). Results showed seven variables correlated significantly with participants' impulsive decision to opt into PA: messaging group ($r_{pb} = -.31$, $p = .006$), age ($r_{pb} = .26$, $p = .022$), d' health ($r_{pb} = .23$, $p = .045$), and the outcome expectations of enjoyment ($r_{pb} = .25$, $p = .028$), positive health ($r_{pb} = .25$, $p = .028$), strength & endurance ($r_{pb} = .23$, $p = .041$), and stress management ($r_{pb} = .34$, $p = .002$).

A logistic regression was performed to determine the effects of the seven significantly correlated predictor variables on the likelihood of opting into the hypothetical PA program (see Table 4.3). The model was statistically significant, $\chi^2(7) = 25.62$, $p < .001$. The model explained 36.7% (Nagelkerke R^2) of the variance for opting into PA and correctly classified 67.5% of cases. Participants with positive automatic associations between health and PA ($b = .591$, $SE\ B = .278$, $p = .034$) were 1.8 times more likely to opt into PA and participants who reported higher

stress management outcome expectations of PA ($b = .763$, $SE\ B = .302$, $p = .011$) were 2.1 times more likely to opt into the PA program.

Discussion

The purpose of this research was to determine whether automatic associations with PA, outcome expectations towards PA, exercise self-efficacy, and positive body image would predict adolescents' impulsive decision to opt in or out of a hypothetical PA program. It was hypothesized that participants would have positive automatic associations between PA and social/appearance outcomes of PA (H1) and would have equally positive and negative associations between PA and health outcomes (H2). Results showed that adolescents have positive automatic associations between social/appearance outcomes (e.g., attractive, muscular, popular) and PA *and* between health outcomes (e.g., strong, happy, confident) and PA. This partially aligns with previous research that found older adolescents automatically associate PA with positive social and appearance outcomes but not with health outcomes, and therefore may be drawn to activities that increase their physical and social appeal rather than activities that focus on health benefits (McFadden et al., 2018). It is important to note that this previous study used a sample of first-year undergraduate university students, who may be more attentive to social and appearance outcomes due to adjustments to new social environments and a more independent lifestyle that are characteristic of emerging adulthood (Olenik-Shemesh et al., 2018).

The third hypothesis predicted that participants in the social group would be more likely than those in the health group to opt into the hypothetical PA program. Instead, results indicated those in the health group were 3.59 times more likely to opt in. While both program descriptions outlined a group setting, the main contrasts involved the format and focus of the PA program.

The health program description proposed all individuals present would engage in individualized exercises and would focus on their own personal health and fitness goals while the social program description proposed everyone exercising together as a group and engage in partner work with a focus on having fun with their peers. Those in the health group may have been drawn to the individualized aspect of exercise with the proposition that everyone present would be focusing on their own exercise process and outcomes. In contrast, those in the social group may not have been interested in group PA or may have perceived engaging in PA through partner activities and group exercises as unappealing or, even, fear-inducing. As is discussed in the ART of physical inactivity and exercise, an individual's automatic negative affective reaction to their immediate environment may create an impulsive desire to avoid PA behavior (Brand & Ekkekakis, 2018). In previous research, adolescents described exercising in clear view of their school peers as intimidating especially if they perceived obvious differences in physical ability or skill (Wiltshire et al., 2017). Embarrassment from looking bad and/or performing poorly during physical tasks in PE class was a strong emotional deterrent and had the power to override any interest or desire adolescents may have had to participate the activity itself (Wiltshire et al., 2017). On the positive side, researchers have found that PA climates that focus on cooperation, allow youth to have some control, and emphasize individual skill development and goal pursuit are perceived to be less intimidating and, therefore, more appealing to adolescents (Hogue et al., 2019).

Exploratory analyses determined differences between those who opted into and those who opted out of the hypothetical PA program within each group. For the health group, those who had more positive automatic health associations, and those who had significantly lower scores on social recognition and social pressure motives were more likely opt into the PA

program. The health program description, particularly the proposed focus on individual health outcomes, may have been more interesting to those who have strong positive automatic health associations with PA. In other words, the program description may have outlined aspects of PA that already attracted these particular adolescents to engage in PA. Research has shown that targeted exercise messages may be more successful in attracting their audience's attention and influencing their (Berry et al., 2018). Those who feel pressured to be active or who desire recognition for their effort, may consider PA to be more of a chore and may subsequently be less likely to opt into the PA program. This is consistent with research showing more controlled motives for exercise, such as external pressure, are less likely to result in adolescents' sustained PA participation over time compared to autonomous motives, such as enjoyment (Gillison et al., 2011).

Within the social group, those who had significantly higher scores for ill-health avoidance, positive health, strength & endurance, weight management, and stress management outcome expectations were more likely to opt into the PA program. For some, the social aspect of group exercise and engaging in teamwork or partner exercises may be appealing and may contribute to feelings of increased energy and decreased stress. Research on group cohesion and group dynamics in exercise classes has shown that feelings of togetherness during exercise contribute to increased exertion, enjoyment, and intrinsic satisfaction (Graupensperger et al., 2019; Maher et al., 2015), all of which could contribute to post-exercise energy boost and stress relief. Furthermore, O'Hara and colleagues (2014) found that engagement in PA for health reasons (e.g., improving strength and endurance, decreasing risk of chronic diseases) acted as a buffer to state self-objectification and state social physique anxiety in a group exercise environment. Therefore, adolescents who have strong health motives for PA either may not

perceive the group environment as intimidating or may pursue PA regardless of any initial perceived discomfort with the environment.

Finally, it was hypothesized that participants' positive automatic social/appearance associations, outcome expectations, self-efficacy, and positive body image would predict their impulsive decision to opt into the PA program. Results showed that positive automatic health associations and the expected outcome of stress management were predictors of opting into the PA program. These results suggest that adolescents may be more willing to engage in PA programs that are promoted as opportunities to improve the psychological and physical outcomes of happiness, confidence, health, enjoyment, strength, energy, and skill development. These results are consistent with research that has reported that active adolescents do find the health benefits of PA, such as feeling healthy, stronger, and in better physical condition, to be appealing (Frisén & Holmqvist, 2010). Additionally, adolescents may seek PA as a strategy to minimize or manage negative feelings, such as stress. Research has shown that participation in exercise, even at a low intensity (e.g., walking) reduces cortisol levels (a physiological measure of stress) and perceptions of anxiety in adolescents and young adults (Hillier et al., 2011). These effects were found in the short-term, but not in the long-term, therefore it is recommended that youth engage in regular exercise (e.g., more than once a week) in order to optimize the stress-reducing benefits of PA (Hillier et al., 2011).

Contrary to what was hypothesized, self-efficacy and positive body image were not predictive of participants' impulsive decision to opt into PA. The scores for these constructs were consistent across all participants and, overall, were of an average value. Participants had moderately high confidence in their ability to successfully engage in PA, their ability to overcome barriers to engaging in PA, and their ability to regularly schedule PA in their lives.

Additionally, they all had moderate appreciation for the functional capabilities and appearance of their bodies. It could be theorized that these constructs only become predictive of adolescents' impulsive decisions to opt into or out of PA if they exist within the extreme ranges. For example, it could be that very low confidence would be predictive of impulsively opting out of PA or that a very high positive body image would be predictive of impulsively opting into PA. Future research could attempt to diversify sampling to include participants who are known to be highly confident/unconfident and/or who exhibit more extreme levels of positive body image to see if a less average sample will change the predictive ability of these constructs.

This study provided unique insight to adolescents' automatic associations with PA using an implicit task tailored specifically to this age group. The quasi-experimental design with cluster random assignment allowed for group comparisons on a variety of psychosocial factors related to PA and brought to light some characteristics of the PA environment that may contribute to automatic positive or negative affective responses and subsequent (dis)inclination to participate in PA. Recruitment through public schools gave the researchers access to a good cross-section of the target population. A limitation, however, involved recruitment from PE classes, which is mandatory curriculum for those in Grade 10, but elective for those in Grades 11 and 12. Therefore, older participants in this study were most likely already interested in PA and based on self-report measures of MVPA, participants were already very active. The PE class context may have also influenced participants' responses to the hypothetical PA program by priming the participants to be more inclined towards PA. Future research should explore adolescents' automatic associations and reflective thoughts of PA sampling from a wider variety of contexts (e.g., non-active environments). Another limitation of this study was the use of self-report measures for PA, which may not have provided an accurate record of participants'

behavior. It is important to use objective measurement devices, such as accelerometers, particularly among young people who may not be particularly attentive to, and therefore have less awareness of, their daily time spent being active/inactive. Finally, by presenting a hypothetical PA program, the impulsive opt-in or opt-out response participants gave was reflective of their intention to participate. Therefore, no comment could be made regarding how participants' impulsive response would translate to actual PA participation. Future research should offer the PA programs described in this research to see how automatic associations and impulsive statements of intent translate into PA behavior.

In summary, this study showed that adolescents automatically associate positive health and social/appearance outcomes with PA and that positive automatic health associations with PA and expectations of stress management from PA are predictive of opting into PA. This implies that adolescents may not necessarily find PA, in general, to be unpleasant or something to avoid. However, aspects of the larger immediate PA environment (physical and social) and the content or focus of the PA itself may impact situational decisions to either pursue or refrain from PA. PE classes and recreational programs that allow adolescents to focus on individual health goals (e.g., increase strength, improve cardiovascular endurance, etc.), develop their skills, and increase their confidence in a fun, non-threatening environment (e.g., low social comparison opportunities) may be more successful in optimizing participation rates compared to programs that include performing PA in front of others (or the perceived possibility thereof), require a certain aesthetic, or make skill comparisons obvious (e.g., one person's success clearly indicates another's defeat). Furthermore, using messaging that promotes PA as an opportunity to focus on positive health outcomes, individual fitness goals, and the stress-reducing effects of PA may be more successful in recruiting adolescent participation than proposing group exercises or team activities.

Figure 4.1. d' scores for health and social/appearance GNATs (n = 80) in study two

Table 4.1 Means and difference tests between those who opted into PA and those who did not within each group in study two

	Health Messaging Group (n = 39)			Social Messaging Group (n = 41)		
	Yes (n = 28)	No (n = 11)	Diff. Test	Yes (n = 17)	No (n = 24)	Diff. Test
Gender (% Female)	43%	45%	χ^2 = 2.88	47%	54%	χ^2 = 1.19
Age	16.32	15.91	F = 1.06	15.71	15.33	F = 1.39
d' Health	1.53	.67	F = 4.97*	1.35	1.09	F = .545
d' Social/Appearance	.84	.75	F = .086	1.05	1.04	F = .001
Affiliation	3.10	3.57	F = 1.09	3.31	2.99	F = .446
Appearance	3.75	4.31	F = 2.70	3.55	2.89	F = 2.18
Challenge	3.39	3.43	F = .013	3.58	2.87	F = 4.05
Competition	3.48	3.59	F = .050	3.44	3.21	F = .217
Enjoyment	3.79	3.50	F = .793	3.99	3.19	F = 3.51
Ill-health Avoidance	2.95	3.73	F = 3.63	3.16	2.15	F = 6.54*
Nimbleness	3.08	3.78	F = 5.36*	3.69	2.81	F = 4.22*
Positive Health	4.13	4.36	F = .939	4.47	3.58	F = 9.03**
Social Pressure	1.26	2.21	F = 6.21*	1.03	1.36	F = .970
Social Recognition	2.46	3.34	F = 5.61*	2.51	2.20	F = .699
Strength & Endurance	4.16	4.15	F = .002	4.31	3.63	F = 4.35*
Stress Management	2.87	2.68	F = .210	3.42	1.96	**F = 13.26****
Weight Management	3.16	3.73	F = 1.58	3.31	2.33	F = 4.29*
Task SE	75.91	74.05	F = .098	81.96	76.52	F = 1.21
Coping SE	55.57	59.39	F = .237	60.49	58.68	F = .078
Scheduling SE	67.02	73.33	F = .550	68.43	71.11	F = .128
Positive Body Image	3.70	3.47	F = .472	3.97	3.55	F = 2.25

Notes. Bold values indicate difference is significant at alpha level corrected by Bonferroni method. SE = self-efficacy
*p < .05, **p < .01

Table 4.2 Point-biserial correlations (n = 80) from study two

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PA option	--																				
2. Messaging group	-.31**	--																			
3. Age	.26*	-.32**	--																		
4. d' Health	.23*	-.04	.10	--																	
5. d' Social/appearance	-.01	.12	-.09	**.37**	--																
6. Affiliation	.002	-.04	.008	.09	.10	--															
7. Appearance	.13	-.29**	.16	.19	.02	.32**	--														
8. Challenge	.20	-.12	.06	.18	.24*	**.44**	**.45**	--													
9. Competition	.05	-.07	.18	.07	.16	**.55**	.19	**.46**	--												
10. Enjoyment	.25*	-.08	.27*	.18	.21	**.64**	**.44**	**.71**	**.63**	--											
11. Ill-health avoidance	.15	-.24*	-.09	-.10	-.01	.08	**.42**	.32	.05	.14	--										
12. Nimbleness	.08	-.05	.01	.09	.20	**.43**	**.41**	**.63**	**.40**	**.50**	.38**	--									
13. Positive health	.25*	-.14	.09	.07	.04	**.40**	**.62**	**.59**	.26*	**.57**	**.49**	**.55**	--								
14. Social pressure	-.21	-.14	-.16	-.06	-.25*	.10	.32**	-.09	-.13	-.21	.24*	-.02	.06	--							
15. Social recognition	-.03	-.17	.10	.03	-.05	**.47**	**.51**	**.52**	.34**	**.42**	.29**	**.51**	.33**	.35**	--						
16. Strength & endurance	.23*	-.14	.13	.09	.10	.32**	**.53**	**.71**	.39**	**.60**	.38**	**.60**	**.68**	-.04	.31**	--					
17. Stress management	.34**	-.10	.01	-.05	.04	.30**	.30**	**.57**	.25*	**.44**	**.45**	**.63**	**.57**	.03	.31**	**.52**	--				
18. Weight management	.15	-.20	.07	.05	-.06	.24*	**.68**	**.43**	.14	.37**	**.52**	.38**	**.54**	.29**	.36**	.38**	**.45**	--			
19. Task SE	.02	.13	.04	**.29**	**.30**	**.39**	.15	**.44**	**.55**	**.56**	-.00	**.43**	**.37**	-.25*	.14	**.37**	.21	.12	--		
20. Coping SE	-.04	.07	-.02	.08	.16	**.47**	.17	**.46**	**.47**	**.56**	.16	**.37**	**.41**	-.09	.28*	**.37**	**.33**	.18	**.65**	--	
21. Scheduling SE	-.09	.03	.01	-.08	.10	**.42**	.23*	**.34**	**.44**	**.49**	.09	**.36**	**.40**	.07	.23*	**.37**	.26*	.19	**.47**	**.59**	--
22. Positive body image	.15	.05	-.01	.15	.28*	.20	-.14	.26*	.19	**.30**	.05	.12	.17	**-.38**	-.00	.27	.12	-.25*	**.42**	**.34**	.24*
α	--	--	--	--	--	.88	.91	.74	.94	.86	.74	.78	.78	.82	.70	.87	.84	.85	.88	.75	.87

Notes. Bold values indicate correlation is significant at alpha level corrected by Bonferroni. SE = self-efficacy
*p < .05, **p < .01

Table 4.3. Binary logistic regression predicting opting into PA program (n = 80) in study two

	R^2	b	SE B	Sig.	Exp(B) [95% CI]
Model	.367				
Constant		-8.626	4.955	.082	.000 [.000 – 2.960]
Messaging Group		-1.004	.581	.084	.367 [.117 – 1.146]
Age		.461	.295	.118	1.586 [.889 – 2.830]
d' Health		.591	.278	.034	1.806 [1.047 – 3.116]
Enjoyment		-.033	.348	.924	.967 [.489 – 1.913]
Positive Health		.009	.484	.986	1.009 [.391 – 2.604]
Strength & Endurance		-.127	.432	.769	.881 [.378 – 2.055]
Stress Management		.763	.301	.011	2.144 [1.188 – 3.868]

Chapter 5. PAPER 3: An Exploration of Methodological Challenges Limiting the Quality of Physical Activity Research with Youth Populations

Research studies conducted in physical activity (PA), particularly those focused on psychosocial factors that contribute to youth (i.e., children and adolescents) PA behavior, are frequently critiqued as being "low quality" (e.g., Hill et al., 2020; Spruit et al., 2016). Comments regarding issues with study design, sample size and/or composition, and measurement tools and procedures are ubiquitous in systematic reviews and meta-analyses published in the research areas of sport, health, and exercise psychology. Authors of several recent reviews (e.g., Hill et al., 2020; McIntosh, et al., 2017; Plotnikoff, et al., 2013; Spruit, et al., 2016) have specifically noted that an overuse of cross-sectional and other nonexperimental designs, an overreliance on convenience sampling, insufficient sample sizes, lack of participant diversity and representativeness, inconsistent and/or inaccurate measurement of PA behavior, and heavy reliance on self-report measures (some of which lack psychometric evaluations within the population being studied) all contribute to decreasing the quality of youth PA studies. In an effort to see improvement in the quality of future research, these authors recommend researchers use more robust study designs, obtain larger and randomly selected samples, employ objective measures where possible, and only use measures that have been validated for the age range of the participants.

These observations, criticisms, and recommendations are neither novel nor unique within these PA research areas, however they continue to be acknowledged as limitations in published papers. A more fruitful discussion or line of inquiry may involve determining the underlying cause(s) that contribute to researchers defaulting to methods and procedures that produce "low quality" studies. Furthermore, it has been suggested that results from "low quality" PA studies

need to be interpreted with appropriate caution (e.g., Rhodes et al., 2016) due to questionable validity, reliability, replicability, and utility. Specifically, issues with design, sampling, and/or measurement can contribute to an inability to determine causal pathways, increase susceptibility to bias and error, decrease confidence in the veracity of observed effects, and lower applicability of the research if results cannot be generalized outside the parameters of the study (e.g., Bornstein et al., 2013; Nigg et al., 2020; Wang & Cheng, 2020). Research studies that suffer from these issues often receive very little recognition for making a significant and meaningful contribution to science, and subsequently make it difficult for academics to publish their research, obtain funding, and gain employment. Additionally, published studies that are of "low quality" may potentially be contributing false or misleading information which can have negative, or even harmful, implications when interpreted by and disseminated to, the general public.

The purpose of this paper was to comment on the challenges that arise when attempting to conduct quality PA research with youth populations and to explore why researchers continue to struggle to mitigate or resolve recurring research methods issues with the aim of helping to improve youth PA research output. This paper will discuss barriers when trying to implement rigorous study designs, difficulties with participant recruitment, retention, and adherence, and limitations when trying to objectively measure behavioral constructs. This paper is divided into sections that outline each individual issue, including *study design, participant samples,* and *measurement of physical activity.* Each section includes a discussion of why the issue has an impact on research quality, what has previously been recommended as a solution to the issue, and an exploration of the reasons why the issue persists (i.e., what may be causing the issue and why researchers struggle to implement the recommended solution). The final commentary

section includes some reflections and perspectives on how the nature of research and the current academic culture may need to shift in order to mindfully acknowledge and address these issues in future so that research quality can be improved, and researchers can gain support and recognition for their efforts to advance the science in the area of youth PA.

Issues with Study Design

The main issue highlighted in PA research reviews is an overabundance of nonexperimental studies, the most commonly criticized of which is the cross-sectional design (e.g., Biddle & Asare, 2011; Spruit et al., 2016). The well-documented limitations of cross-sectional studies involve an inability to demonstrate a temporal relationship of cause and effect due to exposure and outcome variables being measured simultaneously, an inability to measure incidence or rare cases, difficulty interpreting associations, low internal validity, and susceptibility to various types of biases such as nonresponse bias and recall bias (Carlson & Morrison, 2009; Wang & Cheng, 2020). The implications of these limitations include difficulty making substantiated claims about what the results of the research truly show.

The proposed solution is for researchers to conduct more experimental designs, with many placing particular emphasis on the randomized controlled trial (RCT), which is considered the "gold standard" (Hariton & Locascio, 2018) of measurement in various fields of research. The strengths of the RCT are well-known, including their ability to yield causal inferences, greater reliability and credibility in comparison to all other empirical methods, increased resistance to researcher and/or publisher bias or manipulation (e.g., p-hacking, selective analyses, publication bias), and their general exemption from many problems that can arise from implementation of less rigorous study designs (Deaton and Cartwright, 2018). The main challenges for researchers, particularly graduate students and early-career researchers, in

implementing the RCT design (and potentially some of the reasons why researchers pursue nonexperimental designs) are the high financial burden, labor-intensiveness, and lengthy time commitment required to see the study through from planning and implementation to analysis (Frieden, 2017). The list of expenses associated with experimental research span many items, including researcher and assistant wages, purchases or rentals of supplies, materials, software, and other equipment, cost of incidentals such as fees for transportation, access passes to facilities, police background checks for working with vulnerable individuals (e.g., youth), and potentially many more research context-specific items ("Why is Science so Expensive?", 2014; LAM ACTION, 2019). There is also the cost of time, which can be underestimated given that recruitment success and attrition rates are unpredictable and can account for the need to extend the data collection time frame. It is estimated that modern experimental research can take anywhere from six months to two years from the onset of data collection to the stage of being able to publish in a peer-reviewed academic journal ("Why is Science so Expensive?", 2014). That timeframe does not account for the planning, designing, and various levels of approval needing to be obtained prior to data collection, during which the researchers also require funding. RCTs often take years to plan, implement, and analyze which reduces the ability of RCTs to keep pace with quicker experiments and may result in redundant or irrelevant findings once their evaluation is complete (Frieden, 2017). Therefore, as ambitious as a researcher may be in wanting to conduct an experimental study, research programs may get pared down or adjusted to a less expensive, less laborious, and/or less time-consuming alternative in order to complete program requirements within in an expected timeframe (as is the case for graduate students) and expedite the dissemination of findings.

Aside from the cost- and time-saving benefits of nonexperimental research, another potential reason PA researchers persist with non-experimental designs, such as observational studies, include the ability to reach larger numbers of participants relatively quickly, avoidance or decreased impact of loss to follow-up, and reduction of participant burden frequently associated with longer and/or more complex research protocols (Wang & Cheng, 2020). Obtaining a sizeable sample of participants, particularly if those participants span a large geographic area, is advantageous because it allows the researcher to observe widespread trends and it increases confidence in the veracity of any observed effect (Carlson & Morrison, 2009). As sample size increases and approaches that of the population, participant characteristics and the observed effects in the study become increasingly similar to those that would be seen in the population (Sedgwick, 2015). This is essential for reducing error, particularly the chance of failing to observe an effect when there is one (Type II error) and being able to generalize results beyond the study population (Faber & Martins Fonseca, 2014; Hariton & Locascio, 2018). The importance of, and challenges associated with, obtaining a sufficiently large sample size and its implications for generalizability will be explored in greater detail in the next section.

Another important consideration for why PA researchers might decide not to pursue experimental research is that it might not be appropriate or feasible to do so. Depending on what the researcher wishes to evaluate, there may be ethical issues regarding randomization or exposure to a condition/treatment (Burden, 2015; Frieden 2017; Hanley et al., 2016). Furthermore, the RCT may not be the most appropriate study design for the research question under study (Phillips, 2006). It has been suggested that while many researchers acknowledge that the RCT is a prime method for determining that X causes Y, research is also needed to establish why X causes Y (i.e., establishing the underlying physical or social mechanism), which the RCT

itself does not necessarily do (Phillips, 2006). It is, therefore, important for researchers to move beyond the strict experimental research agenda of 'what works?' to determine 'why?', 'where?', 'how', and 'for whom'? (Hanley et al., 2016). This is particularly applicable in research areas (such as PA behavior) where one is interested in a broader application of results and, thus, needs to incorporate or consider contextual factors and circumstances rather than isolate variables.

Issues with Participant Samples

Criticisms with respect to participant samples include the overuse of convenience sampling and small sample sizes. These issues contribute to the larger research problem of failure to replicate and/or generalize results. Many scientists have detailed this 'crisis of confidence' stemming from an inability to successfully reproduce findings (e.g., Ioannidis, 2005; McNutt, 2014; Pereira & Ioannidis, 2011; Ritchie et al., 2012; Schmidt & Oh, 2016; Simons, 2014). The reason why replication and generalizability are important involves the philosophical dilemmas of what observed effects are true/real and what results are worthy of attention. In other words, if a study's results fail to replicate, are the original findings genuine and credible? And if a study's results cannot be generalized to the larger population, what is the importance and significance of the research (i.e., why should funders/researchers/general population invest money, effort, and interest into it)? Different perspectives on the current replication "crisis" will be discussed followed by how issues with participant samples and sampling methods contribute to this research issue.

Replication Crisis

Reliable and replicable methods and results are foundational elements to valid science (Simons, 2014). Therefore, issues establishing reliability via replication indicate a problem with the trustworthiness and robustness of the original findings. The different types of replication

include literal replication (same researcher conducts a new study in the exact same way as the original), operational or direct replication (different researcher tries to duplicate the original study by using the exact same procedures), and systematic or conceptual replication (different researcher conducts a study with many of the same features as the original study, but with some aspects that are different, such as participants or measures) (Schmidt & Oh, 2016). Systematic replication is the most common (Schmidt & Oh, 2016), but causes the most controversy and debate because differences between studies in terms of individual and contextual elements make it less reasonable to expect exact replication of the original results (Goodman et al., 2016). As Galetzka (2019) asserts: "Replications necessarily vary along some dimension (e.g., time), which makes it possible for discrepant results to be attributed to random error or unknown variables" (p. 17). Failure to replicate, therefore, should be anticipated by some measure because the universality of psychological phenomena, particularly those phenomena which are situation-dependent and/or unstable, cannot always be assumed and there often exists naturally occurring variation within and/or between people and contexts (Baucal et al., 2020).

Galetzka (2019) suggests the following causes for the current "crisis" of non-reproducible results of published psychological studies: a) publication bias – statistically significant findings being more likely to be published than null results; b) study design and power – small effects and sample sizes decreasing the probability of discovering true effects; c) questionable research practices (QRPs) – for example, "p-hacking" during statistical analysis and selective reporting of results; and, d) HARKing – hypothesizing after results are known, most commonly seen when researchers present *post hoc* hypotheses as *a priori* to confirm findings. Overall, Galetzka (2019) points to publication bias as the main culprit to this replication crisis, stating that it causes "a skewed incentive system that rewards publication over sound science" (p.

22). He further states that this system encourages the continued use of QRPs and an on-going pursuit of fundamentally flawed research that then makes reproducible results even more difficult to achieve (Galetzka, 2019). The ways in which sampling method and sample size contribute to the bigger research problem of replication will be discussed individually in the following sections.

Sampling Method

Several reviews (e.g., Hill et al., 2020, Rhodes et al., 2016; Spruit et al., 2016) have discussed an excess of PA studies that use convenience sampling as their method for obtaining participants. Convenience sampling, a nonprobability sampling strategy where participants are selected based on their accessibility and/or proximity to the research (Bornstein et al., 2013), is problematic because of the implications for the validity, utility, and generalizability of the results. In particular, the disadvantages of this sampling method include results that lack generalizability to target populations or subpopulations, insufficient power to detect differences among underrepresented subgroups, "noise" or variance that cannot be controlled for statistically, and, when multiple studies are considered collectively, results that are difficult to integrate and synthesize (Bornstein et al., 2013). When the generalizability of the sample is unclear, estimates derived from the sample are often biased and that bias extends to both estimates of population effects as well as estimates of subpopulation differences (Jager et al., 2017). As the authors further point out, "science is supposed to be cumulative; however, the use of convenience samples can translate into across-study inconsistencies that are difficult to integrate and, therefore, build upon" (Jager et al., 2017, p. 20).

The specific overreliance on college/university student volunteer samples in PA studies is particularly troublesome when trying to extend results to anyone other than young, generally

healthy adults. The use of college student samples was justified in early days of PA and exercise science research by claiming that this approach represents "analogue research" (e.g., Martinsen & Morgan, 1997). This type of research was used in clinical psychology and psychiatry "to describe early 'proof-of-concept' studies designed to test basic theoretical propositions or to evaluate alternative methodologies without exposing vulnerable participants to potentially risky procedures unnecessarily" (Ekkekakis & Brand, 2019, p. 132). The authors further highlight that while this type of research may have initially been valuable, the continued recruitment of young, generally healthy and fit participants is a methodological approach still being practiced despite some serious limitations to the generalizability of results (Ekkekakis & Brand, 2019).

Convenience sampling, particularly the recruitment of college student volunteers, has resulted in a lack of accurate representation of the general adult or emerging adult population (to whom authors often aim to generalize) and an overrepresentation of western and educated people from industrialized, rich, and democratic societies ("WEIRD" individuals; Henrich et al., 2010). Arnett (2008) identified that 96% of samples from published psychological studies are from Western industrialized countries, namely Australia, Israel, and those within North America and Europe. Furthermore, the use of convenience sampling in psychological studies has resulted in a majority of the samples being comprised of undergraduate students (Arnett, 2008), which further exacerbates the overrepresentation of WEIRD individuals in research. The implications of this are well described by Henrich and colleagues (2010): "Relying on WEIRD populations may cause researchers to miss important dimensions of variation and devote undue attention to behavioral tendencies that are unusual in a global context" (p. 80). Therefore, when researchers opt to use convenience sampling as their recruitment method, the lack of representation of

naturally occurring variability and diversity at the population level makes any attempt to extend their results to individuals outside of the exact sample they used difficult to substantiate.

In terms of hard-to-reach populations, such as youth, researchers may be limited to recruitment via 'gatekeepers' (e.g., parents, coaches, teachers) and then resort to a snowball sampling approach to obtain sufficient participant numbers (Abrams, 2010). Snowball sampling is a chain-referral approach whereby initial participants recruit their peers who then recruit their peers, exponentially increasing the number of participants with each wave (Heckathorn, 2011). The issues with snowball sampling, similar to problems with other forms of convenience sampling, include bias and skewed representation of the population of interest (Browne, 2005). Specifically, it has been shown that individuals in a social network tend to share similar characteristics (e.g., race, socioeconomic status, education, PA levels, etc.) to those of the participant who referred them (Etikan et al., 2015). Another method used to recruit youth, particularly those who are difficult to access (e.g., homeless youth), is location sampling (Golinelli et al., 2015). With this method, researchers curate a list of locations that the youth of interest are likely to visit in their daily travels and recruit via those locations as opposed to recruiting individuals. The main issue with this type of sampling involves "multiplicity" – the same participant entering the sample at multiple time points (Golinelli et al., 2015).

The proposed solution is to adopt population-based probability sampling methods, such as simple random sampling or more complex designs (e.g., stratified or cluster sampling). The strength of these approaches includes their utilization of some form of random selection such that all individuals from each population, strata, or cluster have equal opportunity to be participants resulting in, theoretically, a highly representative sample and, consequently, generalizable results (Bornstein et al., 2013). The key advantage of probability sampling strategies is that when

carried out properly, they should yield an unbiased sample that is representative of the target population. As a result, researchers can fairly confidently assume that estimates obtained from probability samples are both unbiased and generalizable (Jager et al., 2017). So then why are researchers, particularly those studying youth PA behavior, not pursing probability sampling methods?

The main issues when attempting to gather a representative sample is the time, money, and effort required to not just gain access to the population of study, but to do so in sufficient numbers that randomly selecting participants will result in a large enough sample to meet statistical analysis criteria (Bornstein et al., 2013). Gaining access to a population to the degree where random sampling will procure a sizeable sample, particularly when the population under study is considered vulnerable or protected (e.g., youth, clinical patients, minority groups, etc.), often involves intense levels of resources and labour that may exceed what the researcher(s) has available to use. For example, gaining access to youth populations often involves multiple levels of ethics review prior to contacting potential places of recruitment, legal clearance to be in contact with vulnerable populations, and a commitment to facilitate access to potential participants from those who are directly responsible for the individuals within the environment from which one attempts to recruit (e.g., teachers/principals in schools, coaches of sports teams, leaders or mentors of organized groups, parents/legal guardians, etc.). Once access has been granted, there then exists the challenge of generating interest among those who are present to the point where assenting individuals will actively follow through with obtaining parental/legal guardian consent and subsequently engage in the entirety of the research project. Golinelli and authors (2015) successfully obtained a probability sample of homeless youth, however it required an extensive time commitment (200 days of data collection) from multiple sites across a

sizeable geographic location (incurring profound expenses related to research staff wages and travel) and involved non-stringent protocol regarding privacy and confidentiality (e.g., data collection conducted on sidewalks or in public establishments).

The advantages or appeal of pursuing a convenience sample, such as undergraduate or college students, and/or engaging in snowball sampling methods include cost-efficiency and ease of execution (Bornstein et al., 2013). It is often much quicker and straightforward to receive ethics approval, usually requires little or no travel by the researcher and/or participants, there is no requirement for obtaining additional consent from legal guardians, and researchers tend to be much more successful in efficiently collecting large amounts of data. Essentially, convenience sampling minimizes the number of steps required by the researcher and/or prospective participant prior to commencing the research and frequently makes any follow-up procedures easier to accomplish, thus accommodating a quick and efficient process of data collection. For graduate students and/or unfunded research projects, this sampling method might be the only viable means to collect data.

Sample Size

The second sampling issue oft cited by researchers is that of small sample sizes. Insufficient participant numbers can contribute to low statistical power, overestimates of effect size, and false discovery rates (Colquhoun, 2014; Forstmeier et al., 2017), all of which translate to difficulties establishing whether or not an observed/measured effect is accurate, trustworthy, or true. Low statistical power from small sample sizes can result in difficulty discovering effects that are genuinely true, low probability that an observed effect reaches nominally statistical significance (e.g., $p < .05$), and an exaggerated estimate of the magnitude of a discovered true effect (Button et al., 2013). Small sample sizes, known to contribute to Type II error, are

ultimately a waste of the researchers', participants', funders', and journals' resources (Faber & Martins Fonseca, 2014).

The proposed solution is, quite simply, to recruit more participants. Sufficiently large sample sizes reduce error and bias, increase confidence that any observed effect is not simply due to chance, reducing the chance of Type II error and increasing the precision of the anticipated estimation of effect (i.e., narrowing the confidence interval) (Biau et al., 2008). Furthermore, larger sample sizes can provide the opportunity for more powerful data analysis and inference allowing for researchers to potentially observe and quantify small or complex effects (Lin et al., 2013). Excessively large sample sizes (e.g., > 10,000 data points), a much rarer occurrence than insufficient sample sizes, need to be approached with caution as well because they can cause Type I error whereby any miniscule effect becomes detectable (Lin et al., 2013).

The difficulty in collecting a decidedly large enough sample involves accruing sufficient resources for the recruitment and retention of participants, such that researchers are successful in generating an initial interest and a sustained commitment among the population from which the researcher is sampling. Once researchers gain access to the population, it can be challenging to interest prospective participants in engaging, and subsequently following through with participation, in the research study. There is particular difficulty recruiting from certain populations, such as adolescents, who may be more likely to choose activities or endeavors based on how personally relevant and intrinsically or extrinsically beneficial those activities are to them while also not requiring an excessive amount of their time or effort (Thomas et al., 2019). Therefore, researchers often need to make the process of participation advantageous, quick, easy,

and potentially enticing with some form of personally beneficial outcome (i.e., incentive or inducement) directly related to participation.

The advantages and disadvantages, including ethical concerns, of inducements have made incentivized participation a highly debated topic in psychological and medical research (e.g., Bernstein & Feldman, 2015; Nguyen et al., 2014; Permuth-Wey & Borenstein, 2009; Phillips, 2015; Scherer et al., 2005). The main arguments against using incentives, particularly those of a financial nature, include individuals agreeing to participate without fully reflecting on the risks and processes associated with participation, the possible exploitation of those who are economically disadvantaged, the potential for prospective participants to be dishonest about information that might disqualify them from participating, and concerns about the relationship between researcher and participant becoming transactional or commercial (Permuth-Wey & Borenstein, 2009). Financial compensation is a particularly controversial topic when it involves vulnerable populations (e.g., youth) due to their susceptibility to the allure of monetary gain, a lesser ability to determine value of efforts, continued participation beyond what they would otherwise agree to for fear of losing out on compensation, and conflicting or undue coercion to participate when parents/guardians consent to their child's participation (Scherer et al., 2005).

Even if financial incentives were considered an appropriate addition to recruitment strategies, many researchers do not have the resources to implement the strategy. Therefore, other options need to be explored, such as material incentives, providing greater information about the health and societal benefits of participation, and ensuring that participation is as inexpensive and convenient as possible for potential participants (Nguyen et al., 2014). Implementing these recommendations can be challenging for researchers who may not have the ability to invest the time and effort, nor might they have the permission or the wealth to supply

material incentives, rewards, or reimbursements. The result, therefore, is for researchers to recruit however many participants they can manage and either hope for statistically significant (and thus, publishable) results, or to engage in any of the afore-mentioned QRPs in order to discover some outcome worthy of attention, recognition, and, ultimately, publication.

It is important to recognize that there are rationales for purposefully pursuing smaller sample sizes, such as facilitating the implementation of more detailed methods and gaining greater insight into novel phenomena. As Bornstein and authors (2013) assert, small samples allow for a topic to be explored in greater depth, accumulating more information via methods that encourage detail (e.g., open-ended questions). Larger samples may require more resources than a researcher can obtain to achieve the same level of depth, thus forcing the researcher to resort to less detailed measures. Therefore, prior to allocating significant amounts of resources into a large study that aims to explore and examine a lesser established phenomenon, researchers may decide to first determine its existence via a small-scale study (Hackshaw, 2008). Furthermore, small studies can provide an indication of, or trend toward, an effect, even if that effect misses statistical significance, signalling the necessity for further investigation and, therefore should be recognized and valued for their preliminary contributions (Hackshaw, 2008).

Issues with Measurement of Physical Activity

The third main issue purportedly contributing to "low quality" PA research involves an overreliance on subjective measures (e.g., questionnaires, diaries, logs, etc.), some of which have not been validated for the population within which they are used, for determining PA behavioral outcomes. The problem with subjective measures includes systematic errors, or biases, and random measurement error (Bollen & Paxton, 1998). Misinterpretation of questions, memory limitations, social desirability bias, acquiescence bias, central tendency bias, and errors in

inference and estimation all threaten the validity and reliability of subjective measures (Streiner et al., 2015). When applied to specific populations, such as youth, the margin of error may be even larger given that young participants may not be aware of, nor reflect upon, their PA behavior sufficiently to be able to accurately respond to questions about it (Colley et al., 2019). As Stathi and colleagues (2009) state, finding an appropriate measure for PA in youth populations is particularly important because their daily movement is less predictable and more spontaneous than adult populations and youth tend to have less accurate recall of their PA behavior.

In trying to determine the most appropriate measure, researchers also need to consider whether existing tools have been validated for use in the population of interest. Without valid measurement, there is little confidence in the results of a study and an inability to provide any meaningful and applicable conclusions from the work (Vaughn & Daniel, 2012). Therefore, it has been suggested that PA researchers employ purely objective measures wherever possible, limit subjective measures to only those constructs that cannot be measured objectively (e.g., cognitions and emotions), and ensure that all measures have previously been validated for the population in which they are used (Nigg et al, 2012; Silfee et al., 2018).

Objective vs. Subjective Measures

Objective measures, such as wearable devices (e.g., pedometers, accelerometers, heart rate monitors, etc.) and direct observation, minimize error by assessing multiple dimensions of PA behavior (e.g., type, frequency, duration, intensity, domains), thus providing a more precise picture of human movement than subjective measures (Silfee et al., 2018; Stathi et al., 2009). Nigg and colleagues (2012) outline the advantages of these types of measures, such as the ability of direct observation to capture whole-body movement while minimally interfering with

participants' natural activity, pedometers' ease of use in diverse settings and relatively low cost, accelerometers' ability to capture movement in a variety of planes simultaneously and ability to record complex activities, and heart rate monitors' accurate measurement of exertion and physiological stress on the body.

The difficulties in utilizing objective measures of PA mainly concern their cost, with certain methods being more expensive than others (e.g., accelerometers compared to pedometers), limited measurement of PA in specific circumstances (e.g., pedometers do not measure upper-body activity nor activities without foot impact), noise contributing to accuracy issues (e.g., accelerometers recording background vibrations, heart rate monitor results being affected by medications, pathology, or stress levels), participant burden or discomfort with wearing a device, and the necessity for an extended period of time wearing the device or being observed in order to obtain sufficient data (Nigg et al., 2012). When considering youth populations, participant burden, such as having to remember to wear the device every day, and discomfort or annoyance caused by the device itself can contribute to participants' low compliance with, and adherence to, study protocol. Other limitations of objective measures include heterogeneity of data analytic processes, lack of sufficient memory storage requiring participants to retrieve and record data at regular intervals, and the knowledge of their PA being measured affecting participants' behavior (Silfee et al., 2018). Furthermore, not all devices are capable of capturing all types of PA, such as water-based or load-bearing activities (Colley et al., 2019). Therefore, while generally it is agreed that objective measures are a more accurate option for measuring PA than subjective measures, they are by no means infallible.

Subjective measures may be more appealing to PA researchers because of their ease of administration, cost-effectiveness, capacity to quickly accumulate large amounts of data, lower

participant burden, and their ability to capture quantitative and qualitative information

simultaneously (Ainsworth et al., 2015; Nigg et al., 2012). Despite these advantages and their

superior ability to provide an overview of population level PA, subjective measures are greatly

impacted by measurement error, such as recall bias and/or daily or seasonal variability of PA

behavior (Bauman et al., 2006). The trade-off between obtaining individual, detailed, and

accurate accounts of PA compared to, potentially biased, large-scale population-level PA

behavior information may be difficult to navigate. As Nigg and colleagues (2012) suggest, any

valid measure of PA is better than none at all. However, it is recommended that researchers

pursue improvements to existing measurement methods and potentially use multiple PA

assessment methods to consolidate data (Nigg et al., 2020). For example, Jahedi and Méndez

(2014) suggest that researchers utilize a combination of subjective and objective measures,

paying special attention to situations where there is disagreement between the two types of

measures because it signals interference or additional input from the environment.

Inconsistencies in various measurement modalities create the need for further investigation

whereas strong correlation between objective and subjective measures should reinforce the

validity of results. However, employing multiple PA measures with youth samples, while a

laudable goal, is probably unrealistic considering the struggles researchers have previously

expressed when trying to successfully accumulate complete and accurate data from even a single

PA measure.

Validation of Measures

A well-known definition of validity is "the extent to which a test measures what it

purports to measure" (Cronbach, 1949, p. 48). While this definition covers the fundamental

aspect of validity, it does not take into consideration the proposed purpose and intended uses of

the test and the test scores (Sireci & Soto, 2017). Therefore, a joint committee of scientific bodies (American Educational Research Association [AERA], American Psychological Association [APA], and National Council on Measurement in Education [NCME]) published the following comprehensive definition of validity in the *Standards for Educational and Psychological Testing*: "the degree to which evidence and theory support the interpretations of test scores for the proposed uses of tests." (AERA et al., 2014, p. 11). If a measure is proven to not be valid, any result and subsequent interpretation of that result would fail to be meaningful, useful, appropriate, and trustworthy (Messick, 1995). Essentially, the truthfulness or veracity of one's conclusions is threatened when a non-validated measure is used (Vaughn & Daniel, 2012).

The proposed solution is to ensure a measure is validated for the population and context in which it is to be applied prior to use. Historically, the process of validation included conducting a single study with a single sample, sometimes split in two for cross-validation, in order to make a conclusive declaration of the measure either being "valid" or "not valid" (Zhu, 2012). This approach was eventually deemed unacceptable because it failed to recognize that validity is an evolving property, and the validity of a measure differs across people and places or contexts (Messick, 1995). Therefore, it is recommended that researchers make long-term efforts to continuously collect validity evidence, especially when the test is applied to new subpopulations and in different contexts (Zhu, 2012).

Current recommendations for validity testing include compiling evidence on five aspects of a measure: test content, response processes, relationships to other variables, internal structure, and consequences of testing (Vaughn & Daniel, 2012). Test content refers to aligning the assessment with standards to clarify the true meaning of a score; response processes account for whether the measure is accurately recording the skills or behavior of interest; relationships to

other variables include confirming a positive relationship with other evidence of the behavior known or assumed to be valid; internal structure involves applying statistical techniques (e.g., factor analysis) to assess the validity and reliability of the measure; and, consequences of testing include considering the social aspects of bias, fairness, and distributive justice (Vaughn & Daniel, 2012).

Multiple studies involving mass amounts of data are required in order to assess and gather evidence of validity. As previously discussed, conducting an extensive research program (i.e., multiple studies) requires ample amounts of time, money, access to prospective participants, and resources, some or all of which may be difficult for researchers (particularly those studying youth) to acquire. Another deterrent for validity testing, and perhaps a reason why researchers provide justifications for using measures that have only been validated in population(s) that are loosely justified as being similar to the one they are studying, involves limited value and importance placed in validation studies among publication bodies (Ritchie et al., 2012). Submissions of validation studies are often only accepted by research journals if they are part of a larger research program that provides novel and significant findings with the newly validated measure (Ritchie et al., 2012). Therefore, validating a measure prior to use in a specific population is a sizeable and resource-heavy endeavor that might not even be deemed sufficient to be accepted for publication, leaving researchers to question whether such an undertaking is worth the investment of time, money, and effort.

Commentary

This paper has identified three main methodological issues contributing to, purportedly, "lower quality" PA research – an excess of nonexperimental designs, an overabundance of studies that use convenience sampling and/or have small sample sizes, and an overreliance on

subjective measures of PA behavior – and discussed potential reasons why these issues persist in current research. The main themes emerging from that discussion included: a) lack of resources such as funding and materials, b) time pressures that limit researchers' ability to pursue more complex designs, better recruitment strategies, and appropriate measures, c) challenges gaining and maintaining access to the population of interest, and d) difficulty engaging potential participants in the research such that they agree to participate and adhere to the protocol for the duration of the study. This final commentary section will seek to extend the discussion of these themes to include some ideas on how the current culture surrounding production, value, and publication of research might be stifling the quality of research being produced, how there exists excessive barriers and red tape in connecting with potential participants, and, furthermore, provide some new perspectives on how the research community (including funding agencies, academic journals, research institutes, universities, etc.) might be better able to support researchers in accessing hard-to-reach populations and pursuing quality research.

The most frequently discussed barriers to pursuing high quality methods were lack of funding and time. In determining the cause of these barriers, questions arose, such as: What is valuable and valued in research? And, what is causing seemingly intense time pressures on researchers? There are several recurring points of discussion within the literature that could provide some answers to these questions. Regarding what is valuable in terms of research (i.e., deserving of grants, publication) and researchers (i.e., deserving of academic employment, awards, rewards), one must look at the current systems being used to assess research studies and research institutions. Research quality is initially judged via peer review and is largely based on the novelty and significance of findings (Button et al., 2013). The enduring impact of research is subsequently judged based on number of citations and the quality of the journal in which it is

published (Nathan & Shawkataly, 2019). Journal quality is predominantly determined by its impact factor, which is calculated from the number of publications and citations it has received (Nathan & Shawkataly, 2019). Finally, university rankings are determined from a composite measure of several components (e.g., peer review, recruiter assessment, faculty-student ratio, research citations, international orientation and web-based metrics), but are largely based on creation of information (i.e., research output), which outside stakeholders use to assess quality (Linton et al., 2011). Prolific and influential researchers (e.g., those with a large number of publications and citations, meaning high-impact research), therefore, are desirable to universities in order to boost their rankings (Linton et al., 2011). Essentially, when determining the value of a researcher, the decision comes down to who is most likely to attract and amass the largest amount of external funding, which is determined by number of publications in high-impact journals.

Academics who are privileged in their access to resources and/or blessed with recognition, particularly early on in their careers, will be able to pursue sophisticated methodologies and statistical analyses, elevating their status to become top candidates for further grant support, acceptance for publication, and tenure-track positions (Rozin, 2009). Thus, it can be argued that research quality is about subjective value, influence, and popularity and researcher value is simply about the sheer volume of "quality" research they produce. It has been suggested that the use of citation frequencies (a direct product of peer judgment) as an indicator of quality and, subsequently, for decisions regarding scholarship, employment, and funding causes academics "to engage more aggressively in doing research for the purpose of gaining extrinsic rewards rather than for their own interest or for the sake of acquiring or disseminating new

knowledge and to push the boundaries of knowledge in their field of specialisation" (Nathan &

Shawkataly, 2019, p. 45).

Regarding the question of intense time pressures placed on researchers, commentaries

suggest that the 'publish or perish' culture in academia, whereby researchers, particularly early

career academics, feel a need to constantly produce, be visible, and remain relevant in their field

in order to gain recognition and value as a professional in the world of research and academia,

may be a strong contributor. The perceived need for researchers to publish in order to be

successful is a highly competitive endeavour, the pressure of which is further exacerbated by a

publication bias that results in certain types of findings (e.g., novel and statistically significant)

being favored over others (Button et al., 2013). Ware & Munafò (2015) posit that the 'publish or

perish' culture and journals' desire for novel findings have contributed to many problematic

research behaviors and outcomes, such as significance chasing, QRPs, and poor study

reproducibility. The authors suggest that change to the current culture needs to come from

funders and publishers who have the power to modify the current incentive structures (Ware &

Munafò, 2015). This top-down approach for change suggests that those who control the money

(e.g., funding, awards, academic employment) are ultimately in control of the quality of research

produced.

Musambira and colleagues (2012) suggest that economic downturn since the early 2000s

has contributed to a mounting pressure on university faculties to secure their own funding and

generate external revenue, ultimately creating a "get grants or perish" pressure to accompany the

existing publish or perish culture. The amplified pressure to establish a research presence, gain

recognition and exposure, and, through that, accrue funding, has resulted in a more rushed

research process that has, arguably, contributed to a decline in research quality. The expected

pace of productivity in academia is unsustainable particularly when, as has been observed in the pandemic climate of 2019-2021, researchers' lives outside of the "laboratory" need to, and should, take a higher priority. The problem lies in the fact that researchers' value is almost entirely based on the volume and the acknowledgment/recognition of produced works. Furthermore, the fundamental purpose of publishing – to disseminate knowledge and share new findings with other researchers/academics in the field in order to enhance teachings on the topic (Nathan & Shawkataly, 2019) – does not seem to align with the driving forces for the current pressure to publish – namely, enhancing the prestige and status of universities, accumulating external funding, and gaining tenured employment.

Moving forward, changes to what is recognized as having value and the culture that determines the value of research and researchers is needed. With regards to what is valuable, Rozin (2009) has seven suggestions of types of research studies that should be given more attention and recognition and should occupy more space in journals. They include studies describing phenomena that naturally occur in the world, descriptions of relationships between two variables, interesting phenomenon that is difficult to perceive and occurs among very few or a very specific subpopulation but that still has wider social effects and implications, commentaries on an unstudied phenomenon that can be assumed from other verified phenomena, previously ignored research that deserves a closer look, replication studies to ensure effects previously found are robust and generalizable, and messy easily-criticizable experiments reporting new and interesting findings. Ultimately, Rozin (2009) suggests more diversity in approaches, participants, and the research questions being asked and less preoccupation with "faults" of each individual study. In an effort to stop quashing creativity in critical thinking and broadening the scope of research worthy of recognition, funding, and publication, he states:

There is no simple solution to reconciling the desire for rigor with the desire for relevance […] psychology as an academic discipline has tipped the balance too much in favor of rigor, favoring experiment and hypothesis testing over examination and description of the basic phenomena in the field. It is probably more important to explore something real, important, and general across cultures than it is to do sophisticated experiments on something much less important. (Rozin, 2009, p. 439)

In terms of study design, a new perspective may be to shift away from strictly valuing RCT and other experimental designs and instead placing higher value in the depth of information that can be ascertained from various naturalistic studies. As opposed to experimental studies, naturalistic research does not aim to isolate and control variables, but rather observe and record them as they manifest within the context of the participant's everyday environment (Salkind, 2010). A naturalistic approach may provide a more complete picture of the pathways surrounding human behavior. This approach is based on two sets of concepts, one of which claims that "human behavior is so significantly influenced by the context in which it occurs that regularities in those contexts are often more powerful in shaping behavior than differences among the individuals present" (Owens, 1982, p. 5). The second concept being that "one cannot understand human behavior without understanding the framework within which the individuals under study interpret their environment, and that this, in turn, can best be understood through understanding their thoughts, feelings, values, perceptions, and their actions." (Owens, 1982, p. 5). This is further echoed in Guba and Lincoln's (1981) statement that it is virtually impossible to imagine any human behavior that is not heavily mediated by the context in which it occurs.

In other words, it is difficult to make context-free generalizations about human social systems and behaviors and, therefore, research that is conducted within participants' natural

environments should be valued for its ability to provide a more complete picture of the complexities surrounding the participants' behavior. Kretchmar (2008) states that "[Researchers in kinesiology] encounter more variables, more interactions, more mediators, more reciprocal relationships. The problem [of complexity] seems to expand even as our knowledge increases" (p. 6). He further recommends that researchers broaden their perspective and speak "more in terms of influences, constraints, partial causes, interactions, dynamic relationships, opportunities, and possibilities than, say, underlying mechanisms" (Kretchmar, 2008, pp. 7-8).

In terms of the academic culture in which the value of research and those who conduct research are determined, the San Francisco Declaration on Research Assessment (DORA) has identified problems with the current methods of evaluating individual research performance and makes suggestions for how the system can change to adopt a more holistic evaluation approach. Specifically, researchers contributing to the DORA report have established various cognitive and systemic biases that contribute to inequitable and unfair review, promotion, and hiring practices (Hatch & Curry, 2020; Hatch & Schmidt, 2020). The authors suggest that in order to make changes, the research community must first address the privilege that currently exists in academia and take "proper account of how luck and opportunity can influence decision-making more than personal characteristics such as talent, skill and tenacity" (Hatch & Curry, 2020, p. 2).

It is challenging, however, to make a change at an institutional level if sources of funding and ranking/reputation still rely on traditional assessment tools. As such, the responsibility for pioneering change falls upon those in positions of power (i.e., individuals and committees who are in charge of publishing, funding, and hiring decisions), who may find it difficult to break away from tradition if they perceive their peers and/or competition to be staying the course. A worldwide collective agreement on standards of criteria and procedure, potentially with some

form of enforcement, is needed in order to see progress towards more fair and equitable awarding of funding and jobs. Hatch and Curry (2020) provided examples of various faculties, research groups, and institutions who have begun the process of developing their own standards, however, there is yet to be any widely agreed upon and implemented criteria. Hatch and Schmidt (2020) explored the biases that often arise during review, hiring, and promotion decision-making, such as halo effect, confirmation bias, status quo bias, and the Matthew effect. The authors discussed how these biases contribute to issues during key decision-making processes and further provided some ideas for how institutions can improve their practices in future (see Table 5.1).

The second part of this commentary will address another common theme that arose when exploring difficulties pursuing higher quality research in youth: difficulty gaining access to, and generating interest from, prospective participants. Recruitment efforts are stymied when a disconnect exists between the researcher(s) and the population of interest. When the population of interest is considered vulnerable (e.g., youth), gaining access often involves first connecting with those who are responsible for the vulnerable individuals, sometimes referred to as "gatekeepers" (Abrams, 2010). The networking required is time-consuming and effortful, often requiring various levels of ethical approval, permissions, and safety verifications (e.g., police background check) prior to the researcher being allowed to start the process of contacting potential gatekeepers with the hopes that they agree to facilitate the research process. Even once access is obtained via gatekeepers, there is no guarantee that potential participants will be interested in participating and/or follow through with obtaining parental consent and completing the research. The task of researching youth, therefore, can be quite daunting and discouraging.

In terms of gaining access, many researchers discuss the importance of gatekeepers and research champions – essentially, adults who work with youth populations (i.e., are known, trusted, and have an established rapport) and who can act as a liaison between the researcher and those being researched. Wise and Cantrell (2019) found that the most effective recruitment strategy when trying to recruit marginalized youth involved the researcher first developing a strong relationship with clinical staff and social workers (i.e., gatekeepers to the population of interest). They further comment that close and trusting relationships were the key to recruitment of adolescents while adolescent-related incentives and texting reminders were most effective for retention (Wise & Cantrell, 2019). Providing transportation to/from the research venue was also a key factor for research engagement and continued participation (Wise & Cantrell, 2019). Passive recruitment strategies (e.g., flyers, print or media advertisements) were found to be ineffective unless reinforced in person. In other words, there needs to be some human connection in order to establish even a cursory level of interest and accountability. The authors suggest the more personal contact (e.g., face-to-face, over the phone, and/or texting) researchers have with participants, the more effective the recruitment and retention (Wise & Cantrell, 2019). Therefore, in situations where researchers have limited contact (i.e., one or two interactions) with potential participants, especially if those interactions involve the researcher addressing a group as opposed to each person individually, recruitment may not be very successful.

There have been several studies conducted with the purpose of determining how to facilitate and improve youth participation in research. For example, Robbins and colleagues (2012) conducted focus groups on research participation and found that adolescents are more likely to participate if their parents repeatedly encourage them to participate, if their peers/friends show interest as well, and incentives are provided (in the case of their study, snacks and a gift

card or phone credit). The researchers also noted that some participants expressed more internal factors for participation, such as social good (wanting to contribute to help others), meeting new people and making friends, and learning about themselves (Robbins et al., 2012). In terms of their own study, the authors commented that recruitment was largely done via parents who were acquaintances of the researcher, distribution of flyers at schools, and a one-day advertisement in local newspapers. They noted that despite the variety of recruitment methods used, they mostly had to rely on word-of-mouth recruitment (i.e., snowball sampling). The authors state, "Effective recruitment of adolescents requires an appreciation of motivators, as well as time and resources to extend potential participants' understanding." (Robbins et al., 2012, p. 12).

The topic of incentives, particularly those of a monetary nature, has previously been discussed in terms of the ethical concerns for their use with youth populations. Several researchers have mentioned the success they have had in using incentives. Nguyen and authors (2014) found that money-driven incentives such as gift certificates, cash, prepaid cell phones, and calling cards were useful in recruitment of adolescent participants. Meanwhile, a combination of monetary incentives (e.g., railway passes, movie gift cards) and other types of incentives (e.g., school credit and free food) were helpful for the retention of participants (Nguyen et al., 2014). Permuth-Wey & Borenstein (2009) comment on how incentivizing research participation can assist with quicker recruitment, ensure sufficient numbers and specific types of participants are recruited, compensate participants for their time and effort, and reduce any financial burden participants may experience from participating in the research.

While incentives are often used by researchers who have the resources to offer compensation, others have commented that their use is minimally effective. Scherer and colleagues (2005) observed that financial compensation had very little impact on adolescents'

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decisions to participate and, instead, relationships with research personnel were far more influential. Participant-friendly recruitment approaches involve being consistently present in the spaces occupied by potential participants and building relationships so that there is a sense of camaraderie and accountability. Baxley and Daniels (2014) recommend building relationships with potential adolescent participants by making time for "socialization, food, and fun" (p. 37). They recommend this approach in combination with straightforward and frequent communication via telephone calls, texting, or social media to retain participants (Baxley & Daniels, 2014). Indeed, many researchers discuss the success achieved when they were able to be present in some aspect of potential participants' lives, build a rapport with them over repeated exposures, and engage in activities that capture adolescents' attention and create a desire to participate.

Considering a key factor in recruiting adolescents seems to be connecting with them, either directly or through a parent/guardian/adult who is responsible for them, adolescents who are largely disconnected (e.g., homeless, isolated, sheltered, disengaged) will be far more difficult to reach. Mendelson and colleagues (2020) looked at an often-neglected adolescent subpopulation – low-income urban youth of color – to explore what strategies best help to include them in research. They took a three-phase approach to recruitment in which they mailed study information and consent forms to the potential participants, met with those same potential participants at their schools to further discuss the project and hand out forms, and then followed up with phone calls to the potential participants' homes. Even with using all these measures together, the research team was only successful in recruiting 46% of those who were eligible to participate. The authors go on to explain that having support from school administration (i.e., a letter to parents from the principal indicating the principal's encouragement for students to

participate and phone calls to obtain parental consent completed by school staff instead of research staff) was a key component to successful recruitment (Mendelson et al., 2020). It is important that contact be made by individuals with whom students and parents have an existing familiar and trusting relationship. On-going efforts involved research staff showing up to parent/teacher nights to discuss their study, being present in the school daily in order to follow-up with potential participants and answer any questions they had, and holding pizza parties for classes whose students met return deadlines for consent forms (Mendelson et al., 2020). Furthermore, school staff (e.g., teachers, administrative staff, educational assistants) who worked as "study champions" were provided with small honoraria for their extra assistance in recruitment and retention efforts (Mendelson et al., 2020).

The authors noted that one strategy was particularly helpful in increasing the rate of returned consent forms: digitalizing consent forms. When parents were able to either take a photo of the signed consent form and email it to the research team or use the Adobe app to sign and submit the consent form, the researchers noticed a large increase in the number of returned consent forms (Mendelson et al., 2020). Again, the more direct and efficient the research process, the less opportunity for breakdown of communication and loss to follow-up. In terms of retention, the authors noted having an expanded contact information sheet with not only participants' address(es) and phone numbers, but also participants' social media handles (e.g., Instagram and Facebook) and information of two alternate contacts who would be able to reach the participant, greatly increased the researcher's ability to follow up with them (Mendelson et al., 2020). The issue with such methods, however, is that ethical approval for collecting such extensive personal information of a large amount of people and, further, using less-secure

technological and media outlets for contacting and communicating with youth, particularly

marginalized youth, may be difficult to obtain.

The conclusion one can draw from all of these, reportedly successful, strategies to recruit

and retain adolescent participants is that it will take a lot of time, money, and effort to do so.

Essentially, the researcher needs to become entrenched in some part of the adolescents' natural

environment (e.g., at their school, at a recreational activity or a social space, etc.), make

obtaining consent and participating in the research as easy and efficient as possible, continuously

use incentives such as food or money to attract and retain participants, and maintain frequent and

regular contact via some combination of in-person, phoning, texting, or social media messaging

communication. Furthermore, it appears to be helpful if researchers engage "gatekeepers" (i.e.,

trusted adults) and first recruit them to become research "champions" (i.e., promoters and

facilitators) to optimize reach for recruitment and retention. Therefore, for researchers who are

interested in working with youth populations in future, the recommendation would be to find

ways early on to incorporate themselves into the environments in which youth exist (e.g.,

volunteer in schools, recreation facilities, youth groups, etc.) in order to build relationships with

youth over time and also to connect with other adults who work closely with those youth every

day. Playing the long game of networking, relationship-building, and establishing connections

will facilitate the future research process.

In terms of additional support for researchers who aim to recruit hard-to-reach

populations, enhanced collegiality and collaboration within/between research institutions,

departments, and laboratories can be helpful to pool resources. Many researchers have discussed

how uncommon it is for academics to engage in interdisciplinary work. Kretchmar (2008)

describes the effect of researchers operating uniquely within their own specializations, stating

that it creates division, splinters the profession, promotes hierarchies, impedes unity, creates tension, makes communication difficult, and makes it easier to subdivide departments. As is commonly understood, the more shut off one is from others, the less opportunity there is for advancement. In terms of creating community connections and gaining access to a greater network of individuals who could aid in the recruitment of hard-to-reach populations, combining efforts with other research groups and engaging in multi-laboratory collaborations may be of benefit (Forstmeier et al., 2017).

In summary, research is not naturally built into homes, schools, workplaces, or, really, anywhere in society outside of research institutions. Therefore, those who pursue research often work independently and separately from the people, places, and things they wish to study. This contributes to researchers experiencing challenges designing a research program that is feasible for them and acceptable for those who participate, determining methods that accurately measure what the researcher desires to measure while not being overly burdensome for participants, gaining access to the population from which to draw a representative sample, convincing potential participants and those who facilitate access to those participants of the importance of their research (i.e., gaining buy-in), and ensuring participants comply with, and adhere to, research protocol. Even when researchers develop a rigorous research program, they may find they do not have sufficient resources (e.g., time, funds, manpower) prior to commencing data collection, or they end up depleting their resources prior to completion of the study, leading to a default to simpler methods, such as cross-sectional designs, convenience samples, and subjective measures, as a fast and efficient solution to the problem. It could reasonably be postulated that a large portion of published "low quality" PA studies were originally conceived to be of a much higher quality – something more ambitious, thought-provoking, and impactful to advancing the

field. However, the researcher was most likely forced to whittle their research idea down to a quicker and easier compromise just to complete their research program within designated time constraints and with meager funds to do so. In order to elevate the quality of future research, those in positions of authority (e.g., reviewers, publishers, granting agencies, research institutions) need to reshape their processes, decreasing the competitive pressures placed on individual researchers and increasing their support so that researchers have the necessary resources to pursue, and succeed in, their research ambitions. Furthermore, greater connections need to be forged between researchers and those who are being researched by increasing cooperation and collaboration within and between research institutions, community organizations, and social programs. Ultimately, the more integration there is, the easier it will be to access vulnerable or protected populations (e.g., youth) and increase their representation in research.

Table 5.1. Issues with research assessment & ideas for change

ISSUE	DEFINITION OF ISSUE	IDEAS FOR CHANGE
"Objective" comparisons are not necessarily equitable	Qualities that can be measured or ranked are tempting because they feel less subjective but can feed a false sense of precision.	• Balance the use of quantitative metrics with qualitative inputs that capture more intangible qualities • Select standards based on a wide set of inputs rather than a narrow or anecdotal set • Recognize where setting specific, quantifiable goals may be reinforcing some behaviors at the expense of others
Individual data points can accidentally distract from the whole	It is hard to weigh all information equally, which can give initial or "shiny" data points and personal reference points an advantage.	• Assemble diverse teams to bring a range of perspectives and experiences into decisions • Look outside your institution or discipline to broaden a sense of "normal" • Put reputation-based indicators like education at the end of applicant materials to reduce preconceived notions
We gauge value by association	Highly rated or prominent institutions and journals (and those associated with them) often get the benefit of the doubt based on familiarity or reputation rather than reality.	• Use structured interview protocols to keep decision-makers focused on agreed-upon qualities, rather than on reputation • Explicitly articulate and consider long-term and qualitative values, as well as short-term or easily quantifiable needs • Have applicants highlight and articulate their most meaningful contributions to reduce reviewer reliance on journal names or quantifiable characteristics of productivity
Incumbent processes and perceptions have the advantage	Many institutions have deep legacy traditions that become normalized over time, but these organizational habits can also keep new ideas and people out.	• Make the benefits of new behaviors concrete, salient, and easy to grasp • Recognize where old assumptions may overly reward those who are more traditionally successful, at the expense of new or more diverse talent • Set, publicize, and adhere to measurable goals that look beyond traditional norms of success when reviewing potential candidates to broaden the pool of individuals under consideration

Source: Hatch & Schmidt (2020). Rethinking research assessment: Unintended cognitive and system biases. *DORA*

Chapter 6. General Discussion

Current reports (e.g., Colley et al., 2017; Guthold et al., 2020) indicate that the majority of adolescents are insufficiently active to achieve positive health outcomes. Furthermore, research indicates that time previously spent being active gets increasingly replaced by sedentary time as individuals progress from childhood through adolescence into adulthood (Dalene et al., 2018; Telama et al., 2014). It is important, therefore, to consider the cognitive processes operating when individuals, particularly youth and emerging adults, decide to engage in PA, intentionally avoid PA, or opt for other, more sedentary, pursuits on a daily basis. Theories such as the RIM (Strack & Deutsch, 2004) and the ART of physical inactivity and exercise (Brand & Ekkekakis, 2018) explore impulsivity in decision-making and the influence of automatic affective reactions to stimuli in one's environment that might influence their immediate engagement in, or avoidance of, PA. Additionally, well-known cognitive behavioral theories such as SCT (Bandura, 1986) provide a framework for exploring personal, environmental, and behavioral factors that could impact individuals' deliberate and intentional reflections and subsequent actions. Combined, these theories may provide some insight as to what cognitive, affective, and environmental (physical and social) factors automatically draw adolescents to, or repel them from, PA and the subsequent rationalizing in which they may engage when thoughtfully considering their PA behavior.

The current thesis aimed to explore what positive and negative outcomes of PA adolescents automatically associate and reflectively indicate they associate with PA, how those associations relate to their existing PA behavior, and how those associations influence the immediate decision-making process when faced with the prospect of participating in a hypothetical PA program. An implicit measure (i.e., the GNAT) was used to capture automatic

associations between health and social/appearance outcomes and PA, and explicit measures (i.e., questionnaires) were used to record psychological constructs (i.e., attitudes, outcome expectations, self-efficacy, and positive body image) and PA behavior across two studies. The third and final paper provided an exploration of commonly experienced challenges when pursuing quality PA research with youth (e.g., an adequately powered experimental design using valid and objective measures of PA with a diverse and representative sample) with the aim of addressing the current academic culture that makes it difficult to mitigate these challenges. A brief summary of each of these papers is provided prior to a synthesized discussion of the observations and implications from the current thesis.

Summary of Study One

The purpose of the first study was to explore older adolescents' reflective and impulsive thoughts about health- and social/appearance-related PA outcomes and investigate how those thoughts related to their PA behavior. First-year undergraduate students (i.e., older adolescents or emerging adults) completed two GNATs; one that measured automatic associations between health outcome expectation words and PA words and one that measured automatic associations between social/appearance outcome expectation words and PA words. Participants also completed a questionnaire explicitly measuring their attitudes toward PA, outcome expectations from PA, and their PA behavior. Results showed that participants responded faster when associating desirable social/appearance outcomes with PA compared to undesirable social/appearance outcomes with PA. There was no difference in response times when participants associated desirable health outcomes with PA and undesirable health outcomes with PA. Correlation and regression analyses showed that explicitly-measured instrumental attitudes

predicted participants' self-reported PA behavior in the whole sample and that automatic social/appearance associations correlated with PA behavior, but only in female participants.

Together, these results suggest that older adolescents automatically associate positive social and appearance outcomes with PA, while having equally positive and negative automatic associations of health outcomes from PA. Therefore, older adolescents more strongly associate positive social and appearance outcomes with PA compared to their automatic associations between PA and health outcomes. In particular, immediately experienced or perceived social and appearance gains of PA, such as receiving positive attention and looking good, may play a stronger role than health outcomes, such as avoiding illness or increasing cardiovascular capacity, in older adolescents opting to participate in PA. This may especially be the case for older female adolescents. The emphasis among this age group, therefore, may be on the proximal benefits and costs of PA as opposed to long-term, less immediately perceptible or visible outcomes. The regression results suggest that positive automatic associations with PA alone are most likely insufficient to influence adolescents' PA behavior. Other aspects, such as strong instrumental attitudes (e.g., belief that PA is beneficial), may be needed (either on their own or in addition to positive automatic associations) in order to influence PA behavior in this age group. Instrumental attitudes were the only significant predictor of PA behavior, which might have captured older adolescents' abilities to rationalize and self-regulate behaviors based on perceptions or knowledge of what they *should* do compared to the more impulsive drive of what they want to do.

Summary of Study Two

Building on study one, the purpose of the second study was to determine whether automatic associations with PA, outcome expectations of PA, self-efficacy, and positive body

image would predict adolescents' impulsive decision to opt into or out of a hypothetical PA program. High school students (aged 14-18) completed two GNATs regarding their automatic associations of health and social/appearance outcomes with PA, and a questionnaire that explicitly inquired about their PA behavior, outcome expectations of PA, self-efficacy, and positive body image. Participant groups were cluster randomized by PE class to receive a description of either a hypothetical health-focused PA program or a hypothetical social-focused PA program. The health-focused PA program described a format whereby everyone in attendance would be given an individual exercise program related to their personal health and fitness goals (e.g., increased strength, improved cardiovascular health). The social-focused PA program described a format whereby everyone would participate together in group activities and partner exercises in order to be physically active in a fun and supportive environment. After completing the GNAT and questionnaire, participants were told about the hypothetical PA program and prompted to quickly and confidentially respond "yes" or "no" as to whether they would participate in the program if it existed at their school.

The GNAT results showed participants had greater accuracy when they associated both positive social/appearance and positive health words with PA words. Chi-square analyses showed a significant difference between groups for their responses to the hypothetical PA program, with 78% of those who received the health PA program description opting in versus on 42% of those who received the social PA program description. Odds ratios indicated that those who received the health-focused PA program description were over three times more likely to opt into the PA program than those who received the social-focused PA program description. Regression analyses showed that positive automatic health associations and the expected outcome of stress management were predictors of opting into the hypothetical PA program.

These results indicate that adolescents automatically associate positive health outcomes and positive social/appearance outcomes with PA. Regular and consistent emphasis on the positive gains or benefits of PA may be important when promoting PA to adolescents. The high percentage of opt-ins for the health-focused PA program shows that participants may have been drawn to the individualized aspect of that program. In contrast, the social-focused PA program may have been unappealing, or even intimidating, because it emphasized partner/group exercises whereby participants' bodies and physical abilities would be on display and/or open to observation and critique by their peers. Adolescents may be more attracted to PA that provides them with opportunities to improve physical and psychological health outcomes, such as feeling happy, confident, healthy, strong, energized, and skilled in an environment that does not create excess opportunities for their actions and abilities to be observed. Furthermore, results suggest that adolescents may seek PA as a strategy to minimize or manage negative feelings, such as stress and anxiety.

Summary of Paper Three

The purpose of this paper was to comment on the challenges that arise when attempting to conduct quality PA research with youth populations and, furthermore, to explore why researchers continue to struggle to mitigate or resolve recurring research methods issues. The main issues identified with current PA research include, a lack of experimental studies, an excess of cross-sectional designs, an overuse of convenience sampling methods, insufficient sample sizes, and an overreliance on self-report measures for PA behavior. The recommended solutions to these issues are to pursue more experimental research designs (particularly RCTs), employ population-based probability sampling methods, ensure collection of sufficient amounts of data, and use objective measures of PA behavior. Four main themes arose while exploring reasons

why these research challenges persist and why the proposed solutions are not being implemented: 1) lack of access to resources (e.g., funding, materials), 2) time pressures and limits placed on researchers, 3) difficulty gaining and maintaining access to youth populations, and 4) issues getting potential participants to engage in and adhere to the research study.

From these themes, two discussion points emerged. The first involved what is considered valuable and valued (i.e., worthy of funding and recognition) in research and the second included what is needed to facilitate connection with, and cooperation from, prospective youth participants. The first discussion point brought to light the fact that research quality is currently assessed by its novelty, its significance, the number of citations it receives, and the impact factor of the journal where it is published. Using these metrics as determinants of quality creates a divide whereby those who are privileged in their access to resources and/or blessed with recognition (particularly, early on in their research careers) will be able to continue pursuing more sophisticated methodologies and statistical analyses while those who are less fortunate and/or less privileged will continue to struggle in their pursuit of research of equally high quality. Furthermore, current "publish or perish" and "get grants or perish" cultures are placing immense pressures on researchers to continuously maintain a steady production of novel and significant research and, simultaneously, procure funding from sources outside of their research institution. In response to these pressures, some researchers have been found to resort to QRPs resulting in high volumes of research that is of lesser quality and difficult to replicate. Without considerable changes to the ways in which quality is assessed and quantified, the current "rich get richer, poor get poorer" divide, and subsequent excess of reportedly "low-quality" research getting published, will continue.

The second discussion point illuminated a few key elements that facilitate recruitment and retention of youth, most of which are difficult to achieve without substantial resources. It was determined that access to youth frequently requires networking with, and subsequent 'buy-in' from, "gatekeepers" (i.e., adults who work or live with youth and, thus, are known, trusted, and/or have an established rapport). It is important to develop a relationship with these adults and ultimately recruit them to become research champions, whereby they help bridge the gap between the researcher and those being researched. In other words, a stepped approach needs to be taken whereby researchers build rapport with adults who surround youth prior to building rapport directly with youth. Once access has been granted, developing a close and trusting relationship with youth is essential for their continued interest and cooperation in research. Connecting with youth by spending time with them in person, staying in close contact with them (e.g., via texting or direct messaging on social media) throughout the research study, and providing incentives or some form of material gain (e.g., snacks/food, gift card, money) have been shown to be moderately successful in recruiting and retaining youth in research (e.g., Baxley & Daniels, 2014; Mendelson et al., 2020). The more direct, efficient, and convenient the research process, the less likely participants will drop out.

In sum, researchers require more equal opportunity for access to support and resources in order to be able to produce the "high-quality" research that is expected and even demanded from those in positions of authority in research and academia (e.g., reviewers, journal editors, funding agencies, academic deans, faculty members, etc.). A reconfiguration of the current research assessment processes (i.e., reviewing, awarding, and hiring requirements) that includes an increase in collaboration and collegiality and a simultaneous decrease in pressure to produce, is needed. In terms of successfully completing "high-quality" PA research with youth, researchers

need to be able to gain access to, and maintain connections with, prospective participants. Networking with adults who already have close connections with youth, establishing relationships with youth themselves through consistent in-person and on-line communication, and providing incentives or material gains appear to all be necessary in tandem for generating and maintaining interest in research within this population.

Comment & Implications

Studies One and Two

The first two studies of this thesis used an implicit measure (i.e., GNAT) to capture adolescents' and emerging adults' automatic associations between words representing expected outcomes of PA and words representing PA. Study one lay the groundwork showing that the GNAT was successful in capturing older adolescents' (i.e., 1st-year undergraduate students) automatic thoughts regarding PA outcomes and relating them to their PA behavior. Study two built on those results by capturing younger adolescents' (i.e., high school students) automatic thoughts regarding PA outcomes and relating them to their impulsive decision to engage in a hypothetical PA program. The results of both studies showed that adolescents automatically associate positive physical/psychological health outcomes (i.e., happy, strong, confident, energetic, skilled, healthy, fun) and social/appearance outcomes (i.e., attractive, winner, popular, skinny, beautiful, thin, muscular) with PA (i.e., sports, gym, exercise, play, competition, workout, active). Study one showed that automatic associations of social and appearance outcomes with PA may be more prominent and/or influential in older adolescents, particularly females. The results from study two suggest that adolescents tend to think positively and are likely to experience positive automatic affective reactions when presented with general PA behavior-related stimuli. If these results are accurate and true, then the question remains, why are

the majority of adolescents still not choosing to engage in PA when they are presented with opportunities to do so?

The incongruency between positive automatic associations with PA and the lack of adolescent PA behavior suggests that a) positive automatic associations are insufficient on their own to propel adolescents towards PA participation, and b) there are likely other, context-specific factors that influence adolescents' immediate decisions to engage in or avoid PA. As an extension of this second point, the discrepancy could also be a result of the implicit task insufficiently capturing what is truly attractive or repellent about PA for adolescents. In other words, health, social, and appearance outcomes expectations of PA may be too narrow or simplistic to fully capture what information adolescents process when forced to quickly decide whether to be active or not. I will, thus, first discuss the development and influence of established automatic associations on an individual's behavior, and then explore the contextual (i.e., situation-specific) factors that could be impacting adolescents' decisions regarding PA participation, providing a broader perspective on what information might be processed when adolescents are presented with an opportunity to be active.

Cognitive associations develop via social learning over the course of the lifespan, although the younger years (i.e., from birth to young adulthood) are considered the most impactful for establishing and reinforcing associations (Olson & Dunham, 2010). There are several ways in which this social learning can occur, such as observing the actions of others in one's immediate environment, listening to the expressed thoughts/beliefs/experiences of others, deliberate teachings from those in positions of authority or power, and personal experiences from being exposed to a variety of social environments. Olson and Dunham (2010) further explain that the development of cognitive associations can occur slowly, via repeated exposure to relatively

benign experiences (e.g., day-to-day or common occurrences), or quickly, as might be the case with a highly volatile or emotionally charged experience (e.g., traumatic or miraculous event). These experiences and the emotional reactions brought about by them become internalized as associative stores in one's memory that get activated when similar situations, or elements in one's immediate environment that are similar to a previous situation, trigger them (Olson & Dunham, 2010).

The theorized connection between activation of cognitive associations and the subsequent action or inaction that is taken involves one's emotions and capacity to reflect (Neumann & Kozlik, 2016). For example, a triggered fear response could elicit an automatic avoidance behavior (e.g., flinching) and also serve to draw one's attention to the stimulus responsible for the emotional reaction in order to make a decision (purely impulsive or involving some reflection) regarding subsequent action (e.g., confront, ignore, or evade the stimulus). The difficulties predicting one's behavior from emotional reactions to a stimulus, however, can be attributed to: a) differences in awareness and interpretations of one's emotions, b) the potency (i.e., strength) of one's emotions, c) the complexity of the situation within which one encountered the stimulus (e.g., presence of others, limited options for how to act, etc.), and d) one's ability and/or inclination to engage in self-regulation (Neumann & Kozlik, 2016). In addition to one's immediate emotional reaction to a stimulus and the possible subsequent reflection on one's emotions and surroundings, behavior is influenced by an individual's goal pursuits. Individuals will be more likely to pursue action that aligns with perceived gains bringing them closer to a desired outcome and/or minimizing negative outcomes (Neumann & Kozlik, 2016). Thus, each specific context in which any given individual is faced with a stimulus will be influential in the decisions they make and subsequent (in)action they take.

Applying this knowledge, one can theorize about adolescents' decisional processes when presented with an opportunity to engage in PA. Suppose a high school student is asked by a group of peers to join them in a game of soccer at a local park. There will be an immediate affective reaction to the prospect of engaging in this PA situation that is reflective of the associations automatically activated in the individual's brain. Those automatic associations will be based off previous experiences and/or observations of the behavior itself (e.g., I like/dislike soccer, I'm good/average/not good at soccer, etc.), and/or the social climate in which the behavior will be performed (e.g., I like/dislike this group of peers, they're very/not very competitive, etc.), and/or the physical environment in which the behavior will be performed (e.g., I like/don't like that park, that area is safe/unsafe, etc.). Individuals could have immediate affective reactions to each new piece of information about the contextual elements that they perceive and impute throughout the decisional process. Their immediate reaction could be, a) positive (attraction to this specific PA situation) based on favorable automatic associations with the behavior, the social climate, and/or the physical environment, b) negative (aversion to this specific PA situation) based on unfavorable automatic associations with the behavior, the social climate, and/or the physical environment, or c) neutral (neither attraction nor aversion to this specific PA situation) based on the absence of, or equally positive and negative, automatic associations with the behavior, the social climate, and/or the physical environment. The subsequent reflection on whether or not they will participate in this specific PA situation, if time and/or mental capacity and effort allow for it, would involve rationalizing to either listen to or ignore their immediate affective reaction while also factoring in additional perceived facilitators and barriers.

Social cognitive theories consider facilitators and barriers to be elements within and around oneself that either support/enable or limit/hinder one's behavior (Bandura, 1986; 1997). Many studies have explored the personal (e.g., goal pursuit, physical ability, other priorities or desired activities), social (e.g., family/peer support, coach/instructor feedback), and environmental (e.g., safety, weather, availability, accessibility) facilitators and barriers that encourage or discourage adolescent PA participation (e.g., May et al., 2020; Payán et al., 2019; Peeters et al., 2012; Skogen & Høydal, 2021). Applied to the PA scenario above, it could be theorized that in a situation where one's immediate affective reaction is negative (for whatever reasons), the affect experienced could amplify any perceived personal, social, environmental barriers reflected upon and potentially impede or decrease perceptions of, and reflections on, facilitators. Additionally, the negative affective reaction might draw one's attention to, and magnify, facilitators for a different (i.e., less negatively perceived) behavior, ultimately resulting in the individual opting out of PA and justifying their decision to do something else instead. In a situation where one's immediate affective reaction is positive (for whatever reasons), it could guide the individual to reflect on additional facilitators to engaging in the activity while downplaying any perceived barriers. Additionally, the positive affective reaction might help distract from competing interests or obligations while providing rationales as to how/why pursuit of those interests or obligations could/should be delayed or dismissed. In this case, the individual would be likely to opt into PA. Finally, in situations where there are neutral reactions/reflections or discrepancies between immediate affective reactions and subsequent reflections (for whatever reasons), behavior would most likely be decided upon by determining what course of action would minimize negative affect and personal/social outcomes (i.e., the least threatening or uncomfortable option) and maximize positive affect and personal/social outcomes (i.e., the most

beneficial or comfortable option). For each of these situations, if the decisional process is rushed, there may not be time for all the elements that would factor into one's decision to be perceived, processed, and/or deliberately reflected upon. Therefore, contextual elements that are more salient to the individual, aligning more closely with their personal goals, and, thus, hold more weight in terms of importance or relevance, will probably be more readily perceived and most influential on one's decision and subsequent behavior.

Within this thesis, study two included conditions where participants were pressured to make a quick decision regarding whether or not they would engage in a PA program if it existed at their school. Participants received information about one of two PA programs – a health-focused program and a social-focused program. Both programs described a group environment, although the health-focused program emphasized individual activities while the social-focused program emphasized partner and group activities. Results indicated that those who received the health-focused program were over three times more likely to impulsively opt into the program than those who received the social-focused program. Anecdotally, many of the participants presented with the hypothetical social-focused PA program visibly recoiled at the prospect of engaging in group PA in that environment. In other words, their negative affective response was so strong that their aversion to the PA program (for whatever reasons) was immediately perceptible by their facial expression and body language. This response was not observed in those who received the health-focused program. It could be inferred, therefore, that some element(s) of the social-focused program was unappealing to the majority of participants who received it and, conversely, some element(s) of the health-focused program was either appealing or, at the very least, not immediately off-putting to those who received it.

Considering one of the key differences between the two hypothetical PA programs involved the format in which the PA would be performed (i.e., individual exercises versus partner or group activities), the idea of engaging in PA directly within the social group context may have triggered participants' anxiety. Within PA settings, social anxiety and social physique anxiety have both been found to impact individuals' PA levels (e.g., Cyr et al., 2019; Sabiston et al., 2014). Social anxiety is defined as "a state of anxiety [an aversive cognitive-affective reaction characterized by autonomic arousal and apprehension regarding impending potentially negative outcomes] resulting from the prospect or presence of interpersonal evaluation in real or imagined social settings" (Leary, 1983, p. 67). Social physique anxiety is a subtype of social anxiety whereby individuals experience anxiety specifically related to interpersonal evaluation of their physique (Hart et al., 1989). Social [physique] anxiety can factor into each of the previously discussed contextual elements (i.e., the behavior, the social climate, and the physical environment). For example, an individual might worry about looking bad, functionally and/or aesthetically, while engaged in the activity (e.g., low physical skill, not knowing the rules/equipment, not having proper clothing to wear), an individual might worry about negative interactions with others (e.g., being teased, bullied, criticized, judged, etc.), and/or an individual might worry about elements of the physical environment that increase the chances of a negative social interaction (e.g., location of the activity, high foot traffic, lighting, presence of mirrors or windows, etc.). Situations that involve ambiguity or novel tasks combined with public exposure are more likely to evoke social anxiety (Cyr et al., 2019). The most common settings in which adolescents would engage in PA (e.g., PE class, recreation complexes, sports fields, parks) often include some level of ambiguity and/or novel tasks and almost always include the presence (or

potential presence) of at least one other person, thus being optimal settings for increased experiences of social, and social physique, anxiety.

Another aspect of the social environment that may have deterred participants' responses to the hypothetical social PA program was not just exercising with "others" but, specifically, exercising with their school peers. The hypothetical PA programs were proposed to take place after school hours at the participants' school, thus those who would be participating in the partner and group activities would presumably be the participants' current PE classmates. Perhaps the prospect of engaging in partner or group activities would have been more appealing if it had involved a different social group or a social group identified as having specific characteristics (e.g., same-sex, similar physical ability, similar exercise goals).

Research on group cohesion has shown that harmonious and supportive group dynamics in youth sport and exercise settings can have positive effects on individual well-being (e.g., psychological, emotional) and individual/team success (e.g., Bruner et al., 2014; Fry & Gano-Overway, 2010; McLaren et al., 2015). The PE class environment, on the other hand, has received mixed feedback about how conducive its social environment is to adolescents' well-being and desires to be physically active in and out of class. One key element of PE that adolescents have indicated has had a negative impact on their desire to be active includes peers whose physical/sport skill levels and competitive attitudes did not match their own (Martins et al., 2018). Additionally, the risk of embarrassment from looking bad and/or performing poorly in front of peers has been indicated as a strong deterrent that could disrupt any interest or desire adolescents may have in participating in a PE activity (Wiltshire et al., 2017). In the current research, if participants were accustomed to feeling disconnected from or "less than" their peers (e.g., lower physical skill, different approach/attitude toward PA, different body shape) or if they

had previously had some negative interactions with peers with regards to their physical abilities, appearance, or performance in PE, they would be less inclined to engage in any additional PA with those same people.

While social and appearance outcomes may be at the forefront of adolescents' considerations of PA, research in this thesis showed that health-related automatic associations with PA, explicit attitudes towards PA and expected outcomes from PA were positive and predictive of PA decisions and behavior. Specifically, study one showed that positive instrumental attitudes regarding PA (e.g., valuable, useful, beneficial, good, important) were related to self-reported PA behavior in older adolescents, while study two showed that those who received the health-focused hypothetical PA program were more likely to impulsively opt into the PA program, and that automatic health associations and stress management outcomes were predictive of impulsive decisions to opt into PA. These results suggest that adolescents are highly cognizant that PA, in general, is good for them, that they may be more drawn to PA programs that emphasize opportunities to focus individually on their health goals, and that they may be particularly driven by the desire to decrease feelings of stress.

It is not surprising that adolescents are innately aware of the link between PA and positive health outcomes, to the point that they possess automatic associations between the two concepts. School PE lessons, popular culture, and mass/social media in Western(ized) nations (which are the main sources of information for youth regarding health, fitness, and PA) are dominated by a healthism discourse (Beltrán-Carrillo et al., 2018; Harris et al., 2018). This discourse suggests that health risks are linked to physical inactivity and obesity and that diet, exercise, and body weight are an individual's responsibility that should be self-monitored to conform with what is socially/culturally accepted as healthful (Webb & Quennerstedt, 2010).

The current image Westernized adolescents possess of what healthy looks like involves the "strong and skinny" look – low body fat combined with toned feminine muscles for females and low body fat combined with large bulkier muscles for males (Wiklund et al., 2019). Therefore, it may be difficult for the current generation of adolescents to separate out concepts of health from images or ideas of slim, toned/muscular, youthful-looking people (Harris et al., 2018).

It has been suggested that a triadic relationship exists between PA, fitness, and health in which PA leads to fitness and health, PA is essential for health, and that being fit and having a thin, toned body is evidence of health (Kirk & Colquhoun, 1989). Research has shown that adolescents in Western societies hold the limited conceptions that health and fitness are inherently interlinked and that both are predominantly related to being thin (or not being fat), having muscles, performing physical skills with ease (e.g., running without breathlessness), and being good at sports (e.g., Harris et al., 2018; Burrows et al., 2002; Powell & Fitzpatrick, 2015; Placek et al., 2001; O'Shea & Beausoleil, 2012). Furthermore, physical appearance seems to be a prominent feature in young people's conceptualizations of health and fitness, with several adolescents using descriptors related to body weight, shape, size, and attractiveness when asked to describe a healthy person (Harris et al., 2018). Ultimately, research findings suggest that adolescents' views on health and constructed images of what health looks like are reductive, superficial, simplistic, and narrow with a lack of understanding of a broader, holistic definition of health (Harris et al., 2018).

It is important to theorize, therefore, about what thoughts or images automatically cropped up for participants in the current research when they were presented with health words and/or a PA program that focused on individual health goals. What did they consider their "health" goals to be and what image did those goals create? For instance, the concept of

"increasing strength" might have automatically brought up images of toned or well-developed muscles, the words "cardio" and "endurance" might have brought up images of slim runners or muscular and lithe sprinters, and the idea of "improving flexibility" might have brought up images of thin yoga practitioners or gymnasts contorted into various shapes. It could also be speculated that many of the images those words elicit would most likely involve limited clothing, maximizing the body's exposure, similar to how athletes or athletic bodies would be seen on magazine covers, TV, or social media.

Aside from the intertwined concepts of PA, fitness, and health, there may also be conflation between 'looking good' and 'feeling good' from PA (Camacho-Miñano et al., 2019). It has been found that individuals have a tendency to believe that a positive change in outward appearance via one's own health behaviors (e.g., increasing their PA) will produce a corresponding affective change, such as increased happiness and more confidence (Camacho-Miñano et al., 2019). Participants in study two automatically associated positive health words (e.g., happy, confident, energetic) with PA. It may be that those associations were directly related to personal experience of those outcomes from PA, and/or it might be that participants' ideas of a physically fit, idealized "strong and skinny" person include a person who is also happy, confident, and energetic.

Additionally, participants' expectations of stress management (arguably, a mental health outcome of PA) were predictive of impulsively opting into PA. It could be postulated, therefore, that the affective response of "feeling good" from PA may also relate to mental well-being. Specifically, experiences of increased energy and a release of tension during and after moving one's body may be a motivating factor for subsequent engagement in PA. Recent research aligns with this supposition stating that adolescents generally feel better and more energized after

incidental activity (e.g., climbing stairs) and intentional exercise (e.g., going for a run or going to the gym) and that positive affective feeling states drive adolescents to repeat those PA behaviors (Koch et al., 2020). It is important, however, to consider the impact of adolescents' affective states prior to and at the time of making a decision about PA as they may be more influential on adolescents' immediate decisions compared to any associated positive affect experienced during or after PA (Cushing et al., 2018). In other words, even if adolescents tend to automatically associate "feeling good" with PA and that association normally drives them towards being active, if they are having a bad day or had a negative experience immediately prior to a PA opportunity (e.g., they just failed a test, it's the first day of their menstrual cycle, they had an argument with a friend, etc.), the likelihood that they would opt into PA while in a more negative affective state may be diminished.

Paper Three

The third paper was a departure from the previous two in that it was not an original research paper, but rather, a commentary on the challenges researchers face when pursuing "high quality" PA research with youth. As previously stated, this paper came about after the originally proposed third study involving a randomized text messaging and activity-tracking experiment was revised to a qualitative study involving youth in Northern Canada, which then also proved to be too costly and time-consuming to conduct. Thus, both ideas for an original research study had to be abandoned. At that point, the idea arose that the personal experiences incurred when trying to pursue certain types of studies (i.e., experimental/quasi-experimental) and/or when recruiting individuals who are considered protected or are inherently difficult to access (i.e., children and adolescents, particularly those of minority populations) are by no means uncommon to

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researchers wanting to engage youth in their PA studies and, thus, deserve specific and critical attention.

All of the arguments and discussion points presented in the third paper may seem obvious or intuitive and may even be common knowledge to anyone who has conducted research. The goal was to gather all these points in a single document and discuss how, altogether, they contribute to excessive difficulties for researchers who aim to produce "high quality" research with youth. The two key talking points – 1) that there is a lack of resources for, and exceptionally high pressures on, researchers to continuously produce valuable research output, and 2) that there are immense barriers to accessing, recruiting, and retaining youth participants in PA research studies – can ultimately be attributed to a failure to recognize the importance of research and the unfair assessment of what is considered quality research. Specifically, there is inadequate overall investment in research that has resulted in insufficient financial resources for all the research projects that are wanted and needed in the world. This lack of funding has created a panicked response of competing for, and striving to continuously accumulate, what precious little money there is. Furthermore, the current system for determining where and to whom funding should be allocated is elitist and biased, based mostly on personal connections, reputation, and quantifiable metrics of value (e.g., number of citations, previous awards). This creates a privileged, inequitable divide whereby those *with* more continue to *get* more while those starting with little have a much steeper, obstacle-riddled hill to climb to achieve equivalent recognition, support, and resources.

At every level, the pressure to gain funding and boost one's metrics has created an academic workplace culture whereby productivity and research output is valued above all else (even the physical health, mental well-being, and family/life priorities of those conducting the

research). A common outcome of this pressure is researchers feeling the need to resort to QRPs and/or to lower the quality, complexity, or scope of their research in order to maximize the quantity of it. Additionally, the process of completing a research study with certain research methods (e.g., experimental designs) and/or with certain populations (e.g., youth) demands more time, effort, and funding than other research methods and populations. Thus, researchers who pursue those types of research studies are automatically at a disadvantage for quickly churning out results and may feel impelled to speed up the process by engaging in QRPs and, subsequently, manipulating their metrics. Ultimately, a conundrum exists whereby there is a repeated demand for "higher quality" research, but without any commentary or propositions on how to increase resources and relieve pressure so that researchers can actually properly conduct that "higher quality" research.

In an effort to address some of the existing issues and biases, The San Francisco Declaration on Research Assessment (DORA; 2012), The Leiden Manifesto (Hicks et al., 2015), The Metric Tide (2015), and Responsible Research and Innovation (RRI; 2021) have been created to inspire a public dialog and to spur global initiatives toward fair and equitable evaluations for publishing, funding, hiring, and promoting practices in research. Assessments that excessively focus on the parameterization of science (i.e., 'Quantophrenia'; Kowaltowski et al., 2021) over rely on such tools as bibliometric indices, journal impact factors, and alternative metrics (e.g., Académie des Sciences, Leopoldina, & Royal Society, 2017; Kowaltowski et al., 2021). Identified problems with these types of assessment tools include that they are reductionistic (e.g., lacking representation of broader contributions), arbitrary (e.g., unable to discriminate between results from genuine merits/effort and results from biases and luck), and

perverse (e.g., shifting the purpose of research from the creation of knowledge to publication tactics and manipulation of metrics) (Aubert Bonn & Paxton, 2021a).

With the identification of problematic assessment tools, a multitude of research and opinion papers have recently been written with the purpose of proposing some direction in how to solve these issues (e.g., Hatch & Patterson, 2019; Hatch et al., 2019; Kowaltowski et al., 2021; Lerouge & Hol, 2020; Murray et al., 2019). For example, a recent qualitative study found that many people in research-related positions would like to see assessments that allow for a balanced and diverse view of success, that are not blindly dependent on metrics but also value human input, and that favor quality over quantity (Aubert Bonn & Paxton, 2021a). Another study provided a comprehensive list of actions based on interviews conducted with researchers, key stakeholders, research integrity policymakers, publishers, editors, and funding organizations and committees regarding what they think could be done to improve research integrity (see Table 6.1; Mejlgaard et al., 2020). Ultimately, the authors suggest that research assessment reform requires making available a variety of recommendations and also providing the support and tools needed so that organizations can choose what best fits their research environments and have success in implementing the changes that are appropriate for them (Mejlgaard et al., 2020). They also recommend that on-going pilot studies be conducted, and subsequent reports of outcomes be made public, so that successful changes at one organization can be implemented at others while unsuccessful initiatives can be made into a shared learning opportunity (Mejlgaard et al., 2020).

In theorizing about what research and researcher evaluations would look like if there were a shift away from quantitative metrics, Mejlgaard and colleagues (2020) state that assessments could take a more qualitative and holistic nature in which researchers' output, contributions, philosophies, virtues, and work ethic would be described instead of inferred. It has

also been suggested that research institutions, agencies, and organizations take a unified and coordinated approach to shifting away from mostly quantitative evaluation (Hatch & Patterson, 2019). It is understandable, however, that those who currently occupy positions of assessment in research would be hesitant to change because of skepticism as to whether or not everyone would implement proposed changes equally. Aubert Bonn and Paxton (2021b) found that many individuals in those positions of influence (e.g., funders, editors/publishers, faculty members, researchers) did not feel responsible for, nor capable of, initiating change and further indicated mistrust of peers or fellow actors in addressing research assessment issues. The pursuit of change, in any context, requires elements of bravery and vision. Thus, appeals have been made for those in research-related positions to step forward as advocates and champions in order for the implementation of new assessment tools to be successful (e.g., Curry, 2018; Hatch & Patterson, 2019; Mejlgaard et al., 2021).

To address the second discussion point from paper three (i.e., difficulties accessing youth and engaging them in research studies), the barriers to recruitment and participation in this population are indicative of both a physical and relational disconnect between the researcher and the youth they would like to include in their research. It could be suggested, therefore, that a need exists for better integration of research into adolescent-occupied spaces (e.g., schools, community centers, workplaces, recreation areas, and even private homes). Again, a societal-level shift in how research is valued would help promote its necessity and would help with its regular incorporation into more spaces. In absence of this ideal, however, there are some organizational-level efforts that could be implemented to facilitate access to difficult-to-reach populations. Namely, fostering relationships between researchers and community places/spaces would be helpful for connecting researchers with "gatekeepers" (i.e., those who are responsible

for and/or regularly supervise youth), who seem to be the key to accessing vulnerable or difficult-to-reach individuals (Abrams, 2010). Instead of leaving the establishment of such connections to the individual researcher, research institutions could foster intra- and inter-organizational collaborations to create mutually beneficial relationships (Forstmeier et al., 2017). As a basic example, universities or specific departments/laboratories within a university could partner with local schools, providing them with some form of benefit/service/access (e.g., use of facilities, specialized instruction) in exchange for the development of a community service credit at their school that requires all students to participate annually in at least one research study conducted by the university.

It is important to consider, however, that there may be some initial and, even, on-going hesitancy and/or resistance to allowing and enabling research in youth's lives. Reasons for this could possibly stem from adults' fears of unethical practices, perceived risks, or impingement on youth's personal freedoms (Field & Berman, 2004). From the adolescent perspective, research participation might be perceived as burdensome, irrelevant, or unnecessary and, thus, do not inspire youth to engage in it (Robbins et al., 2012). A key factor in mitigating such attitudes seems to be adult "champions" who can help to make a strong case for the importance of research and who continuously work to promote participation among youth in their trusted care (Mendelson et al., 2020). Another somewhat proven method for engaging adolescents in research participation is for the researchers themselves to become enmeshed into some aspect of the adolescents' lives and develop a rapport directly with youth (e.g., Baxley & Daniels, 2014; Wise & Cantrell, 2019). This tactic means the researcher needing to engage with youth online as well as in person, sometime going so far as becoming a "contact", "friend", or "follower" with potential participants on social media. Debates are on-going regarding the existing ethical

ambiguity of this level of engagement (i.e., having access to personal information, images, social content and having the ability to privately communicate with youth users, etc.) between adult researchers and research participants who are minors with no real consensus regarding the regulation of it (e.g., Gelinas et al., 2017; Hunter et al., 2018). At this point, it seems as though any method that is effective in adolescent recruitment for research (i.e., results in increased access and higher participation rates) and is acceptable to, or at least goes uncontested by, participants and their legal guardians, is deemed permissible. In other words, if the outcome is positive (i.e., accruement of a sufficiently sizeable and representative sample of the desired population), the process, even if it is one that could be considered ethically questionable, is retroactively deemed acceptable.

Strengths & Contributions

Several strengths of the research in this thesis allowed for novel contributions to the existing literature. First of all, studies one and two used an implicit measure (i.e., GNAT) that was specifically tailored to an adolescent age group (i.e., use of appropriate language and response deadlines reflective of their reaction time). The GNAT allowed for unique insight to high school students' and older adolescents' automatic thoughts about PA, which may be different from what adolescents explicitly indicate they think about PA in self-report measures. The results of the GNAT could be helpful for those creating PA messaging, commentary, or promotional materials tailored to youth. Specifically, the GNAT results highlight the importance of knowing how to make messages, comments, and materials immediately attractive and relevant to adolescents because their initial affective reaction will be important for whether or not they pay subsequent attention to what is being said. For high school students, messages focusing on attaining positive outcomes from PA, including those related to one's health, social status, and

appearance, may be more effective in encouraging PA participation. For older adolescents, particularly undergraduate female students, messages incorporating the social and appearance benefits of PA may more compelling.

Study two involved a pressured situation that required participants to respond quickly about participating in a hypothetical PA program, ultimately capturing adolescents' impulsive decisions. Pressuring participants for a response provided more clarity on immediate affective, or gut, reactions to PA as opposed to the deliberate reflections and potentially biased decisions that a longer response time would permit. Results showed that more participants opted into the hypothetical health-focused PA program and, overall, automatic health associations with PA and expected stress management outcomes from PA were predictive of opting into the PA program. These results provide insight to the importance of understanding the dynamics between the individual, the immediate or proposed PA environment (physical and social), and the individual's perceptions of themselves within that environment. Understanding those dynamics would be helpful for those who are responsible for developing group PA programs for youth (e.g., recreational activities, PE classes). It could help with tailoring, or at least improving adolescents' perceptions of, the environment so that it is more conducive to their participation. For example, results from study two suggest that high school students may be more attracted to, or at least not immediately put off by, PA programs that focus on individual health or fitness goals, help them develop physical skills, are perceived to have immediate affective benefits (e.g., the PA program is fun and makes them feel good), and help reduce their stress levels.

The self-report measures selected to assess certain psychological constructs (e.g., outcome expectations, self-efficacy) in studies one and two provided a more detailed picture of those constructs compared to other self-report measures. For example, the EMI-2, which breaks

down motives for PA into distinct subcategories (e.g., ill-health avoidance, social recognition, stress management, appearance, etc.), allowed for a deeper understanding of what types of outcomes adolescents expect from PA. Typically, outcome expectations are presented as a single composite score, allowing for researchers to declare that participants possess mostly positive, neutral, or mostly negative outcome expectations of PA and then relate that score to other constructs. While that method provides an overall or average idea of one's thoughts or feelings, it does not capture any detail regarding the content of those thoughts. Similarly, self-efficacy is often presented as a psychological construct that participants possess to a high, medium, or low degree. The Multidimensional Self-efficacy for Exercise Scale, however, further discriminates into three different types of self-efficacy (i.e., task, coping, scheduling), which allows for a more detailed consideration of participants' confidence (or lack thereof) and how each individual type of self-efficacy uniquely contributes to PA engagement or avoidance.

Other strengths of study two include the sampling method and study design. Specifically, recruitment through high schools provided access to a good cross-section of the population and allowed for a direct assessment of adolescents' automatic associations with PA and self-reported thoughts on PA as opposed to inferring that information from an undergraduate (i.e., emerging adult) sample. Additionally, the quasi-experimental design with cluster random assignment allowed for comparisons to be made and differences to be highlighted between those who received the health-focused PA program and those who received the social-focused PA program.

The third paper brought together challenges and issues commonly experienced by researchers, particularly those who pursue experimental research studies about PA behavior in youth and other vulnerable or hard-to-reach populations. By exploring frequent criticisms about existing research and the factors that are said to contribute to "low quality" research, the paper

contributed to conversations about limited resources, the unequal distribution of existing

resources, and the greater systemic issues of research assessment. Ultimately, the third paper

served to encourage researchers to reflect on the bigger picture and try to address or even work

towards solving some of the larger issues instead of rehashing the same vague assertions about

the need for better or "higher quality" research.

Limitations and Future Directions

The following sections will explore several limitations of the research conducted in

studies one and two. Many of these limitations provide guidance for future research in the area of

adolescents' affective reactions to, and deliberate reflections on, PA. In terms of paper three, the

inability to pursue the originally proposed experimental text-messaging study as a third original

research paper could be considered, in and of itself, a limitation to what could have been a more

profound investigation of how different types of prompts influence adolescents' immediate

decisions to engage in or avoid PA. The third paper also extensively discusses elements that

contribute to "low quality" research, some of which (e.g., convenience sampling, self-report of

PA behavior, cross-sectional study design) were employed within the two original research

studies in this thesis. Thus, the drawbacks of those research elements warrant some

acknowledgement in this section.

Measures

Study one used response times (RTs) as the measure of participants' automatic

associations with PA whereas study two used sensitivity (d') scores. While both RTs and d'

scores are legitimate outcome measures for interpreting GNAT results (Nosek & Banaji, 2001),

slight differences in how the GNAT was formatted resulted in one measure being used over the

other within each study. An error with random display without replacement in the Inquisit

program for the GNAT was the reason RTs were the more appropriate outcome measure for interpreting study one's GNAT data. To elaborate, every word for each of the two categories (i.e., target words and distractor words) was supposed to be shown once over the course of a trial, however it was programed "with replacement", thus some words were repeated while others were not shown at all. The error was only caught once data cleaning and analysis began. The GNAT was corrected before use in the second study; however, it was not possible to gather new data for the first study. While participants' automatic associations in studies one and two were able to be inferred from the analysis of RTs and d' scores, respectively, I was unable to do a direct comparison of the data from the two studies.

In both studies one and two, a self-report measure (IPAQ-A) was used to gather data on participants' PA behavior. The data suggests that the samples were fairly active (i.e., more active than the average adolescent), however, self-report is known to be questionably accurate, especially in young people. In addition to asking participants about their daily moderate and vigorous PA behaviors, the IPAQ-A also includes questions about walking and sitting. These measures of low-level PA and sedentary behaviors were not able to be included in analyses because of the large variation in, and thus, assumed inaccuracy of responses. For example, participants' responses to the amount of walking they engage in on a daily basis ranged from 0 to 180 minutes while their responses to the time they spend sitting each day ranged from one hour to 18 hours. The large range in values suggests that adolescents' awareness of how (in)active their bodies are, in general, and even more so while focused or preoccupied with another task (e.g., texting, doing homework, traveling to/from school, eating, etc.), is limited.

This lack of awareness could also be applied to incidental PA throughout the day, such that when adolescents are temporarily moving their bodies in pursuit of a goal that is not

associated with the explicit intention of being physically active (e.g., running to catch the bus), they may not fully realize, nor be able to accurately recall, the effort they exerted nor for how long they exerted that level of effort. The data from the IPAQ-A are further evidence that whenever possible (i.e., when materials, or financial support to acquire the necessary materials, are available to the researcher), objective measures should be used to capture young people's daily movement. Thus, a future direction would be to objectively measure adolescents' PA and sedentary behaviors to see if those (in)activity levels relate to their automatic associations with PA. Furthermore, research should explore if adolescents make immediate changes to their activity levels when prompted to do so (e.g., immediately upon receiving a motivating message or being provided with a novel opportunity to be active).

In Study two, participants were presented with a hypothetical PA program and prompted to respond about whether or not they *would* participate, thus capturing their immediate decisions regarding intention to be physically active as opposed to actual PA behavior. A future direction would be to present adolescents with an actual PA program and record not only their immediate responses about desire to participate, but also their subsequent action of engaging (or not) in the PA program. This could be explored within different decisional timeframes such that some adolescents are provided with an immediate opportunity to participate in the PA program, some are provided with a short-term delay in participation (e.g., PA program starts in an hour) which would allow them some time to potentially gather additional information that they consider important to their decision (e.g., will my friends be participating?), reflect, and reconsider their initial decision, and then others with an even longer-term delay in participation (e.g., PA program takes place after school tomorrow) which would allow for more extensive reflection

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time and also potential changes to one's personal circumstances (e.g., mood, stress levels, school demands, etc.).

Recruitment and Sample Size

In study one, participants were recruited from a first-year undergraduate psychology class. As is often the case, an undergraduate student sample was pursued due to ease of access and efficiency in completing data collection. Even though age limits were set so that participants were all under the age of 20 years, it had to be acknowledged that the data from these older adolescents (i.e., emerging adults) could not be considered equivalent to those of younger adolescents and may actually be more in line with data that would be seen from young adults. The sample was sufficiently large for analyses, but not evenly distributed among gender. The sample was predominantly (72%) female, which meant there were inadequate data from male participants for any gender comparisons. In understanding and recognition that a young undergraduate sample may be an acceptable alternative to a high school-aged sample when resources and capacity to pursue such a sample are lacking, it is still recommended that efforts be made to connect with gatekeepers who can champion research in the adolescent population.

In study two, participants were recruited from PE classes at high schools in the Edmonton area. Just over half (54%) of participants were in Grade 10, in which PE is a requirement as a part of the core curriculum. The other half of participants were divided between Grades 11 and 12, in which PE is offered as an elective for those who want to participate in it. Thus, it could reasonably be assumed that study participants from the upper grades were already more attracted to PA and, thus, would have been more inclined to impulsively opt into additional opportunities for PA than those in Grade 10. Additionally, collecting GNAT and questionnaire data during PE class could have primed adolescents' automatic associations and biased their deliberate

responses on questionnaire items to be more positive or favorable. Therefore, future research should consider recruiting participants and collecting data from non-active environments and potentially purposively sampling from less active adolescent groups.

The sample size for study two ended up with just enough participants to be sufficiently powered for the main analyses. The process for recruitment was disappointing with low response rates from schools (1/3 responded) and subsequently low participation rates (11-34%) from students who were presented with the opportunity to participate in the research at each school. Figure 6.1 provides a flowchart of the recruitment process from the number of schools contacted to the number of students who agreed to participate. Many of the issues with recruitment were the same as those explored in paper three – difficulty gaining/maintaining access to prospective participants, difficulty generating interest in the research project, and difficulty getting prospective participants to remember to return consent forms. The most successful location for data collection (McNally High School) had a PE teacher who was very enthusiastic about the research project and continuously encouraged students to return their consent forms so that they would be able to participate. Her efforts and success are further evidence that a "research champion" whom prospective participants respect, or at least listen to, is pretty much a necessity when conducting research with youth.

Validity and Reliability

A review of the results from study one shows small effect sizes (ranging from .017 to .22) across all analyses. For study two, effect sizes were a bit higher (ranging from .10 to .56), falling within a small to medium range according to guidelines suggested by Cohen (1992). These values suggest weak to moderately strong experiences of a phenomenon or relationships between variables, depending on what was measured. Furthermore, these effects sizes make it difficult to

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suggest that the phenomenon or relationship between variables truly exists not just in the current sample, but in a larger adolescent population as well. For example, in study one the RM ANOVA test for the social/appearance GNAT had a very low effect size ($\eta^2=.031$), which suggests that the statistically significant ($p = .038$) result of participants possessing positive associations between social/appearance outcomes and PA was minimal. With such a small observed effect, it is difficult to suggest that one can safely reject the null hypothesis (i.e., no relationship exists between social/appearance outcomes and PA).

In study two, analyses of the GNAT data showed positive associations between both health outcomes and social/appearance outcomes and PA. The statistically significant results were much stronger in both trials (health = $p < .001$, $\eta^2 = .56$; social/appearance = $p < .001$, $\eta^2 = .48$). In this case, it is safer to reject the null hypothesis and suggest that these observed effects are true and potentially more reflective of those that would be observed within the population. Based on previous discussions in paper three, it could be suggested that future research should be more cautious about inferring too much about a larger population from the data. Instead, when studying psychological factors contributing to adolescent PA/sedentary behavior, it may be more valuable to measure/observe phenomena at an individual, case-level and then discuss results in terms of processes or outcomes that similar others may experience.

Self-reported PA data indicated that the participants in study two considered themselves to be quite active. If these data are accurate and if you factor in current population-level data that reports less than 20% of adolescents worldwide meet the recommended 60 minutes per day of MVPA, this sample would not be representative of the general adolescent population. It could reasonably be argued that participants' responses to questions about their daily activity were inflated due to response biases, such as recall bias and/or social desirability bias. As was

mentioned previously, if there are sufficient resources to record PA objectively (e.g., use accelerometers), it would be preferable to capture adolescents' daily movement using those methods. This is especially important among young people who may be more likely to engage in spontaneous or incidental bouts of PA as opposed to intentionally scheduled exercise/sport sessions and who are also more likely to engage in periods of physical inactivity without awareness of, nor ability to report, how much time has passed.

Recommendations & Conclusions

Overall, the research conducted for this thesis showed that adolescents automatically associated positive health, social, and appearance outcomes with PA. Older adolescents (i.e., emerging adults), especially females, might attend more to positive social and appearance outcomes when considering engagement in PA. The results suggested that those associations alone, however, are not sufficient to propel adolescents towards PA. It is postulated that individual and social elements related to the immediate or imagined PA environment have additional impact on adolescents' impulsive decisions to opt into PA or opt out in favor of an alternative, probably less active, behavior. It is important, therefore, to continue gathering information about what individual, social, and environmental conditions are optimal for adolescent PA participation. Specifically, there needs to be greater exploration of social anxiety and social physique anxiety related to the PA context perceived by adolescents at the time of their decision about whether or not they will participate in PA. Different group dynamics should also be explored to see if there are social environments that are perceived as more cohesive and supportive than others depending on individual factors (e.g., skill level, body shape, etc.).

It is important to consider that there is most likely very little intraindividual and/or interindividual stability in both decisions about PA and perceptions of affect, social climate, and

environment. In other words, it could be suggested that there are no laws or rules about PA behavior that can be applied to a general adolescent population. Instead, there may only be consistency at the individual level, but only to the degree that the individual's emotional reactions to, and thoughts about, PA behaviors and PA environments are stable. Thus, the questions become: What activities, social climates, and PA environments are conducive to PA participation for each individual adolescent? How can researchers, teachers, mentors, parents, etc. help youth identify those PA elements/factors that best motivate them to be active? Furthermore, how can we teach youth to seek out those PA elements/factors continuously, no matter how their circumstances change over the course of their lives (e.g., new school, new city/neighborhood, new relationships, new job, new dependents, new health status, etc.) in order to build some PA resilience in the face of new barriers? Therefore, for researchers pursuing PA research with youth, it is further recommended that they recognize that what would be considered optimal conditions may drastically vary over time and from one individual to the next. Thus, future research may be more successful in discovering these phenomena if it were to take a more qualitative, individualistic approach to measurement as opposed to gathering group-level data.

The original research of studies one and two also showed that adolescents, in general, recognize that PA is good for their health. Study two showed that adolescents may be attracted to PA programs that are presented as opportunities to focus on their individual health goals, with stress management outcomes of PA being of particular importance for high school students. It is important to note, however, that current health discourses conflate the concept of health with concepts of fitness, looking good, and feeling good (Camacho-Miñano et al., 2019). Thus, while strong positive associations existed between health words and PA words, the image those words

automatically evoke might be more related to appearance. For example, when adolescents hear or see words, such as healthy, strong, happy, or confident in the context of PA (e.g., exercise, gym, sports), images of fit, slim, toned or muscular, physically skilled individuals might arise. Future research should look at measuring automatic associations using some form of image presentation (or combination of image and word presentation) to explore in more depth how adolescents automatically interpret "health" and what "healthy" looks like from the adolescent perspective. Furthermore, it may be important to explore the connection between PA and stress management outcomes in adolescents. What does managing stress mean to adolescents (e.g., Feeling energized? Feeling a reduction or release of tension in muscles? Feeling happier? Feeling relaxed?), and what types of PA and/or PA environments are most conducive to experiencing those outcomes?

The mental health outcomes of PA could be considered particularly important for individuals navigating the tumult of adolescence. Therefore, if PA participation is conducive to positive changes in adolescents' affective states, it is important to determine whether that could become a strong motivating factor for continuation of PA behavior. It could be suggested that a key barrier to PA uptake, however, is that even when individuals recognize the positive outcomes of PA (e.g., I will feel good during or after PA), their immediate affect and mood states prior to PA are most likely what will impact whether or not they actually engage in PA. Thus, more research on situational affect at decisional timepoints (i.e., the moments immediately preceding incidental or planned PA) would help clarify the impulsivity or deliberateness of adolescents' PA behavior.

Paper three came about as a response to personal experiences in trying to conduct an experimental study with high school students. Those experiences sparked a need to explore the

challenges researchers, particularly early-career academics, face when attempting to pursue "high quality" PA research studies with youth or other "vulnerable" or "protected" populations. Resolution of many of the research issues presented in paper three and also in the limitations section of this thesis involves a change in the way research is valued, assessed, and incorporated into society. The multitude of research and commentary papers written in acknowledgment of research assessment issues (see DORA, 2012) make it obvious that there are no quick and easy solutions. Most likely the issues presented here will continue to be debated and discussed on an abstract level for years to come with only minor and slowly adopted practical implementations. It could be suggested that those who are brave enough to take on the role of "champion" and initiate change or facilitate better research practices will be the key players in making the improvements that everyone seems to be demanding. In the meantime, however, I think it is important that all researchers, editors, publishers, and others who occupy research(er) assessment roles be more mindful about their urging of better research methods and "higher quality" research output in recognition that the shortcomings they critique are not reflective of the researcher or research institution but are the outcome of a much larger systemic issue including insufficient resources, unequal distribution of available resources, and biased assessments.

Table 6.1. Better research: Three areas, nine topics, many actions

Area	Topic	Action
Support	Research environment	Ensure fair assessment procedures and prevent hyper competition and excessive publication pressure
	Supervision and mentoring	Create clear guidelines for PhD supervision (such as on meeting frequency); set up skill training and mentoring
	Integrity training	Establish training and confidential counseling for all researchers
Organization	Ethics structures	Establish review procedures that accommodate different types of research and disciplines
	Integrity breaches	Formalize procedures that protect both whistle-blowers and those accused of misconduct
	Data practices and management	Provide training, incentives and infrastructures to curate and share data according to FAIR principles
Communication	Research collaboration	Establish sound rules for transparent working with industry and international partners
	Declaration of interests	State conflicts (financial and personal) in research, review and other professional activities
	Publication and communication	Respect guidelines for authorship and ensure openness and clarity in public engagement

Source: Mejlgaard et al. (2020) Research integrity: Nine ways to move from talk to walk. *Nature, 586*, 358-360.

Figure 6.1 Flow chart of study two recruitment process

October 2017

Contacted 9 high schools; Received a response from 3 schools (in bold):
- **McNally**
- Lillian Osborne
- Queen Elizabeth
- Eastglen
- Harry Ainlay
- W.P. Wagner
- Millwoods Christian
- **J. Percy Page**
- **Ross Shepperd**

October-November 2017

Data collection at McNally:
- distributed ~200 consent forms
- **68 students participated**

February-March 2018

Data collection at Ross Sheppard:
- distributed ~150 consent forms
- **16 students participated**

April 2018

Data collection at J Percy Page:
- distributed ~60 consent forms
- **10 students participated**

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Appendix A. Study 1 GNAT Words

<u>Health-related words</u>

Desirable: healthy, happy, strong, energetic, fun, lively, pleasant

Undesirable: unhealthy, sad, boring, weak, tired, lazy, unpleasant

<u>Social/Appearance-related words</u>

Desirable: skinny, thin, muscular, popular, winner, attractive, look good

Undesirable: fat, chubby, scrawny, unpopular, loser, unattractive, look bad

<u>Generic words</u>

desk, book, mug, rental, carpet, door, printer

<u>Physical Activity words</u>

sports, gym, play, competition, exercise, workout, exertion

Appendix B. Study 2 Health and Social PA Program Descriptions

Individual Health-Focused Program

Now that you've finished the computer task and questionnaire, I just need your attention for a few more minutes while I tell you about an idea for a potential physical activity program to be offered here at your school. It would be an individual exercise program done in a small group setting. The sessions would focus on developing your strength, endurance, and flexibility to improve your overall physical fitness. The layout of each session would include a warm-up, a circuit of different body weight exercises performed individually, and then some cooldown stretches to finish. It would be a great opportunity to focus on increasing your own strength, cardio, and improving your health. An instructor would lead each of you through all the exercises and help out as necessary. There would be music playing and it would be an upbeat environment for everyone to focus on their individual health and fitness goals! At this point, I'm interested in knowing how many people would want to participate in this program if it were to be offered here at your school. Please quickly jot down on the back of your questionnaire package either "yes" or "no" as to whether you would be interested.

Group Social-Focused Program

Now that you've finished the computer task and questionnaire, I just need your attention for a few more minutes while I tell you about an idea for a potential physical activity program to be offered here at your school. It would be a group fitness program that includes lots of partner work and opportunities to work together to achieve fitness goals. The sessions would focus on building strength, endurance, and flexibility through teamwork and partner exercises. The layout of each session would include a warm-up, a circuit of different body weight exercises performed in pairs as well as partner or group activities, and then some cooldown stretches to finish. It would be a great opportunity to do a workout in a supportive environment where everyone encourages each other, and you can all just have fun together as a group. An instructor would lead each of you through all the exercises and help out as necessary. There would be music playing and it would be an upbeat and fun environment for everyone to work together and support one another! At this point, I'm interested in knowing how many people would want to participate in this program if it were to be offered here at your school. Please quickly jot down on the back of your questionnaire package either "yes" or "no" as to whether you are interested.

Appendix C. Study 2 GNAT Words

<u>Health Trial</u>
Desirable – happy, strong, confident, energetic, skilled, healthy, fun
Undesirable – sad, weak, tired, unskilled, unhealthy, boring, lazy
Physical Activity – active, gym, competition, exercise, workout, sports, play
Generic – door, mug, bus, tree, chair, desk, book

<u>Social/Appearance Trial</u>
Desirable – attractive, winner, popular, skinny, beautiful, thin, muscular
Undesirable – unattractive, loser, unpopular, fat, ugly, chubby, scrawny
Physical Activity – active, gym, competition, exercise, workout, sports, play
Generic – door, mug, bus, tree, chair, desk, book

Appendix D. Study 1 Research Material

LETTER OF INFORMATION

Study Title: Adolescents' Attitudes toward Physical Activity

Research Investigator:	**Supervisor:**
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Background
- You are being asked to participate in a research study looking at older adolescents' thoughts and feelings about physical activity
- People under the age of 20 years are eligible to participate
- The results of this study will be used in support of my thesis

Purpose
The purpose of this project is to examine older adolescents' views about participating in physical activity and what they expect to result from physical activity participation. The results of this study will be used to develop future studies and physical activity interventions for adolescents, and will be used in research papers and presentations.

Study Procedures
- You will be asked to complete 2 computer tasks and a questionnaire, after which your height and weight will be measured. The procedure includes completing a 20-minute computer task in a computer laboratory on campus. Immediately after completion of the computer task, you will be asked to fill out a questionnaire. After you have finished with the questionnaire, you will enter a private area in order for the researcher to record your height and weight. The total time it will take for you to participate in the computer task and questionnaire is approximately 50 minutes**.**

Benefits
- You will be receiving course credit for participating in this research. The total time it will take to complete the study is 50 minutes, therefore you will be receiving 1 course credit worth 2%.
- The benefit to you might be just helping us out and hopefully helping design future interventions to encourage people to do more exercise
- We hope that the information we get from doing this study will help us better understand how adolescents view physical activity in their lives.

ID: _____

Risk
- There are no risks to participating in today's tasks, although you may feel a little frustrated at times because the computer tasks are very fast.

Voluntary Participation
- Participation in this research is voluntary. You are free to withdraw at any point. If you don't want to answer a question, or wish to stop at any time for any reason, please tell the researcher. If you decide to withdraw, we will destroy all information you had provided up to that point.
- If you withdraw from the study but still want to receive your course credit, you can complete the alternate task, which includes reading the introduction of a health psychology research paper and filling out a one-page worksheet.

Confidentiality & Anonymity
- The results of this research will be used for a graduate thesis project as well as in research articles and presentations. No person will be identified in any research presentations or papers.
- All your responses and information will remain confidential. Only the research team will have access to the data.
- A random identification number will be assigned to your data and no personal information (e.g., name, e-mail address) will be attached to your data.
- All computer data will be stored on a password protected computer.
- All questionnaire data will be stored in a locked filing cabinet in the researcher's office.
- Normally data are kept for a period of five years post-publication, after which it is destroyed.
- If you are interested in receiving a copy of the study results, please notify the researcher and provide contact information.

Further Information
- If you have any further questions regarding this study, please do not hesitate to contact Kimberley McFadden or Dr. Tanya Berry.
- If you have questions about Research Participation, please contact the Research Participation coordinator at rescred@ualberta.ca or 780-492-5689.
- The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.

ID: _____

CONSENT FORM

Adolescents Attitudes towards Physical Activity

Principal Investigator: Kimberley McFadden, Ph.D. student
Faculty of Physical Education and Recreation
University of Alberta
kmcfadde@ualberta.ca

Do you understand that you have been asked to be in a research study?	Yes	No
Have you read and received a copy of the attached Information Sheet	Yes	No
Do you understand the benefits and risks involved in taking part in this research study?	Yes	No
Have you had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that you are free to refuse to participate, or to withdraw from the study at any time, without consequence, and that your information will be withdrawn at your request?	Yes	No
Has the issue of confidentiality been explained to you? Do you understand who will have access to your information?	Yes	No

This study was explained to me by: _____

I agree to take part in this study:

_____   _____
Signature of Research Participant   Date

_____
Printed Name

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____   _____
Signature of Investigator or Designate   Date

ID: _____

Demographic Questions

Gender: _____

Age: _____

Weight: _____ (lbs)

Height: _____ (in)

Primary language spoken at home: _____

ID: _____

Physical Activity Questions

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the <u>last 7 days</u>. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at school, work, as part of your chores at home, to get from place to place, and in your spare time for recreation, exercise or sport.

> Think about all the vigorous activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort, make you breathe much harder than normal, and make you sweat. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the last 7 days, on how many days did you do vigorous physical activities like heavy weight training, hockey, soccer, judo, running, aerobics, swimming laps, or fast bicycling?

    _____ days per week

    ☐ No vigorous physical activities ➡ *Skip to question 3*

2. How much time did you usually spend doing vigorous physical activities on one of those days?

    _____ hours per day
    _____ minutes per day

    ☐ Don't know/Not sure

> Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort, make you breathe somewhat harder than normal and cause light sweating. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the last 7 days, on how many days did you do moderate physical activities like light weight lifting, yoga, bicycling at a regular pace, or doubles tennis? Do not include walking.

    _____ days per week

    ☐ No moderate physical activities ➡ *Skip to question 5*

4. How much time did you usually spend doing moderate physical activities on one of those days?

_____ hours per day
_____ minutes per day

□   Don't know/Not sure

Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the last 7 days, on how many days did you walk for at least 10 minutes at a time?
_____ days per week

□   No walking   ➡   *Skip to question 7*

6. How much time did you usually spend walking on one of those days?

_____ hours per day
_____ minutes per day

□   Don't know/Not sure

The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at school, work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, playing computer or video games, visiting friends, reading, or sitting or lying down to watch television.

7. During the last 7 days, how much time did you spend sitting on a <u>week day</u>?

_____ hours per day
_____ minutes per day

□   Don't know/Not sure

8. During the last 7 days, how much time did you spend sitting on a <u>weekend day</u>?

_____ hours per day
_____ minutes per day

□   Don't know/Not sure

ID: _____

Please circle the number that best fits your answer to the following statement.

For me, physical activity is:										
Worthless	1	2	3	4	5	6	7	8	9	Valuable
Useless	1	2	3	4	5	6	7	8	9	Useful
Harmful	1	2	3	4	5	6	7	8	9	Beneficial
Dull	1	2	3	4	5	6	7	8	9	Exciting
Unimportant	1	2	3	4	5	6	7	8	9	Important
Bad	1	2	3	4	5	6	7	8	9	Good
Exhausting	1	2	3	4	5	6	7	8	9	Energizing
Fun	1	2	3	4	5	6	7	8	9	Boring
Uninteresting	1	2	3	4	5	6	7	8	9	Interesting
Unpleasant	1	2	3	4	5	6	7	8	9	Pleasant
Difficult	1	2	3	4	5	6	7	8	9	Easy

The following is a list of statements concerning the reasons people often give when asked why they do physical activity. <u>Whether you are currently physically active or not</u>, please read each statement carefully and indicate, by circling the appropriate number, whether or not each statement is true for you personally, or would be true personally if you did do physical activity.

Remember, we want to know why <u>you personally</u> choose to be physically active or might choose to be physically active, not whether you think the statements are good reasons for anybody to be physically active.

Personally, I do physical activity (or might do physical activity) …	Not at all true for me				Very true for me	
1. To stay slim.	0	1	2	3	4	5
2. To avoid illness.	0	1	2	3	4	5
3. Because it makes me feel good.	0	1	2	3	4	5
4. To help me look better.	0	1	2	3	4	5
5. To show my worth to others.	0	1	2	3	4	5
6. To give me space to think.	0	1	2	3	4	5
7. To have a healthy body.	0	1	2	3	4	5
8. To build up my strength.	0	1	2	3	4	5
9. Because people put pressure on me to do it.	0	1	2	3	4	5
10. Because I enjoy the feeling of exerting myself.	0	1	2	3	4	5
11. To spend time with friends.	0	1	2	3	4	5
12. Because I like trying to win in physical activities.	0	1	2	3	4	5
13. To stay or become agile.	0	1	2	3	4	5
14. To give me goals to work towards.	0	1	2	3	4	5
15. To lose weight.	0	1	2	3	4	5
16. To prevent health problems.	0	1	2	3	4	5
17. Because I find physical activity invigorating.	0	1	2	3	4	5
18. To fit in with other people.	0	1	2	3	4	5
19. To have a good body.	0	1	2	3	4	5
20. To compare my abilities with other peoples'.	0	1	2	3	4	5
21. Because it helps to reduce tension.	0	1	2	3	4	5
22. Because I want to maintain good health.	0	1	2	3	4	5
23. To increase my endurance.	0	1	2	3	4	5
24. Because I find physical activity satisfying in and of itself.	0	1	2	3	4	5
25. To enjoy the social aspects of physical activity.	0	1	2	3	4	5
26. Because I enjoy competing.	0	1	2	3	4	5
27. Because people give me no choice.	0	1	2	3	4	5

Personally, I do physical activity (or might do physical activity) …	Not at all true for me				Very true for me	
28. To maintain flexibility.	0	1	2	3	4	5
29. To give me personal challenges to face.	0	1	2	3	4	5
30. To help control my weight.	0	1	2	3	4	5
31. To avoid heart disease.	0	1	2	3	4	5
32. To recharge my batteries.	0	1	2	3	4	5
33. To improve my appearance.	0	1	2	3	4	5
34. To gain recognition for my accomplishments.	0	1	2	3	4	5
35. To help manage stress.	0	1	2	3	4	5
36. To please other people.	0	1	2	3	4	5
37. To feel more healthy.	0	1	2	3	4	5
38. To get stronger.	0	1	2	3	4	5
39. For enjoyment of the experience of being active.	0	1	2	3	4	5
40. To have fun being active with other people.	0	1	2	3	4	5
41. Because I enjoy physical competition.	0	1	2	3	4	5
42. To stay or become flexible.	0	1	2	3	4	5
43. To develop personal skills.	0	1	2	3	4	5
44. Because physical activity helps me to burn calories.	0	1	2	3	4	5
45. Because people expect me to do it.	0	1	2	3	4	5
46. To look more attractive.	0	1	2	3	4	5
47. To accomplish things that others are incapable of.	0	1	2	3	4	5
48. To release tension.	0	1	2	3	4	5
49. To develop my muscles.	0	1	2	3	4	5
50. Because I feel at my best when I am being physically active.	0	1	2	3	4	5
51. To make new friends.	0	1	2	3	4	5
52. Because I find physical activities fun, especially when competition is involved.	0	1	2	3	4	5
53. To measure myself against personal standards.	0	1	2	3	4	5
54. Because people make me do it.	0	1	2	3	4	5

Each of the following questions has two statements (A & B). Please read both statements and choose the one (either A or B) that most applies to you. Once you have chosen a statement, please indicate whether the statement is "very true" or "sort of true" for you by circling one of those two options in the box below the statement.

1. A) Some people feel that they have a good-looking (fit) body compared to other people,

   Very true for me   Sort of true for me

   B) Other people feel that compared to most, their body doesn't look so good.

   Very true for me   Sort of true for me

----

2. A) Some people find it difficult to keep their bodies looking good physically,

   Very true for me   Sort of true for me

   B) Other people find it easy to keep their bodies looking good physically.

   Very true for me   Sort of true for me

----

3. A) Some people are pleased with the appearance of their bodies,

   Very true for me   Sort of true for me

   B) Other people wish that their bodies looked in better shape physically.

   Very true for me   Sort of true for me

----

4. A) Some people feel that they are often admired for their good-looking bodies,

   Very true for me   Sort of true for me

   B) Other people feel that they are seldom admired for the way their bodies look.

   Very true for me   Sort of true for me

----

5. A) Some people are confident about how their bodies look physically,

   Very true for me   Sort of true for me

   B) Other people are uneasy about how their bodies look physically.

   Very true for me   Sort of true for me

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6. A) Some people don't like how their bodies look physically,

<div align="center">Very true for me   Sort of true for me</div>

B) Other people are pleased with how their bodies look physically.

<div align="center">Very true for me   Sort of true for me</div>

Please indicate to what extent these goals are important for you while being physically active.

	Not at all important					Extremely important	
1. To connect with others in a meaningful manner.	1	2	3	4	5	6	7
2. To improve the look of my overall body shape.	1	2	3	4	5	6	7
3. To increase my resistance to illness and disease.	1	2	3	4	5	6	7
4. To be well thought of by others.	1	2	3	4	5	6	7
5. To acquire new sport or exercise skills.	1	2	3	4	5	6	7
6. To share my physical activity experiences with people that care for me.	1	2	3	4	5	6	7
7. To improve my appearance.	1	2	3	4	5	6	7
8. To increase my energy level.	1	2	3	4	5	6	7
9. To be socially respected by others.	1	2	3	4	5	6	7
10. To learn and practice new techniques.	1	2	3	4	5	6	7
11. To develop close friendships.	1	2	3	4	5	6	7
12. To be slim so to look attractive to others.	1	2	3	4	5	6	7
13. To improve my overall health.	1	2	3	4	5	6	7
14. To gain favorable approval from others.	1	2	3	4	5	6	7
15. To become skilled at a certain activity.	1	2	3	4	5	6	7
16. To form close bonds with others.	1	2	3	4	5	6	7
17. To change my appearance by altering a specific area of my body.	1	2	3	4	5	6	7
18. To improve my endurance, stamina.	1	2	3	4	5	6	7
19. So that others recognize me as athletic.	1	2	3	4	5	6	7
20. To develop my sport or exercise skills.	1	2	3	4	5	6	7

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE!

FROS 478 Research Debrief

The purpose of this research is to explore older adolescents' attitudes toward physical activity. Everyone has different ideas about what physical activity entails (e.g., playing sports, going to the gym) and what outcomes they can expect to achieve from being physically active (e.g., lose weight, become healthier). To determine what individuals think about physical activity and its outcomes, researchers often use questionnaires, which allow participants time to reflect on their opinions and respond at their own pace. These thoughts are considered "explicit" because they are an individual's deliberate reflections, which may be influenced by their social environment (e.g., opinions voiced by family, friends, media). Another way of measuring people's thoughts is through fast-paced word association tasks, such as the computer task you completed. These tasks aim to determine an individual's automatic, or "implicit", thoughts about a topic by forcing them to respond quickly to different types of associations (e.g., physical activity and undesirable words). The task you completed allowed only 600 milliseconds for you to process the word shown on screen (e.g., exertion), make an association between that word and the categories you were supposed to be responding to (e.g., generic and desirable), and respond by either clicking or refraining from clicking the space bar. How quickly and accurately you respond indicates how automatically you associate that word with those categories.

There were two different types of desirable and undesirable words used – one involved more internal goals with words that focused on health and wellness outcomes (e.g., energetic, happy), while the other involved more external goals with words that emphasized body image and social status outcomes (e.g., muscular, popular). We are looking to see if there are differences in response times and accuracy between these two types of outcomes and, further, whether male and female participants differ in their response to certain body image words (e.g., guys may have a stronger association with words related to muscularity, while girls might have stronger associations with words regarding weight loss). The questionnaire package included measures of physical activity participation, attitudes, motivation, and goals as well as a measure of physical self-perception. These were included to obtain your explicit thoughts on these topics and the scores you provided will be compared to your scores on the implicit computer task. This will allow for us to see if there are differences between what you automatically think about physical activity outcomes and what you say you think about physical activity outcomes when given time to reflect on them. The demographic questions and height/weight measures were included to provide some information in case we want to further compare different groups (e.g., different ages, different body mass indices, etc.).

We realize that participating in this study may have caused you to think about your physical body and physical health and the body issues that you might have about yourself. If you want more information about the body issues you might have about yourself, you might find this website helpful to look at: http://edmonton.cmha.ca/mental_health/eating-disorders/. There are also some resources on campus you can access to gain more information or receive support for body image issues. Here is the contact information for a few of the University of Alberta services:

Student Counseling Services   780-492-5205
Peer Support Centre   780-492-4357

In future, we will be replicating this study in younger adolescents (ages 14-17) to see if there are differences in how they think about physical activity and what outcomes they expect from being physically active. Thanks very much for participating. Without the help of people like you, we couldn't answer most important scientific questions in psychology. You have been a great help. If you have any questions regarding the study after your departure, please contact Kimberley McFadden or Dr. Tanya Berry. If you have general questions about your research participation, send an e-mail to the Research Participation Coordinator at rescred@ualberta.ca. And lastly, please don't tell other people about what we had you do here because we may be asking others in your class to be research participants, and we don't want people to come in with any biases. Please note that now is your last chance to remove your data as we will hereafter remove identifiers. If you should choose to remove your data now, you will still receive full course credit.

Tanya Berry, Ph.D., Lab Supervisor   **Research Participation Coordinator**
tanyab@ualberta.ca   **Dept. of Psychology**
                                                rescred@ualberta.ca

Kimberley McFadden, Ph.D. student
kmcfadde@ualberta.ca

Appendix E: Study 2 Research Materials

LETTER OF INFORMATION

Study Title: <u>**What Adolescents Expect from Physical Activity**</u>

Research Investigator: **Supervisor:**
Kimberley McFadden   Dr. Tanya Berry
1-165 University Hall   1-153 University Hall
University of Alberta   University of Alberta
Edmonton, AB, T6G 2J9   Edmonton, AB, T6G 2J9
kmcfadde@ualberta.ca   tanyab@ualberta.ca

Background
- You are being asked to participate in a research study looking at adolescents' thoughts and feelings about physical activity
- People in Grades 10-12 are eligible to participate
- The results of this study will be used in support of my thesis

Purpose
The purpose of this project is to examine adolescents' views about participating in physical activity and what they expect to result from physical activity participation. The results of this study will be used to develop future studies and physical activity interventions for adolescents and will be used in research papers and presentations.

Study Procedures
- You will be asked to complete two computer tasks and a questionnaire. The procedure includes completing two 10-minute word association computer tasks in a classroom at your school during the school day. Immediately after completion of the computer task, you will be asked to fill out a questionnaire about physical activity and expectations. Once all measures have been completed, the researcher will make a brief presentation about physical activity to all participants present. The total time it will take for you to participate in the computer task and questionnaire is approximately 40-45 minutes**.**

Benefits
- The benefit to you might just be helping us out and hopefully helping design future interventions to encourage people your age to be more physically active.
- We hope that the information we get from doing this study will help us better understand how adolescents view physical activity in their lives.

Risks
- There are no risks to participating in the research tasks, although you may feel a little frustrated at times because the computer tasks are very fast.

Voluntary Participation

- Participation in this research is voluntary. You are free to withdraw at any point. If you don't want to answer a question or wish to stop at any time for any reason, please tell the researcher. If you decide to withdraw, we will discard all information you had provided up to that point.

Confidentiality & Anonymity

- All your responses and information will remain confidential. Only the research team will have access to the data.
- A random identification number will be assigned to your data and no personal information (e.g. name, e-mail address) will be attached to your data.
- All computer data will be stored on a password protected computer.
- All questionnaire data will be stored in a locked filing cabinet in the researcher's office.
- Normally data are kept for a period of five years post-publication, after which it is destroyed.
- The results of this research will be used for a graduate thesis project as well as in research articles and presentations. No person will be identified in any research presentations or papers.
- If you are interested in receiving a copy of the study results, please notify the researcher and provide contact information.

Further Information

- If you have any further questions regarding this study, please do not hesitate to contact Kimberley McFadden or Dr. Tanya Berry.
- If you have questions about Research Participation, please contact the Research Participation coordinator at rescred@ualberta.ca or 780-492-5689.
- The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.

CONSENT FORM

What Adolescents Expect from Physical Activity

Principal Investigator: Kimberley McFadden, Ph.D. candidate
Faculty of Physical Education and Recreation
University of Alberta
kmcfadde@ualberta.ca

Do you understand that your child has been asked to be in a research study?	Yes	No
Have you read and received a copy of the attached Information Sheet?	Yes	No
Do you understand the benefits and risks involved in your child taking part in this research study?	Yes	No
Has your child had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that your child is free to refuse to participate, or to withdraw from the study at any time, without consequence, and that your child's information will be withdrawn at his/her request?	Yes	No
Has the issue of confidentiality been explained to your child? Do you understand who will have access to your child's information?	Yes	No

I agree to my child taking part in this study:

_____   _____

Signature of Parent/Guardian   Date

_____

Printed Name
I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____   _____

Signature of Investigator or Designate   Date

Demographic Questions

Gender: _____

Grade: _____

Age: _____

Physical Activity Questions

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the <u>last 7 days</u>. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at school, work, as part of your chores at home, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the vigorous activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort, make you breathe much harder than normal, and make you sweat. Think *only* about those physical activities that you did for at least 10 minutes at a time.

---

5. During the last 7 days, on how many days did you do vigorous physical activities like heavy weight training, hockey, soccer, judo, running, swimming laps, or fast cycling?

_____ days per week

☐ No vigorous physical activities ➡ *Skip to question 3*

6. How much time did you usually spend doing vigorous physical activities on one of those days?

_____ hours per day
_____ minutes per day

☐ Don't know/Not sure

Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort, make you breathe somewhat harder than normal and cause light sweating. Think only about those physical activities that you did for at least 10 minutes at a time.

7. During the last 7 days, on how many days did you do moderate physical activities like light weight lifting, yoga, or bicycling at a regular pace? Do not include walking.

_____ days per week

☐ No moderate physical activities ➡ *Skip to question 5*

8. How much time did you usually spend doing moderate physical activities on one of those days?

_____ hours per day
_____ minutes per day

☐ Don't know/Not sure

Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

9. During the last 7 days, on how many days did you walk for at least 10 minutes at a time?
_____ days per week

☐ No walking ➡ *Skip to question 7*

10. How much time did you usually spend walking on one of those days?

_____ hours per day
_____ minutes per day

☐ Don't know/Not sure

The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at school, work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, playing computer or video games, visiting friends, reading, or sitting or lying down to watch television.

11. During the last 7 days, how much time did you spend sitting on a <u>week day</u>?

_____ hours per day
_____ minutes per day

☐ Don't know/Not sure

12. During the last 7 days, how much time did you spend sitting on a <u>weekend day</u>?

_____ hours per day
_____ minutes per day

☐ Don't know/Not sure

Please circle the number that best fits your answer to the following statement.

For me, physical activity is:									
Worthless	1	2	3	4	5	6	7	8	9	**Valuable**
Useless	1	2	3	4	5	6	7	8	9	**Useful**
Harmful	1	2	3	4	5	6	7	8	9	**Beneficial**
Dull	1	2	3	4	5	6	7	8	9	**Exciting**
Unimportant	1	2	3	4	5	6	7	8	9	**Important**
Bad	1	2	3	4	5	6	7	8	9	**Good**
Exhausting	1	2	3	4	5	6	7	8	9	**Energizing**
Fun	1	2	3	4	5	6	7	8	9	**Boring**
Uninteresting	1	2	3	4	5	6	7	8	9	**Interesting**
Unpleasant	1	2	3	4	5	6	7	8	9	**Pleasant**
Difficult	1	2	3	4	5	6	7	8	9	**Easy**

The following is a list of statements concerning the reasons people often give when asked why they do physical activity. <u>Whether you are currently physically active or not</u>, please read each statement carefully and indicate, by circling the appropriate number, whether or not each statement is true for you, personally, or would be true personally if you did do physical activity. Remember, we want to know why <u>you personally</u> choose to be physically active or might choose to be physically active, not whether you think the statements are good reasons for anybody to be physically active.

Personally, I do physical activity (or might do physical activity) …	Not at all true for me				Very true for me	
1 Because it makes me feel good.	0	1	2	3	4	5
2 To avoid illness.	0	1	2	3	4	5
3. To have a healthy body.	0	1	2	3	4	5
4. To help me look better.	0	1	2	3	4	5
5. To show my worth to others.	0	1	2	3	4	5
6. To give me space to think.	0	1	2	3	4	5
7. To stay toned.	0	1	2	3	4	5
8. To build up my strength.	0	1	2	3	4	5
9. Because people put pressure on me to do it.	0	1	2	3	4	5
10. Because I enjoy the feeling of exerting myself.	0	1	2	3	4	5
11. To spend time with friends.	0	1	2	3	4	5
12. Because I like trying to win in physical activities.	0	1	2	3	4	5
13. To stay or become agile.	0	1	2	3	4	5
14. To give me goals to work towards.	0	1	2	3	4	5
15. To lose weight.	0	1	2	3	4	5
16. To prevent health problems.	0	1	2	3	4	5
17. Because I find physical activity invigorating.	0	1	2	3	4	5
18. To fit in with other people.	0	1	2	3	4	5
19. To have a good body.	0	1	2	3	4	5
20. To compare my abilities with other peoples'.	0	1	2	3	4	5
21. Because it helps to reduce tension.	0	1	2	3	4	5
22. Because I want to maintain good health.	0	1	2	3	4	5
23. To increase my endurance.	0	1	2	3	4	5
24. Because I find physical activity satisfying in and of itself.	0	1	2	3	4	5
25. To enjoy the social aspects of physical activity.	0	1	2	3	4	5
26. Because I enjoy competing.	0	1	2	3	4	5

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Personally, I do physical activity (or might do physical activity) …	Not at all true for me				Very true for me	
27. Because people give me no choice.	0	1	2	3	4	5
28. To maintain flexibility.	0	1	2	3	4	5
29. To give me personal challenges to face.	0	1	2	3	4	5
30. To help control my weight.	0	1	2	3	4	5
31. To avoid heart disease.	0	1	2	3	4	5
32. To recharge my batteries.	0	1	2	3	4	5
33. To improve my appearance.	0	1	2	3	4	5
34. To gain recognition for my accomplishments.	0	1	2	3	4	5
35. To help manage stress.	0	1	2	3	4	5
36. To please other people.	0	1	2	3	4	5
37. To feel more healthy.	0	1	2	3	4	5
38. To get stronger.	0	1	2	3	4	5
39. For enjoyment of the experience of being active.	0	1	2	3	4	5
40. To have fun being active with other people.	0	1	2	3	4	5
41. Because I enjoy physical competition.	0	1	2	3	4	5
42. To stay or become flexible.	0	1	2	3	4	5
43. To develop personal skills.	0	1	2	3	4	5
44. Because physical activity helps me to burn calories.	0	1	2	3	4	5
45. Because people expect me to do it.	0	1	2	3	4	5
46. To look more attractive.	0	1	2	3	4	5
47. To accomplish things that others are incapable of.	0	1	2	3	4	5
48. To release tension.	0	1	2	3	4	5
49. To develop my muscles.	0	1	2	3	4	5
50. Because I feel at my best when I am being physically active.	0	1	2	3	4	5
51. To make new friends.	0	1	2	3	4	5
52. Because I find physical activities fun, especially when competition is involved.	0	1	2	3	4	5
53. To measure myself against personal standards.	0	1	2	3	4	5
54. Because people make me do it.	0	1	2	3	4	5

Please indicate **HOW CONFIDENT YOU ARE THAT YOU CAN PERFORM** each of the physical activity related tasks below. <u>Physical activity means all sport, exercise, or activity during free time that you do continuously for at least 30 minutes.</u>

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No confidence								**Complete Confidence**		
How confident are you that you can . . .										
Perform physical activity using proper technique								%		
Follow directions to perform physical activity								%		
Perform all of the movements required for physical activity								%		
Be physically active when you feel discomfort from the activity								%		
Be physically active when you lack energy								%		
Include physical activity in your daily routine								%		
Consistently do physical activity every day of the week								%		
Do physical activity when you don't feel well								%		
Arrange your schedule to include regular physical activity								%		

Please respond to the question below about how much control you have over your physical activity schedule:

How much is scheduling sport and/or exercise into your week under your control?								
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Very little control				Moderate control				Complete control

Please indicate whether the question is true about you never, seldom, sometimes, often, or always.

	Never	Seldom	Sometimes	Often	Always
1. I respect my body.	1	2	3	4	5
2. I feel good about my body.	1	2	3	4	5
3. I feel that my body has at least some good qualities.	1	2	3	4	5
4. I take a positive attitude towards my body.	1	2	3	4	5
5. I am attentive to my body's needs.	1	2	3	4	5
6. I feel love for my body.	1	2	3	4	5
7. I appreciate the different and unique characteristics of my body.	1	2	3	4	5
8. My behavior reveals my positive attitude toward my body; for example, I hold my head high and smile.	1	2	3	4	5
9. I am comfortable in my body.	1	2	3	4	5
10. I feel like I am beautiful even if I am different from media images of attractive people (e.g., models, actresses/actors).	1	2	3	4	5