Physical Literacy and Motivation to Engage in Physical Activity after Bariatric Surgery

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Abstract

Background: Long-term weight loss and improved health after bariatric surgery require patients to adhere to a healthy post-surgical lifestyle, including regular physical activity (PA). Physical literacy is a holistic, multifaceted concept fundamental to an individual's participation in lifelong PA. Physical literacy and its relationship to motivation to engage in PA after bariatric surgery is currently void from the patient’s journey. Purpose: This study explored a post-bariatric surgical patient population at two hospitals in Northwestern Indiana. It assessed if there was a relationship between perceived physical literacy and motivation to engage in PA after bariatric surgery. Method: This quantitative, non-experimental single-stage survey study used a cross-sectional design. The population was a homogeneous, convenience, non-random sampling of post-bariatric surgical patients who voluntarily and anonymously were invited to an email or postal mailed survey. Results: A total of 128 respondents were included in the final sample. Bivariate correlations revealed significant associations between PPLI Summary score ($r = .44, p < .001$), sub-scales of Knowledge and Understanding ($r = .57, p < .001$) and Sense of Self ($r = .35, p < .001$) with the Autonomous Motivation Index. Linear regression analysis showed that the model significantly predicted the Autonomous Motivation Index $F(2, 125) = 23.54, p < .001$, adjusted $R^2 = .31$. The Knowledge and Understanding score, which significantly contributed to the model ($p < .001$), increased by one unit and the Autonomous Motivation Index score increased by 1.37. No significant correlations were found between age, motivation, or perceived physical literacy ($p > .05$). This suggested that perceived physical literacy (PPL) may play a role in motivating post-bariatric surgical patients to engage in PA.

Keywords: physical literacy, perceived physical literacy, motivation, physical activity (PA), bariatric surgery
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Introduction

According to the World Obesity Atlas (2022), global obesity is on track to double, resulting in an estimated one billion individuals living with obesity by 2030. Obesity is a chronic, multi-factorial, relapsing, and progressive condition (Bray et al., 2017). The Centers for Disease Control and Prevention (CDC) (2022a) reported the highest level in its history, with approximately 42.4% of adults in the United States having obesity. Garvey et al. (2016) and Wolfe et al. (2016) report that the condition of obesity increases the risk of over 60 comorbidities, including type 2 diabetes, dyslipidemia, sleep apnea, hypertension, stroke, coronary heart disease, gallbladder disease, osteoarthritis, cancer and more. Bariatric surgery can lessen a patient's weight quickly and offer a significant opportunity to reduce or resolve many co-morbid conditions (Arminian et al., 2015; Buchwald et al., 2009; Chang et al., 2014). Nevertheless, bariatric surgery is a powerful tool, not an elixir, for weight loss. Patients must follow post-surgical guidelines for sustained weight loss, including a healthy diet and consistent physical activity (PA). According to the CDC (2022c), current PA guidelines consist of 150 minutes of moderate-intensity PA, 75 minutes of vigorous-intensity PA, or an equivalent combination of the two twice weekly.

The current practice of prescribing a structured PA regime after bariatric surgery is suspect as it has not markedly increased patient adherence (Hood et al., 2016; Toussi et al., 2009; Welch et al., 2008). Research shows that physical literacy may be associated with consistent patterns of PA and thus improved overall health (Belanger et al., 2018; Cairney et al., 2019). Physical literacy is defined as motivation, confidence, physical competence, knowledge, and understanding of the importance of engaging in lifetime PA (Whitehead, 2010; Whitehead, 2019). Whitehead (2001; 2007; 2010) and Taplin (2019) argue that physical literacy is
foundational to being physically active, as it embodies participation in any PA, not just structured and prescribed activity. Physical literacy has emerged as a novel opportunity related to PA and health benefits (Whitehead, 2010; Belanger et al., 2018; Cairney et al., 2019; Jurbala, 2015) but has yet to be explored in the bariatric literature.

**Problem Statement**

Even though systematic reviews have shown that structured PA, referred to as exercise, has a positive relationship with increased weight loss after bariatric surgery (Jacobi et al., 2010; Livhits et al., 2010), a significant number of individuals do not engage in exercise post-surgery (Bond & King, 2014; Elkins et al., 2005; Toussi et al., 2009). Therefore, is the traditional practice of prescribing structured PA sessions using generalized guidelines not meeting the individual needs of today's bariatric patients? According to Whitehead (2019), exploring physical literacy may assist our understanding of engaging in PA with this population. Unfortunately, the bariatric literature does not mention physical literacy as an underlying concept of a physically active life post-bariatric surgery. This void is a problem and invites exploration into whether physical literacy is associated with a bariatric surgical patient's motivation to be physically active after surgery.

**Purpose Statement**

This study aims to explore if there is an association between physical literacy and motivation to be physically active in adults post-bariatric surgery and whether the motivation to engage in PA is associated with age.

**Research Questions**

To address the study purpose, the following research questions were answered.
1. Is there an association between perceived physical literacy and motivation to engage in PA among post-bariatric surgical adult patients aged 18-65 who had surgery at one of two Northwestern Indiana hospitals within the last six years?

2. Is there an association between age and motivation to engage in PA among post-bariatric surgical adult patients aged 18-65 who had surgery at one of two Northwestern Indiana hospitals within the last six years?

3. Is there an association between age and perceived physical literacy among post-bariatric surgical adult patients aged 18-65 who had surgery at one of two Northwestern Indiana hospitals within the last six years?

**Objectives**

1. To determine the relationship between perceived physical literacy, measured with the Perceived Physical Literacy Instrument (PPLI; Sum et al., 2018), and motivation to engage in PA, measured with the Situational Motivation Scale (SIMS; Guay et al., 2000; Standage et al., 2003).

2. To explore the association between age and motivation to engage in PA, as measured with the SIMS (Guay et al., 2000; Standage et al., 2003).

3. To explore the association between age and perceived physical literacy, as measured with the PPLI (Sum et al., 2018).

**Significance of the Study**

This study is essential for the bariatric discipline to learn about physical literacy and how it relates to a patient’s motivation to engage in PA after bariatric surgery. By exploring the relationship, this study offers new insights for bariatric professionals to update their current practice of disseminating prescriptive, structured, general exercise programs to all ages post-
surgery. In addition, this study’s findings convey valuable information to bariatric surgical programs to embrace and nurture the domains of physical literacy as antecedents to increasing motives for engaging in a physically active lifestyle post-bariatric surgery while considering diverse age group motivators in this population.

**Literature Review**

**Obesity**

Obesity is diagnosed based on body mass index (BMI), which is defined as when an individual's body weight is 20% or more above what is considered healthy for their height (Centers for Disease Control and Prevention [CDC], 2022b). Obesity is a domestic and global issue (CDC, 2022b). It contributes to over 60 co-morbid conditions like type 2 diabetes, dyslipidemia, sleep apnea, hypertension, coronary heart disease, stroke, and cancer (CDC, 2021). According to the CDC (2021), the prevalence of obesity in the United States (US) in 2017 was nearly 42%, an increase of more than 10% from the previous reported period. Additionally, in 2017, severe obesity (individuals with a BMI >40) nearly doubled, increasing to 9.2% from 4.7% (CDC, 2021).

Economically, obesity challenges the US with an annual estimated cost of $344 billion (CDC, 2022a). At the individual level, those with obesity had nearly $2,000 more medical expenses than those with a healthy weight (CDC, 2022a). In addition, the Millikin Institute (2020) estimated $1.02 trillion in indirect obesity costs related to lost workdays (Lopez et al., 2020). When combining all expenses, obesity costs the US approximately 6.76% of the 2018 Gross Domestic Product (Lopez et al., 2020).

Obesity is a complex, multi-factorial medical condition whose causations include genetic predisposition, increased unhealthy food consumption, increased technological advancements
that reduce daily movement, and decreased PA (Chooi et al., 2019; Diels et al., 2020; Grundy, 1998; Hawkes et al., 2015). The Harvard School of Public Health (2012) states that unhealthy food choices certainly contribute to an increased risk of obesity; however, the toxicity of the food environment poses a far greater risk. Additional research shows that genetics, hormones, and epigenetics play a significant role in developing obesity (Thaker, 2017). Finally, the CDC (2022a) acknowledges that in addition to unhealthy eating patterns, lack of PA, insufficient sleep, social determinants of health, and certain illnesses and medications can contribute to obesity. In summary, no simple solutions exist to assist individuals with unhealthy body weight (CDC, 2021). All segments of society, including but not limited to the food and beverage industry, local and national government, elementary, secondary, and higher-level educational institutions, and healthcare, need to work together toward a comprehensive, multidimensional, systems-based approach that offers sustainable results to reduce the threat of obesity to the public’s health (Grundy, 1998; Lee et al., 2017). Although a successful sustainable, multi-segment plan has yet to be unveiled, bariatric surgery remains a viable solution (Arterburn et al., 2020; Rognoni et al., 2020).

**Bariatric Surgery**

Compared to non-surgical options for obesity, bariatric surgery results in significant and sustained weight loss and reduced related comorbidities if post-surgical guidelines are adhered to (American Society for Metabolic and Bariatric Surgery [ASMBS], 2019; Colquitt et al., 2014). According to the ASMBS (n.d.), individuals with a BMI > 40, over 100 pounds overweight, or a BMI > 35 with at least one or more comorbidities related to obesity and who have been unsuccessful at previous weight loss attempts may qualify for bariatric surgery. In addition, Angrisani et al. (2015) examined data from the International Federation for the Surgery of
Obesity and Metabolic Diseases and found that bariatric surgery has increased globally. The same holds domestically, with a nearly 100,000 increase in these surgical procedures from 2011-2019 (Estimate of Bariatric Surgery Numbers, 2021).

Bariatric surgery, as with any surgery, may cause safety concerns (Arterburn et al., 2020). Anastomotic leaks, hernias, bleeding, ulcers, and even death are possible (Chang et al., 2014; Lim et al., 2018). However, current bariatric procedures use modern surgical techniques, reducing complication risk and demonstrating safety and efficacy (Aminian et al., 2014; Arterburn et al., 2020; Lim et al., 2018; Pomp, 2014). Since the early 2000s, bariatric surgery's estimated range of mortality rates has been between .03% to .20%. (Arterburn et al., 2020).

Bockelman et al. (2017) used hazard ratio comparisons for bariatric surgery, cholecystectomy, knee arthroplasty, and colorectal resection in their nationwide study. They found that mortality rates after bariatric surgery were surprisingly lower than those of all other elective surgeries. Despite low complication risk and mortality, bariatric surgery without significant lifestyle changes can result in modest weight loss results, at best (Campos et al., 2020; Richardson et al., 2009).

**Post-Bariatric Surgery Guidelines for Successful Weight Loss**

According to Hood et al. (2018), significant and comprehensive lifestyle behavioral modifications are required for long-term weight loss sustainability after bariatric surgery. Therefore, in addition to regular follow-ups and attendance at monthly support groups (ASMBS, 2022), dietary changes and consistent PA are essential (Correia et al., 2019; Petridou et al., 2019; Zabatiero et al., 2015) for continued lifestyle changes and long-term improvements. Typically, bariatric surgical patients are educated on the importance of drinking 64 ounces of non-sugary, non-caffeinated fluid daily, eating 60-100 grams of protein daily, avoiding high sugar and high-
fat foods, and taking vitamin/mineral supplements for best outcomes (ASMBS, 2022). Adhering to these dietary guidelines has been shown to correlate with increased weight loss after surgery (Mitchell et al., 2016). Furthermore, in addition to following strict nutritional guidelines after bariatric surgery, the ASMBS (2022) posits that formal exercise and daily PA are equally important.

Regular daily exercise post-bariatric surgery is encouraged and strongly recommended (Hood et al., 2018; Mechanick, 2016). ASMBS guidelines assert that post-surgical patients complete an average of 30 minutes of moderate exercise daily (ASMBS, 2022; Mechanick, 2016; Tabesh et al., 2019). Studies reveal that bariatric surgical patients can receive an array of benefits from a structured, individualized exercise program after surgery (Bellicha et al., 2018; Coen et al., 2014; Daniels et al., 2017; Gil et al., 2021; Ren et al., 2018). For example, Gil et al. (2021) conducted a randomized controlled study with 80 post-bariatric surgical women. They measured the effects of a 6-month, three times per week, aerobic and resistance training program and found that the exercise group had better performance with both the timed-up-and-go \( p = .05 \) and timed-stand test \( p < .01 \) compared to the non-exercise group. Furthermore, the exercise group had greater absolute \( p < .01 \) and relative \( p < .01 \) strength in comparison to the non-exercise group. Bellicha et al. (2018) performed a systematic review examining 15 studies. They found that a structured exercise program after bariatric surgery improved fitness and enhanced weight and fat loss. Even with the positive results of these studies, there is contradictory evidence showing that the current prescriptive exercise program after bariatric surgery indeed results in patient non-adherence (Hood et al., 2016; Welch et al., 2008). An exploration into general, unstructured PA may be warranted if a lack of adherence to a structured exercise program is evidenced.
Physical Activity Versus. Structured Exercise

Exercise is conceptually different from PA (Caspersen et al., 1985; CDC, 2017; Dasso, 2018; Gummelt, 2015). According to Caspersen et al. (1985), although exercise and PA result in energy expenditure, their features differ. Physical activity, like doing housework, gardening, or walking the dog, is the broader, overarching concept encompassing general bodily movement (CDC, 2017; Dasso, 2018). In contrast, structured exercise, like lifting weights, running on a treadmill, or walking in a 5K race, is a planned, structured, repetitive, and purposive activity (CDC, 2017; Dasso, 2018). Until recently, these two terms have been used interchangeably despite their significant differences (Caspersen et al., 1985; CDC, 2017; Dasso, 2018; Gummelt, 2015). Traditionally, exercise research focuses on achieving fitness and body composition goals, like improving cardiovascular efficiency, increasing strength, and enhancing lean tissue. Indeed, research shows that structured exercise delivers substantial benefits (Astrand, 1988; Blair, 1992; Blair et al., 1989; Blair et al., 2004; Manini, 2015; Morris & Heady, 1953; Paffenbarger et al., 1986; Thompson et al., 2001). Typically, exercise is prescribed according to industry guidelines, which state that individuals aged 18-65 should engage in a minimum of 150 minutes per week of moderate aerobic exercise or a minimum of 60 minutes per week of vigorous activity (Ligouri & ACSM, 2022). These structured, prescriptive exercise plans improve fitness and body composition (Amaro-Gahete et al., 2019; Blair et al., 2004; Branch et al., 2000).

However, recent attention has pivoted to the overall health and well-being benefits of unstructured PA (Dasso, 2018), which is the focus of this study. Engaging in daily movement as opposed to traditional exercise bouts is beneficial, especially for “functional fitness training” (Astrand, 1992), and should be considered for overall health improvements (Jakicic et al., 2019). Importantly, Jakicic et al. (2019) reviewed 29 cross-sectional studies investigating whether < 10
minutes of PA bouts resulted in health benefits. They found that < 10-minute bouts of PA were associated with positive health outcomes (Jakicic et al., 2019).

Research shows that the post-surgical bariatric population struggles with adherence to formal exercise (Hood et al., 2016; Welch et al., 2008), yet these patients continue to be prescribed structured exercise programs after bariatric surgery (ASMBS, 2022; Mechanick, 2016; Tabesh et al., 2019). Structured exercise program research touts the benefits of prescriptive exercise in the post-bariatric surgical population and purely focuses on physical parameters like weight loss and fat mass loss (Bellicha et al., 2018; Coen et al., 2014; Gil et al., 2021; Ren et al., 2018). However, since the evidence supports health improvements with less than the current industry exercise duration guideline (Jakicic et al., 2019), bariatric patients who struggle with adherence to formal exercise may do well if healthcare providers shifted the paradigm and promoted < 10-minute bouts of PA like playing with the dog, sweeping the floor, or walking a flight of stairs (Jakicic et al., 2019). Interestingly, many studies ignore unstructured PA as a part of everyday living, which is crucial and related to a concept called physical literacy (Whitehead, 2001; 2007; 2010; 2019).

**Physical Literacy**

Whitehead defines physical literacy as a multidimensional concept with holistic underpinnings defined as "the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engaging in PA for life (2019, p. 8)". In addition, Cairney et al. (2019) argue that physical literacy offers a robust and rich lens to examine PA and its function in health promotion. However, most of the physical literacy research has targeted youth (Belanger et al., 2018; Jefferies et al., 2019), adolescents (Liu & Chen, 2020), and, most recently, older adults (Huang et al., 2020; Roetert & Ortega, 2019).
Sadly, the concept of physical literacy has yet to be studied in the adult (18-65 years of age) healthcare ecosystem with the post-surgical bariatric population.

In 2020, Cornish et al. conducted a comprehensive literature review regarding physical literacy and identified 17 articles for inclusion. Although there was no perfect consensus on the definition of physical literacy, 94% of the articles identified by Cornish et al. (2020) used the physical literacy definition proposed by Whitehead (2001; 2007; 2010; 2019). In addition, Cornish et al. (2020) confirmed that much of the physical literacy research had been done in the youth and adolescent sector, focusing on the physical domain (Cairney et al., 2019). Furthermore, studies have yet to be conducted in the healthcare sector with adults despite evidence of physical literacy's connection to improved health (Cairney et al., 2019).

Nonetheless, Holler et al. (2019) conducted a first-of-its-kind, non-randomized adult study with an intervention group of 30 physically inactive females and a matched control group of 30 physically inactive females. The intervention consisted of a once-weekly low-dose exercise session, for a total of 15 weeks, with the novel addition of a physical literacy element that proved to be promising (Holler et al., 2019). Holler et al. (2019) found that the intervention group’s physical literacy score improvement was statistically significant ($p < .001$) with a large effect size ($\eta^2 = 0.21$). Due to shortcomings with their physical literacy measurement instrument and the inability to focus on recruitment solely within the primary healthcare area, Holler et al. (2021) conducted a second, comparable non-randomized study. Similar to their first study, Holler et al. (2021) found statistically significant physical literacy improvements among physically inactive adults ($p < .001$, $\eta^2 = 0.29$). However, this study identified a few limitations, including a convenience sample and a small sample size (Holler et al., 2021).
As evidenced by the literature, a gap exists in exploring the relationship between physical literacy and PA in the post-bariatric surgical adult (ages 18-65 years) population. Additionally, understanding if an individual's age is related to motivation and whether age and motivation are associated with engaging in PA would benefit bariatric healthcare providers. Lastly, this information would provide valuable insight into developing suitable approaches for working with the post-bariatric surgical population and their engagement in lifelong PA.

**Motivation and Engaging in PA**

Motivation is defined as the drive or desire to perform or participate in a particular behavior (Baumeister, 2016) and is a vital element that contributes to an individual's PA engagement (Schwarzer et al., 2011; Quested et al., 2021; Rhodes et al., 2017). In addition, studies have shown that motivation is likely to predict if individuals will participate in PA (Bond et al., 2014; Schwarzer et al., 2011). For example, the Bari-Active study (Bond et al., 2016) explored pre-bariatric surgery vs. post-bariatric surgery PA and identified that additional research is needed to pinpoint contributors, such as motivation, that may be related to participation in PA with bariatric surgical patients. Furthermore, Palmer et al. (2020) conducted a concept analysis to explore the relationship between motivation and PA by examining 68 full-text articles in the adolescent sector. They found that autonomous motivation is essential in developing PA interventions and should be considered for further study.

**Motivation and Age**

Age and motivation have been found to be related (Nikitin et al., 2014; Steltenpohl et al., 2019; Stults-Kolehmainen et al., 2013). Nikitin et al. (2014) examined age and motivation and examined avoidance motivation and social situations with 55 male and female younger adults ($M = 23.67$ years) and 58 male and female older adults ($M = 71.44$). Using repeated-measures
analysis of variance (ANOVA), Nikitin et al. (2014) reported a statistically significant difference in avoidance motivation between younger and older adults, $t(109) = -3.81, p < .001, d = .73$, concluding that age is an essential variable in predicting motivation.

In a qualitative study by Steltenpohl et al. (2019), the Socioemotional Selectivity Theory (Lockenhoff & Carstensen, 2004) framework was used to verify shifts in exercise motivation depending on age. Their focus group research examined age differences related to exercise motivation and found that age was related to motivation. Thus, they recommended that health professionals integrate age-specific messaging to enhance exercise at various stages of life. Additionally, in their study with highly active individuals, Stults-Kolehmainen et al. (2013) argued that many motives contribute to exercise engagement. Importantly, their research identified that an individual’s motivational 'profile' differs depending on age. Stults-Kolehmainen et al. (2013) recommend that future studies investigate this concept within a theoretical framework like the Self-Determination Theory (SDT) developed by Deci & Ryan (1985).

**Self-Determination Theory**

While examining the relationship between physical literacy and PA in the post-bariatric surgical population, it is vital to understand an individual’s underlying motivations and other determinants that contribute to adopting a physically active lifestyle after surgery. SDT is a human motivation theory proposing that human behavior is driven to meet the basic needs of competence, autonomy, and relatedness (Deci & Ryan, 2014; Ryan & Deci, 2000). The literature offers evidence to support the efficacy of interventions based on the SDT and PA in both the bariatric surgical and non-surgical populations (Edmunds et al., 2008; Teixeira et al., 2012; Wilson et al., 2006).
In the non-bariatric surgical sector, Coumans et al. (2022) conducted a cross-sectional study of 1,142 adults using two questionnaires, the Behavioural Regulation in Exercise Questionnaire (BREQ-2) and the Treatment Self-Regulation Questionnaire (TSRQ), to measure motivation for PA and diet based on SDT. They found that self-determined forms of motivation for lifestyle domain-specific activities are relevant for forecasting sub-behaviors (Coumans et al., 2022). Furthermore, Mancini (2008) reminds us that program approaches can significantly influence motivation in his work in the mental health realm with patient recovery. For example, programs that do not consider the patient's independent behaviors and interests but instead focus on a dictatorial or commanding approach can negatively affect motivation (Mancini, 2008).

Additionally, Ostendorf et al. (2021) studied the relationship between motivational profiles of overweight or obese adults and changes in their PA during an 18-month behavioral weight loss program which included supervised exercise for six months followed by an unsupervised exercise program for six months (Ostendorf et al., 2021). Similarly, they found that intrinsically motivated adults appeared to sustain PA after removing the supervision, offering additional alignment with SDT (Ostendorf et al., 2021).

In the bariatric surgical population, Jimenez-Loaisa et al. (2020) and Gonzalez-Cutre et al. (2018) conducted studies where exercise programs were built using SDT. As a result, Jimenez-Loaisa et al. (2020) identified that exercise intervention based on SDT improved bariatric patients' reported quality of life post-surgery. Furthermore, using a qualitative methodology, Gonzalez-Cutre et al. (2018) found positive themed outcomes in the bariatric surgical patient population participating in SDT-based exercise programs. Finally, Anderson & Chacko (2018) worked with post-bariatric surgical patients and implemented a holistic self-
management program based on SDT. This SDT-based intervention emboldened autonomy, consistent with intrinsic motivation (Hagger et al., 2014).

While SDT literature is robust and offers insight into its contribution to PA, limited studies have focused on its relationship to physical literacy. A study with college students identified a reciprocal association between SDT’s psychological needs satisfaction and physical literacy (Wang et al., 2020). McClelland (2013) studied children in 4th-6th grade and found a propensity towards engaging in PA shaped by needs satisfaction which is an element of SDT. Lastly, Chen (2015) described how a physically literate individual must have intrinsic motivation, stemming from SDT constructs (Ryan & Deci, 2000), to be physically active.

As evidenced above, some peer-reviewed studies have used SDT to examine physical literacy and PA in youth, adolescent, and college populations. However, no studies have used an SDT lens with the post-surgical adult (18-65 years of age) bariatric population. Studying this population's relationship between perceived physical literacy, age, and motivation to engage in PA will contribute to the contemporary literature on the post-bariatric standard of care.

Conclusion

Although bariatric surgery offers metabolic and anatomical changes for substantial weight loss, it is not a panacea. It requires a consistent and sustained focus on healthy lifestyle choices, such as lifelong PA and incorporating movement into everyday living practices. In addition, the multidimensional concept of physical literacy is void from the bariatric surgical literature. Therefore, the opportunity exists to examine whether physical literacy is correlated with an individual's motivation, a construct of SDT, and whether age is associated with a post-bariatric surgical patient’s motivation to participate in PA.

Method
Study Type and Design

This quantitative, non-experimental study used a cross-sectional design. This single-stage survey study also used a homogeneous, convenience, non-random sampling of post-bariatric surgical patients in Northwestern Indiana. The study did not involve direct patient contact, as it was designed as primarily an email survey using Qualtrics survey software, with some postal mailed surveys for patients who did not have an email address. The study ran from January 2023 to March 2023. The appropriate institutional review board approvals were secured before the study was released.

Participants

Post-surgical bariatric patient populations of two hospital-based clinics in Northwestern Indiana served as the population of interest for this study. To be included in this study, patients needed to be between 18 and 65 years old. In addition, they had a verified EPIC electronic medical record (EMR) identifying that either a Roux-en-Y Gastric Bypass or a Vertical Sleeve Gastrectomy surgery was completed at either St. Mary Medical Center in Hobart, Indiana, or Community Hospital in Munster, Indiana, since 2016. In addition, study participants needed an accurate email address or physical address extracted from the EPIC electronic medical record to deliver the study questionnaire. Male and female patients who had other bariatric surgeries, such as the lap band, were excluded from the study since the lap band does not permanently amend the anatomical structure of the gastrointestinal area, nor is categorized as a permanent metabolic surgical procedure.

An initial query of the ICD-10 codes for Roux-en-Y Gastric Bypass and Vertical Sleeve Gastrectomy in the EMR at the two Northwestern Indiana hospitals estimated that approximately 1,050 patients had had these surgeries since 2016. An a priori sample size calculation using
G*Power, version 3.1 (Faul et al., 2009) was conducted based on using a bivariate correlation two-tailed test and the following parameters: alpha of .05, power of .80, and an effect size of .30. The calculation resulted in a minimum sample size of 84.

Data

Self-reported data included the following:

Demographic Independent Variables

- Geographic region: whether the subject resided in Northwestern Indiana (Lake, Porter, Jasper, Newton, LaPorte counties): (a) Yes or (b) No
- Perceived level of safety within the residential community (i.e., how well the community was protected from dangerous situations): (a) Very safe or (b) Somewhat safe or (c) Somewhat unsafe or (d) Very unsafe
- Perceived access to recreational areas for physical activities like walking (i.e., trails, sidewalks, malls, parks, etc.), playing, hiking, swimming, biking, etc.: (a) Very good access (b) Good access (c) Somewhat good access (d) Somewhat poor access (e) Poor access (f) Very poor access
- Age in years
- Gender: (a) Female or (b) Male or (c) Other
- Race: (a) Asian or (b) African American/Black or (c) Caucasian/White or (d) Latino/Hispanic or (e) Pacific Islander/Native Hawaiian or (f) Native American or (g) Other
- Type of bariatric surgery: (a) Gastric (Roux-en-Y) Bypass or (b) Vertical Sleeve Gastrectomy
- Years since bariatric surgery
• Level of education: (a) Eighth grade or less (b) Some high school (c) High school graduate or GED (d) Some college (e) College graduate or (f) Graduate/Professional degree

• Marital status: (a) Married or (b) Divorced or (d) Widowed or (e) Single, never married

Additional Independent Variable

• Perceived physical literacy

Outcome/Dependent Variable

• Motivation to engage in PA

Operationalized Variables

According to the International Physical Literacy Association (n.d.), physical literacy is "the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engagement in physical activities for life" (n.d.). Physical literacy was operationalized by summing the total and related sub-scale scores from the Perceived Physical Literacy Instrument (PPLI).

Deci and Ryan (1985) define motivation as fundamental to their SDT. They state that autonomy, competence, and relatedness are foundational to understanding one's self-determined motivation, which is categorized into intrinsic (coming from within), extrinsic (external regulation), defined as coming from outside or identified regulation defined as "the most autonomous form of extrinsic motivation" (Ryan & Deci, 2000, pp. 72–73) or amotivation (absence of motivation). Situational motivation is the motivation an individual experiences in the ‘here and now’ (Vallerand, 1997; Vallerand & Ratelle, 2002). Intrinsic and extrinsic motivation
were operationalized as the sub-scale scores derived from the Autonomous Motivation Index and Controlled Motivation Index obtained from the SIMS.

**Instruments**

*Perceived Physical Literacy Instrument*

Approval was obtained for the PPLI (Appendix A). The PPLI measured perceived physical literacy (Sum et al., 2016). The PPLI originally contained 18 items; however, after both exploratory and confirmatory factor analyses were conducted, the instrument was modified to contain a 9-item, 3-factor sub-scale (Sum et al., 2016). Therefore, the PPLI used for this study was the 9-item, three-factor assessment tool with three items per subscale factor (Appendix B). The three identified subscale factors are knowledge and understanding, self-expression and communication with others, and a sense of self and self-confidence. The instrument used a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Values from all nine items were totaled, with the overall score ranging from 9 to 45. In addition, scores for each of the three subscales were also totaled, with scores ranging from 3 to 15. For the overall and subscale scores, higher scores indicated greater overall perceived physical literacy.

Researchers developed this instrument, administered it to 336 physical education professionals in Hong Kong, and proved that it has construct validity with good validity and reliability. Analyses showed internal consistency reliability, with a Cronbach's alpha from .73 to .76 and exploratory factor analysis from .69 to .87, demonstrating construct validity (Sum et al., 2016). A good fit for the model was supported by confirmatory factor analysis (Mohamad et al., 2020). Although no information was provided regarding test-retest reliability, convergent validity, or discriminant validity, Mohamad et al. (2020) found the PPLI reliable and valid for measuring perceived physical literacy. Furthermore, the PPLI was initially used with physical
education professionals, yet Mohamad et al. (2020) argued that it could also be used in medical and health settings. Confirmatory factor analysis was used to determine subscale validity. To determine the goodness of fit for all the subscale models, Sum et al. (2016) found that 33% of the residuals were greater than .05, and all subscales had a Cronbach’s alpha > .70, indicating internal consistency.

**Situational Motivation Scale**

The SIMS was also approved for use (Appendix A). It is a multidimensional instrument (Appendix C) used to assess intrinsic motivation, identified regulation, external regulation, and amotivation at the situational level (Guay et al., 2000). The SIMS is a 16-item instrument (Guay et al., 2000) used to measure situational motivation in numerous studies within various PA situations (Kowal & Fortier, 2000; Standage et al., 1999; Standage & Treasure, 2002). The SIMS questionnaire offered a 7-point Likert scale for participant responses, including 1–corresponds, not at all; 2–corresponds a very little; 3–corresponds a little; 4–corresponds moderately; 5–corresponds enough, 6–corresponds a lot; and 7–corresponds exactly. The SIMS identified four subscales: intrinsic motivation, identified regulation, external regulation, and amotivation. The scores from the four subscales were totaled and then divided by the number of questions (Guay et al., 2000). The higher the score, the greater the motivation (Guay et al., 2000). The SIMS identified an Autonomous Motivation Index, calculated by adding and averaging the intrinsic motivation and identified regulation scores. A Controlled Motivation Index was calculated by adding and averaging the external regulation and amotivation scores.

Five studies, with collectively over 1000 French Canadian college students, were conducted in the original research (Guay et al., 2000). Although the original research used college students, Clancy et al. (2017) found that the SIMS instrument could be used in most
settings. Exploratory factor analysis (EFA) was done to determine internal reliability. EFA identified the four subscales and verified that intrinsic motivation, identified regulation, external regulation, and amotivation could be assessed with this instrument. (Guay et al., 2000)

Cronbach's alpha values for the four subscales were as follows: intrinsic motivation = .95; identified regulation = .85; external regulation = .62; and amotivation = .83). Clancy et al. (2017) found the SIMS to have adequate test-retest reliability. Several studies identified that the content, factorial, predictive validity, and reliability of the SIMS scores exist and have a good model fit (Blanchard et al., 2007; Clancy et al., 2017; Gillet et al., 2012; Guay et al., 2000; Standage et al., 2003).

Procedures

Initially, all bariatric surgical patient lists at the two Northwestern Indiana hospitals were cross-checked by the bariatric clinic manager to verify ICD-10 surgical codes for Roux-en-Y Gastric Bypass or Vertical Sleeve Gastrectomy and patients ages 18-65 were identified as qualified study participants. After identifying the qualified study participants, the primary researcher manually reviewed all the patients' EMRs to confirm they met the age, type of bariatric surgery, and time since bariatric surgery criteria. Excluded patient information, including the reason for exclusion, was logged and totaled by the researcher. Additionally, the researcher extracted emails from the EMR and cross-referenced them with the Marketing department's bariatric patient database. Patient information was permanently deleted from all electronic files if they did not meet the inclusion criteria. Patient information was de-identified and kept in password-protected files housed in Community Healthcare System computers, protected by extensive firewalls and multiple servers. In addition, the Corporate Compliance Officer of the Community Healthcare System, where the patient data was stored, served as the
expert in overseeing risks of patient identification with the set of health information data collected in this study.

**Recruitment**

This study used the following strategies, suggested by Pit et al. (2014) for successful recruitment:

1. Support of the two hospitals within the healthcare system from the President/CEO, Medical Director of the Department of Bariatrics, and Bariatric Surgeons of the Department of Bariatrics was secured (Appendix D).

2. Postcard, email, newsletter, and office signage was used to pre-notify bariatric surgical patients about the study.

3. Bariatric surgical patient emails and physical addresses were verified as current and up to date by cross-referencing the EMR with the marketing department's CRM database.

4. The Medical Director emailed and postal mailed a letter of invitation to participate in the study. Subsequently, actual invitations to participate were emailed and postal mailed during the data collection phase of the study.

**Informed Consent**

According to the Revised Common Rule (2017), an institutional review board needed to confirm the need for informed consent since this study involved human subjects and the extraction of personal health information occurred from an EMR (Manti & Licari, 2018). Therefore, the participant's informed consent was collected electronically for the survey. On the first page of the survey, participants agreed to participate in the study by clicking the agreement
button. Individuals who did not agree to participate in the study were taken to the end of the survey.

For the postal mailed surveys, the face page of the survey contained the consent information and a statement indicating that by answering and returning the survey, the participant was providing their consent. If they desired to be included in the incentive gift card drawing, a gift card drawing ticket needed to be completed and returned with their survey in a pre-printed, pre-paid envelope with no return address requested (Appendix E).

**Pre-data collection**

The Hospital’s EMR (EPIC) was queried to identify all bariatric surgical patients. Participant name, email address, and mailing address were extracted and provided to the primary researcher in a password-protected Excel file in the healthcare system's secured server. The primary researcher manually screened the Excel patient data file to identify those who met the inclusion criteria. Patients excluded from the study were deleted from the eligible list, and their emails were placed into a study exclusion file for future reference.

Once potential participants were identified and determined to be eligible for the study, a pre-survey letter of support and invitation to participate from the Medical Director of Bariatric Services was sent approximately two to three weeks before releasing the survey. This invitation included information regarding an optional incentive gift card drawing for patients who completed the survey.

**Data Collection**

Data collection was done at the Community Healthcare System in a closed office to protect the privacy and confidentiality of the respondents. A Community Healthcare System registration representative within the Department of Bariatric Services sent all invitation emails
and postal mail to the approximately 1,050 post-bariatric surgical patients. For the email surveys, a link and QR code to a Qualtrics survey (Appendix E) was embedded in a HIPAA-compliant Constant Contact message and emailed from a unique healthcare system email address that had end-to-end encryption and was reserved for this study. In addition, the Constant Contact account was set up to release up to three subsequent email reminders for individuals who still needed to open their initial emails. The header in the follow-up emails reiterated the gift card drawing prize incentive and presented the immediacy for a call to action.

The registration representative tracked the response rate in a password-protected Community Healthcare System Sharepoint document for the researcher to review daily. After three days of unopened initial email identification, a second reminder email was released. A third reminder email was sent after seven days of unopened initial email identification. Two weeks after the survey was emailed, an unopened email list and any emails returned undeliverable were generated. Postal mailing addresses were extracted from EPIC, and surveys were postal mailed to patients who still needed to open their emails or did not have an email in the EMR.

The postal mail survey was sent via the United States Postal Service. The mailed envelope contained the letter of invitation, statement of informed consent, printed survey, gift card drawing ticket, and postage-paid return envelope with the Department of Bariatrics address as the return address. A final email was sent approximately three weeks after the initial email. It included a thank you to those who completed the survey, a reminder about the incentive gift card drawing, and a reiteration of the survey closing date.

The following strategies were implemented to ensure survey respondents did not take the survey multiple times or share the survey with others, as well as mitigated the risk of bot responses (Nesterak, 2019). First, the online Qualtrics survey was designed to set a cookie on the
respondent's browser when they submitted their response. If the respondent attempted to click on the survey more than once, Qualtrics identified the cookie and prohibited additional survey submissions. In addition, since the survey was sent from a unique email within the healthcare system, a one-time-use link was generated by Qualtrics for each participant, further reducing multiple submissions by the same respondent. Next, the mailed survey had a survey identifier located in a section entitled 'office use only,' preventing duplication and distribution of the survey to others than to whom the survey was intended. Finally, the mailed drawing ticket contained a proprietary logo watermark to reduce the risk of fraudulent duplication or distribution.

Since the study response rate superseded the minimum sample size of 84, the researcher did not seek additional post-bariatric surgical patients via online sites like Reddit.

**Data Management**

Once the study closed, the primary researcher downloaded the data from Qualtrics into an Excel file. Data were cleaned, and instrument scores were calculated and analyzed using the raw data. Participant data was protected and conformed to all privacy and confidentiality regulations and laws (i.e., HIPAA). All participant emails were stored in a password-protected electronic Excel file and a password-protected Constant Contact healthcare system account. All participant response data downloaded from Qualtrics was de-identified and stored in a password-protected Excel file. The computers used for this study were password protected with a dual-authentication system (i.e., Imprivata).

All returned surveys mailed via the United States Postal Service were received by the registration representative at the Department of Bariatrics, who handled all incoming department mail. The registration representative had access to a Sharepoint Excel file and was responsible
for uploading all returned survey response data into the file. The office lead oversaw the uploading of survey responses to ensure all data was entered correctly. All paper surveys were placed in a sealed envelope and were retained in the department’s locked data collection drawer. Paper surveys were shredded at the end of this study. Only the office lead and hospital security had the master key for the locked data drawers.

**Incentive Gift Card Drawing**

An incentive gift card drawing was built into Qualtrics to increase survey participation. At the end of the online survey, a question asked the participants if they would like to enter the drawing to win a $10 Amazon e-gift card. If the respondent answered "no," they were thanked for participating, and the survey was terminated. If the respondent answered "yes," they were directed to the drawing page. Participants’ names and contact information were collected on the gift card drawing page. Once the survey closed, the data from the drawing page was downloaded and exported into a second Excel file by the Department of Bariatrics’ registration representative and double-checked by the office lead.

Participants’ line location in Excel served as their numerical drawing number. Twenty winning numbers were randomly selected using the [www.random.org](http://www.random.org) random number generator website. The drawing winners were notified via email, and a $10 digital Amazon e-gift card was attached to notify them of their winning. The primary researcher sent the winning participants the digital Amazon e-gift cards via the healthcare system's unique email address developed for this study. In addition, the email was set so the researcher received a read receipt. A master list of all gift card drawing winners, date of email notification, return read receipts of emails, and prize amounts were contained in an Excel file entitled "Online gift card drawing winners,"
located on the Sharepoint drive, managed by the Department of Bariatrics’ registration representative, and overseen by the office lead.

Since only one gift card drawing ticket (Appendix F) was returned in the pre-paid survey return envelope, the primary researcher contacted the winner via their contact information and mailed their $10 Amazon gift card via United States Postal Service certified mail, requesting a return receipt.

**Statistical Analysis**

**Descriptive Statistics**

Descriptive statistics were used to describe the sample and report survey responses. Frequencies and percentages were reported for nominal data, and median and 25th and 75th percentiles were reported for ordinal and non-normally distributed interval and ratio data. In contrast, means and standard deviations were reported for normally distributed interval and ratio data. The normality of data was determined using the Shapiro-Wilk test and visualization of Q-Q plots and histograms. Data were analyzed using IBM SPSS Statistics for Windows, Version 28.0 (IBM Corp., Armonk, NY). All comparisons were two-tailed, and an alpha level less than .05 was considered statistically significant.

**Inferential Statistical Tests**

Bivariate correlations were conducted to determine if there was an association between motivation to engage in PA and perceived physical literacy and motivation to engage in PA and age. A scatter plot was used to determine whether a linear relationship existed, and a line of best fit was used to identify the strength of that relationship. Depending on the normality of the distribution, either the Pearson correlation or Spearman rho correlation was conducted. Based on the recommendations of Kraemer et al. (2003) and Kellar and Kelvan (2013), the Pearson
correlation and Spearman rho correlation coefficients were interpreted using the following scale: 

%.1-.29 = small association; .30-.49 = medium association and .50 - .99 = large association.

A linear regression analysis was completed to determine if perceived physical literacy and age, controlling for potential confounders, predict motivation to engage in PA. For regression results to be valid, several assumptions had to be met, including linearity, homoscedasticity of residuals, independence of observations, no multicollinearity, no significant outliers, and normally distributed residuals (Field, 2017). The assumptions were tested and interpreted based on the recommendations of Field (2017).

- Partial regression plots and a plot of studentized residuals against the unstandardized predicted values assessed linearity.
- Homoscedasticity was determined by visually examining a plot of studentized residuals against the unstandardized predicted values.
- A Durbin-Watson statistic assessed the independence of observations. If the value was between 0.80 and 3.20, then the assumption of independence of observations was met.
- No multicollinearity was determined using tolerance values and correlation coefficients between the independent variables. Tolerance values greater than 0.10 indicated no multicollinearity, as did correlation coefficients less than .85.
- No significant outliers were indicated if the standardized residuals value were with ±3 standard deviations.
- Normally distributed residuals were assessed through visual inspection of the histogram of standardized residuals and the probability plot (P-P plot).

Results
A total of 147 individuals responded to the survey, with 146 completing the Qualtrics survey online via email and one respondent submitting a mail-in survey, which was manually added to the raw data. However, 19 responses were excluded from the study due to non-consent ($n = 2$) or survey incompletion ($n = 17$). Therefore, the final survey sample size included in the study was 128 respondents.

**Descriptive Statistics**

The sample consisted of 128 respondents, with a slight majority falling in the 45-49 age group ($n = 29, 22.7\%$). The majority of participants were female ($n = 115, 89.8\%$) and identified as Caucasian/White ($n = 86, 67.2\%$), which aligns with previous bariatric surgical studies’ demographics (Chang et al., 2019; Courcoulas et al., 2018; DeMaria et al., 2010; Voorwinde et al., 2022). This indicates that the sample in this study is representative of the gender and ethnicity distribution within the post-bariatric surgical population. Most participants were married ($n = 75, 58.6\%$) and resided in Northwestern Indiana ($n = 111, 86.7\%$). Nearly all respondents had education beyond high school ($n = 118, 92.2\%$). The time since surgery varied from less than one year to 6 years, with a relatively even distribution across the years. Finally, similar to bariatric surgery industry trends (English et al., 2020), the most common bariatric surgery procedure was Sleeve Gastrectomy ($n = 86, 67.2\%$). Complete descriptive statistics are presented in Table 1. Table 2 shows the descriptive statistics for the PPLI and Motivation Index scores.

**Research Question 1**

Is there an association between perceived physical literacy and motivation to engage in PA among post-bariatric surgical adult patients aged 18-65 who had surgery at one of two Northwestern Indiana hospitals within the last six years?
**Bivariate Correlations**

As shown in Table 3, absolute correlation coefficients ranged from .13 to .57. There were statistically significant correlations for the PPLI Summary score \(r = .44, p < .001\), Knowledge and Understanding sub-score \(r = .57, p < .001\), and Sense of Self sub-score \(r = .35, p < .001\) with the Autonomous Motivation Index. Therefore, these three variables were identified as potential predictors of the Autonomous Motivation Index since they met the pre-established inclusion criterion of the correlation coefficient being ≥ .30. However, due to the strong correlation between the PPLI Summary score and the Knowledge and Understanding sub-score \(r = .78\) and the PPLI Summary score and Sense of Self sub-score \(r = .86\), there was a possibility of multicollinearity. Therefore, the PPLI Summary score was not entered into the model, and only Knowledge and Understanding, and Sense of Self sub-scores were used in the regression analysis.

For the Control Motivation Index, correlations with the PPLI Summary score, Knowledge and Understanding sub-score, Self-Expression sub-score, and Sense of Self sub-score did not reach the threshold for being included in the regression model. See Table 4. Therefore, linear regression analysis was not warranted.

**Linear Regression**

Linear regression was conducted with the dependent variable Autonomous Motivation Index and the independent variables Knowledge and Understanding and Sense of Self. All the assumptions of independent observations, normal distribution, linearity, and homoscedasticity were met. The model was statistically significant and predicted Autonomous Motivation Index, \(F(2, 125) = 23.54, p < .001\), adjusted \(R^2 = .31\). Only Knowledge and Understanding added statistically significantly to the model \((p < .001)\). As Knowledge and Understanding scores
increased, the Autonomous Motivation Index score increased by 1.37. Further information is presented in Table 5.

**Research Question 2**

Is there an association between age and motivation to engage in PA among post-bariatric surgical adult patients aged 18-65 who had surgery at one of two Northwestern Indiana hospitals within the last six years?

**Bivariate Correlations**

As shown in Table 6, absolute correlation coefficients between age and the Autonomous Motivation Index and between age and Control Motivation Index ranged from .01 to .13; neither was statistically significant ($p = .887$ and $p = .141$, respectively). Therefore, regression analysis was not justified because neither of the correlation coefficients was greater than .30.

**Research Question 3**

Is there an association between age and perceived physical literacy among post-bariatric surgical adult patients aged 18-65 who had surgery at one of two Northwestern Indiana hospitals within the last six years?

**Bivariate Correlations**

Table 7 shows absolute correlation coefficients ranging from .03 to .12 when examining Age against PPLI Summary scores, Knowledge and Understanding, Self-Expression, and Sense of Self sub-scores. In addition, none of the correlations were statistically significant ($p = .312$, $p = .173$, $p = .720$, $p = .502$, respectively). Therefore, regression analysis was not warranted since all the correlation coefficients were less than .30.

**Discussion**
This study explored the association between perceived physical literacy and motivation to engage in PA among adult post-bariatric surgical patients (18-65 years) in Northwestern Indiana. Additionally, the study examined the relationship between age and motivation to participate in PA among these patients. The findings of this study have implications for healthcare practitioners and patients, offering valuable insights to improve healthcare strategies and program outcomes for bariatric patients.

The study employed the Self-Determination Theory (SDT) as a theoretical framework developed by Deci and Ryan (1985), distinguishing between two primary motivation types: intrinsic and extrinsic. The researcher utilized the Autonomous Motivation Index of the SIMS survey instrument (Guay et al., 2000) to represent intrinsic motivation and the Control Motivation Index of the same instrument to represent extrinsic motivation. Although this study found no relationship between control motivation (extrinsic motivation), and any of the physical literacy subscales, the physical literacy sub-scale of Knowledge and Understanding did demonstrate a positive association of .31 with the Autonomous Motivation Index (intrinsic motivation). This finding suggests that individuals with a higher level of knowledge and understanding regarding general PA may exhibit an increased internal motivation to engage in PA. Furthermore, knowledge and understanding of physical literacy may equip individuals with information about the positive impact of PA on improved health and overall quality of life. When individuals are aware of these benefits, it is plausible that they are more inclined to be internally motivated to participate in PA to attain these favorable outcomes.

The study's findings reveal a positive relationship between the physical literacy subscale of Knowledge and Understanding and the Autonomous Motivation Index. Specifically, as individuals' scores on the Knowledge and Understanding subscale increased, the Autonomous
Motivation Index score increased by 1.37. This suggests that individuals with a higher level of knowledge and understanding about PA may exhibit a greater intrinsic motivation to participate in physical activities. This result implies that having a more profound comprehension of physical literacy may contribute to a more substantial internal drive and motivation to engage in PA. It highlights the importance of providing individuals with comprehensive information and education regarding physical literacy, as it can positively influence their intrinsic motivation and, subsequently, their overall engagement in PA after bariatric surgery.

These study findings support Cairney et al.’s (2019) assertion that physical literacy is valuable when exploring PA’s role in promoting health and well-being. While previous research has suggested the benefits of physical literacy initiatives as being viable, they targeted demographics such as youth (Belanger et al., 2018; Jefferies et al., 2019), adolescents (Liu & Chen, 2020), and older adults (Huang et al., 2020; Roetert & Ortega, 2019). This study’s results suggest that physical literacy could be vital to the adult bariatric surgical patient program.

Although research indicates age and motivation are correlated (Nikitin et al., 2014; Steltenpohl et al.; Stults-Kolehmainen et al., 2013), this study’s outcomes found no significant associations between age and motivation or age and physical literacy in the adult post-bariatric surgical population. It is worth noting that Stults-Kolehmainen et al. (2013) conducted a study involving more than 2,000 individuals aged 18 to 64 who were not post-bariatric surgical patients with obesity and argued that different age-related motivational profiles contribute to exercise engagement. While Stults-Kolehmainen et al.’s (2013) findings shed light on various age-related motivational profiles that contribute to engaging in formal exercise, it remains to be seen how these age-related profiles relate to the population in this study.
In contrast to the Stults-Kolehmainen et al. (2013) research, others support the finding of this study, stating that age is not a significant predictor of PA (Bergh et al., 2017) after bariatric surgery. In the Bergh et al. (2017) study, 112 participants wore an ActiGraph accelerometer for seven consecutive days, 18-24 months after bariatric surgery. In addition, they answered a questionnaire for the researchers to gather information regarding self-regulatory predictors of PA after bariatric surgery, which found that age was not a significant predictor of PA.

Subsequently, when exploring age and physical literacy, this study found no statistically significant correlation in the post-bariatric surgical population in Northwestern Indiana. This study’s results contradict others that found physical literacy levels may decline with age (e.g., Huang et al., 2020; Roetert & Ortega, 2019). Some possible reasons why this study did not find a statistically significant correlation are as follows. First, the patients in this study may have had similar physical literacy levels across different age groups, resulting in a lack of significant variation to detect a correlation. Next, there might have been other factors influencing physical literacy in this particular demographic that overshadowed the potential impact of age. For example, the participants' previous experiences, motivations, or access to resources and support for PA could have substantially influenced their physical literacy levels more than their age alone. Finally, there could have been differences in this study's methodologies or assessment instrument selection to assess physical literacy compared to other studies. Further research with more diverse samples may better understand the relationship between age and physical literacy in post-bariatric surgical populations.

This study highlights the need for bariatric department healthcare providers to prioritize physical literacy as a fundamental and integral component of the bariatric surgical patient's journey. The results underscore the importance of physical literacy initiatives in a comprehensive
care approach for these patients. In addition, the results of this study suggest that healthcare providers consider taking steps to equip bariatric surgical patients with the knowledge, skills, and sense of self required to maintain a healthy and active lifestyle following bariatric surgery.

While a formal, prescriptive, and structured exercise program is effective and has its place in the post-bariatric surgery sector (Bellicha et al., 2018; Coen et al., 2014; Daniels et al., 2017; Gil et al., 2021; Ren et al., 2018), it is crucial to shift the focus towards ensuring that this population understands the significance of their activities outside of formal exercise. Specifically, paying attention to daily PA and movement and decreasing the time spent sitting or being inactive represents the missing link that needs attention (Dempsey et al., 2020; Dunstan et al., 2021; Hwang et al., 2022; Tremblay et al., 2007). Ultimately, incorporating a physical literacy program into the bariatric surgical patient's care plan may fill a gap, leading to improved participation in PA throughout the lifespan.

Limitations

The main limitation of this study was the lack of a control group population, which could have significantly compromised the research design (Campbell & Stanley, 1963; Polit & Beck, 2020). The lack of a control group hindered the ability to establish a basis for comparison or a reference point to assess the impact of the variables investigated. Consequently, this study could not establish causal relationships and was limited to reporting correlations. In addition, the absence of a control group compromised the study's internal validity and the findings' generalizability (Campbell & Stanley, 1963; Polit & Beck, 2020), which could have significantly compromised the research design (Campbell & Stanley, 1963; Polit & Beck, 2020). Therefore, the study's conclusions are likely weakened by the absence of a control group, limiting the robustness of the insights derived from this research.
Additionally, four other limitations were noted. First, this study may have had a bias, as it used a non-randomized control design, which could have affected the validity of the results (Creswell, 2014; Polit & Beck, 2020). In addition, non-response bias was another limitation of this study, as eighty-six percent of the invited patients did not participate in this survey.

Second, this study relied on self-reported data, which may have contributed to response and social desirability biases (Gaskin & Happell, 2014). As a result, instead of offering accurate, honest responses, participants may have selected responses they felt were expected or socially acceptable. Additionally, participants may have felt pressured to represent themselves in a positive light to conform to department or industry post-surgical expectations. Third, this study’s low email response rate was concerning. Previous studies have found that a 20-30% response rate is acceptable for email surveys (Kaplowitz et al., 2004; Kongsved et al., 2007; Shih et al., 2013). However, in this study, the response rate was only 14%.

Lastly, the study investigated various confounding variables yet found no statistically significant relationships among the variables examined. However, it is essential to consider the potential presence of additional confounding variables that were not explored, which could have introduced bias into the study (VanderWeele & Shipitser, 2013). Furthermore, exploring additional confounders such as socioeconomic status, comorbidities, employment status, body mass index, PA level before bariatric surgery, and depression may be worth considering.

**Future Opportunities**

The findings of this study offer an exciting glimpse into future research opportunities that can help us better understand and improve the lives of bariatric patients. For example, a qualitative study could provide a deeper understanding of the complex personal, psychological, and social factors (Creswell, 2014; Patton, 2014) that affect these patients' motivation to engage
in PA. In addition, the power of qualitative research, especially when combined with this quantitative data, would offer a unique, unattainable insight through quantitative studies alone.

Furthermore, a randomized controlled study could test different interventions, such as education, health coaching, social support, and technology, to determine which might be most effective in improving motivation to engage in PA post-bariatric surgery. Such research could be revolutionary in the future of bariatric healthcare and help promote healthy lifestyles among patients.

Finally, exploring the 24-hour movement cycle with bariatric patients presents a new avenue for future opportunities. A growing body of research (Carson et al., 2020; Kuzik et al., 2020; Stamatakis et al., 2019; Tremblay et al., 2017) has supported this contemporary framework, which considers the interrelated movement behaviors of sleep, sedentary time, and physical activity over a 24-hour period. For example, the studies conducted by Carson et al. (2020) and Kuzik et al. (2020) provide evidence for the benefits of adhering to a 24-hour movement behavior guideline with adults. Carson et al.’s (2020) findings revealed improvements in cardiorespiratory fitness, adiposity levels, mental health, and reduced risk of chronic conditions. Similarly, Kuzik et al. (2020) found positive cardiometabolic outcomes associated with adherence to this guideline. These findings underscore the significance of integrating physical activity, sedentary behavior, and sleep as part of a comprehensive approach to enhance health and well-being in adults. Furthermore, the absence of published research on this topic within the bariatric surgical patient population amplifies the potential for exploration. In conclusion, this area of study holds promise in uncovering novel insights and potential interventions that might significantly contribute to the health and recovery of bariatric surgical patients.
Conclusions

The findings of this study reinforce the conclusions of previous research, albeit conducted on different populations. Belanger et al. (2018) explored the relationship between motivation and PA in youth, demonstrating a positive association between intrinsic motivation and higher PA levels. Their study also highlighted the significance of intrinsic motivation in promoting sustained engagement in PA over time. Similarly, Jefferies et al. (2019) focused on motivation and PA among adolescents, revealing a positive correlation between intrinsic motivation and their participation in PA. Consistent with Belanger et al.'s (2018) findings, adolescents with higher levels of intrinsic motivation displayed greater adherence to regular PA. Additionally, studies by Huang et al. (2020) and Roetert and Ortega (2019) examined the relationship between motivation and PA in older adults. These studies further support the positive association between intrinsic motivation and higher PA levels among older adults.

Collectively, these studies affirm the importance of intrinsic motivation in driving engagement in PA. The findings of this research underscore the significance of cultivating intrinsic motivation, like promoting lifelong enjoyment and personal satisfaction in PA engagement, within the post-bariatric surgical population. Moreover, integrating physical literacy education into the bariatric healthcare sector may be warranted, as the strong correlation between physical literacy, particularly the Knowledge and Understanding and Sense of Self sub-scales, and intrinsic motivation have been identified as significant predictors of motivation for PA in this population.

In light of these findings, it may be imperative to address the need for incorporating physical literacy education as an integral part of the bariatric surgical patient's journey. The emphasis should shift from solely prescribing formal exercise programs to equipping patients...
with physical literacy knowledge, skills, and a strong sense of self to engage in PA beyond traditional, prescriptive exercise guidelines. As the renowned philosopher Lao Tzu (n.d) once said, "The journey of a thousand miles begins with a single step." In the context of PA, we must remember that all movement counts and holds value. Let us embrace the power of every step, every dance, and every moment of physical expression as we strive for holistic well-being in the bariatric surgical population.
References


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https://doi.org/10.1172/jci78016

https://doi.org/10.1002/14651858.CD003641.pub4


improves physical literacy among physically inactive adults: A pilot intervention study. 


Zamarripa, J., Castillo, I., Baños, R., Delgado, M., & Álvarez, O. (2018). Motivational regulations across the stages of change for exercise in the general population of

https://doi.org/10.3389/fpsyg.2018.02368
Table 1

*Sample Demographics and Descriptive Statistics (N = 128)*

<table>
<thead>
<tr>
<th>Variable Name and Categories</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;35</td>
<td>18 (14.1)</td>
</tr>
<tr>
<td>35-39</td>
<td>15 (11.7)</td>
</tr>
<tr>
<td>40-44</td>
<td>22 (17.2)</td>
</tr>
<tr>
<td>45-49</td>
<td>29 (22.7)</td>
</tr>
<tr>
<td>50-54</td>
<td>16 (12.5)</td>
</tr>
<tr>
<td>55-59</td>
<td>15 (11.7)</td>
</tr>
<tr>
<td>60-65</td>
<td>13 (10.2)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>115 (89.8)</td>
</tr>
<tr>
<td>Male</td>
<td>13 (10.2)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>Caucasian White</td>
<td>86 (67.2)</td>
</tr>
<tr>
<td>Non-Caucasian/Non-White</td>
<td>42 (32.8)</td>
</tr>
<tr>
<td><strong>NWI Residence</strong></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>17 (13.3)</td>
</tr>
<tr>
<td>Yes</td>
<td>111 (86.7)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>75 (58.6)</td>
</tr>
<tr>
<td>Not Married</td>
<td>53 (41.4)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>College Graduate</td>
<td>44 (34.4)</td>
</tr>
<tr>
<td>Graduate/Professional Degree</td>
<td>22 (17.2)</td>
</tr>
<tr>
<td>HS Graduate or GED</td>
<td>10 (7.8)</td>
</tr>
<tr>
<td>Some College</td>
<td>52 (40.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surgery Type</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric ByPass</td>
<td>42 (32.8%)</td>
</tr>
<tr>
<td>Sleeve Gastrectomy</td>
<td>86 (67.2%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years Since Surgery</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>32 (25)</td>
</tr>
<tr>
<td>1 year</td>
<td>22 (17.2)</td>
</tr>
<tr>
<td>2 years</td>
<td>18 (14.1)</td>
</tr>
<tr>
<td>3 years</td>
<td>14 (10.9)</td>
</tr>
<tr>
<td>4 years</td>
<td>15 (11.7)</td>
</tr>
<tr>
<td>5 years</td>
<td>15 (11.7)</td>
</tr>
<tr>
<td>6 years</td>
<td>12 (9.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Safety</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Safe</td>
<td>6 (4.7)</td>
</tr>
<tr>
<td>Safe</td>
<td>122 (95.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Access to Physical Activity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Access</td>
<td>116 (90.6)</td>
</tr>
<tr>
<td>Poor Access</td>
<td>12 (9.4)</td>
</tr>
</tbody>
</table>

*Note. NWI = Northwest Indiana; HS = High School; GED = General Education Development.*
Table 2

_Descriptive Statistics for PPLI Scores and Motivation Scores (N = 128)_

<table>
<thead>
<tr>
<th></th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPLI Summary</td>
<td>33.58 (4.94)</td>
</tr>
<tr>
<td>Knowledge and Understanding</td>
<td>12.55 (1.75)</td>
</tr>
<tr>
<td>Self-Expression</td>
<td>11.08 (2.08)</td>
</tr>
<tr>
<td>Sense of Self</td>
<td>9.95 (2.56)</td>
</tr>
<tr>
<td>Autonomous Motivation Index</td>
<td>21.53 (4.21)</td>
</tr>
<tr>
<td>Control Motivation Index</td>
<td>12.11 (4.22)</td>
</tr>
</tbody>
</table>

*Note.* PPLI = Perceived Physical Literacy Instrument
Table 3

Correlations between PPLI Summary Score and Sub-Scores and Autonomous Motivation Index (N=128)

<table>
<thead>
<tr>
<th></th>
<th>$r$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPLI Summary</td>
<td>.44</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Knowledge and Understanding</td>
<td>.57</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Self-Expression</td>
<td>.13</td>
<td>.161</td>
</tr>
<tr>
<td>Sense of Self</td>
<td>.35</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

*Note. PPLI = Perceived Physical Literacy Instrument*
Table 4

Correlations between PPLI Summary Scores and Sub Scores and Control Motivation Index (N=128)

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPLI Summary</td>
<td>-.15</td>
<td>.096</td>
</tr>
<tr>
<td>Knowledge and Understanding</td>
<td>-.24</td>
<td>.005</td>
</tr>
<tr>
<td>Self-Expression</td>
<td>-.01</td>
<td>.883</td>
</tr>
<tr>
<td>Sense of Self</td>
<td>-.11</td>
<td>.228</td>
</tr>
</tbody>
</table>

*Note. PPLI = Perceived Physical Literacy Instrument*
Table 5

Linear Regression Model Predicting Autonomous Motivation Index from Knowledge and Understanding and Sense of Self (N = 128)

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>t</th>
<th>95% Confidence Interval</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.44</td>
<td>2.26</td>
<td>1.97</td>
<td>0.021</td>
<td>8.9</td>
</tr>
<tr>
<td>Knowledge and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding</td>
<td>1.37</td>
<td>0.23</td>
<td>6.05</td>
<td>0.92</td>
<td>1.81</td>
</tr>
<tr>
<td>Sense of Self</td>
<td>-.01</td>
<td>0.15</td>
<td>-0.03</td>
<td>0.31</td>
<td>0.30</td>
</tr>
</tbody>
</table>
Table 6

Correlations between Age and Motivation Measures (N=128)

<table>
<thead>
<tr>
<th></th>
<th>Rs</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous Motivation Index</td>
<td>-.01</td>
<td>.887</td>
</tr>
<tr>
<td>Control Motivation Index</td>
<td>.13</td>
<td>.141</td>
</tr>
</tbody>
</table>
Table 7

Correlations between Age and PPLI Summary Scores and Sub Scores (N=128)

<table>
<thead>
<tr>
<th></th>
<th>Rs</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPLI Summary</td>
<td>-.09</td>
<td>.312</td>
</tr>
<tr>
<td>Knowledge and Understanding</td>
<td>-.12</td>
<td>.173</td>
</tr>
<tr>
<td>Self-Expression</td>
<td>-.03</td>
<td>.720</td>
</tr>
<tr>
<td>Sense of Self</td>
<td>-.06</td>
<td>.502</td>
</tr>
</tbody>
</table>

*Note. PPLI = Perceived Physical Literacy Instrument*
Appendix A

Author Support for Using Perceived Physical Literacy Instrument

Dear Deb,

Yes, the PPLI has been validated and can be used by different age groups and populations. Attached please find the PPLI in word file for your reference. You may modify it for future use.

Regards,
Raymond

---

Author support for use of the 16-item original SIMS instrument

Frédéric Guay

Yes, I am aware of this paper, but I recommend that you use the 16-item version.

All the best,

Fried

Frédéric Guay, Ph.D.

Titulaire de la chaire de recherche du Canada en motivation, persévérance et réussite scolaires

Président de la Division 5 de l’International Association of Applied Psychology

Département des sciences de l'éducation
Pavillon des sciences de l'éducation
2320, rue des bibliothèques
Local 942
Université Laval
Québec (Québec) G1V 0A6
### Perceived Physical Literacy Instrument (English and Chinese Version)

**PHYSICAL LITERACY INVENTORY**

Please circle the number that best matches your understanding. 請針對以下各項描述，依據您對自己的了解，圈選符合的選項。

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Comment</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am physically fit, in accordance to my age.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2. I have a positive attitude and interest in sports.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3. I appreciate myself or others doing sports.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4. I possess self-management skills for fitness.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5. I possess self-evaluation skills for health.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6. I have strong social skills.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7. I am confident in wild/natural survival.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>8. I am capable in handling problems and difficulties.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>9. I am aware of the benefits of sports related to health.</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix C

Situational Motivation Scale (SIMS)

Description: The SIMS measures situational motivation, or an individuals’ motivational orientation toward a particular activity, e.g., a homework or project assignment.

Directions: Read each item carefully. Using the scale below, please circle the number that best describes the reason why you are currently engaged in this activity. Answer each item according to the following scale: 1: corresponds not at all; 2: corresponds very little; 3: corresponds a little; 4: corresponds moderately; 5: corresponds enough; 6: corresponds a lot; 7: corresponds exactly.

Why did you engage in this activity?

<table>
<thead>
<tr>
<th>Why did you engage in this activity?</th>
<th>corresponds not at all</th>
<th>corresponds exactly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Because I think that this activity is interesting.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2. Because I am doing it for my own good.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3. Because I am supposed to do it.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4. There may be good reasons to do this activity, but personally I don’t see any.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. Because I think that this activity is pleasant.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6. Because I think that this activity is good for me.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7. Because it is something that I have to do.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>8. I do this activity but I am not sure if it is worth it.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>9. Because this activity is fun.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>10. By personal decision.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>11. Because I don’t have any choice.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>12. I don’t know; I don’t see what this activity brings me.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>13. Because I feel good when doing this activity.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>14. Because I believe that this activity is important for me.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>15. Because I feel that I have to do it.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>16. I do this activity, but I am not sure it is a good thing to pursue it.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

Coding:
- Intrinsic motivation (IM): Items 1, 5, 9, 13
- Identified regulation (IR): Items 2, 6, 10, 14
- External regulation (ER): Items 3, 7, 11, 15
- Amotivation (AM): Items 4, 8, 12, 16

Self-Determination Index (SDI) = \((2 \times \text{IM}) + \text{IR} - \text{ER} - (2 \times \text{AM})\)

References:
Appendix D

To: University of Indianapolis Office of Human Research Protections Program

From: Dr. Paul Stanish, Medical Director and Bariatric Surgeon

Re: Physical Literacy and Motivation to Engage in Physical Activity after Bariatric Surgery

Date: November 20, 2022

As the authorizing official for and on behalf of Healthy 4 Life, Advanced Weight Loss Center – Department of Bariatrics’- Bariatric Surgeon and Medical Director, I submit this Letter of Cooperation to indicate our cooperation with Deborah Pillarella to conduct human subjects research within our facility(ies). I have read and/or received briefing on the research protocol, and I understand the research to entail an electronic or postal mailed Qualtrics survey to the bariatric surgical patients who had either the Roux-en-Y Gastric Bypass or Sleeve Gastrectomy since 2016 at Community Hospital or St. Mary Medical Center. The survey will investigate whether there is a relationship between physical literacy and a patient’s motivation to engage in physical activity after bariatric surgery. In addition, I understand a raffle with incentive prizes will be offered to patients participating in this survey research.

By signing and dating this letter, I affirm and attest that:
(1) Community Hospital and St. Mary Medical Center will cooperate in the following ways;
   • Patient emails or mailing addresses will be extracted from EPIC, the healthcare system’s electronic medical system
   • The Healthy4Life email address (Healthy4Life@comhs.org) will be used to send the Qualtrics survey link
   • Registration representative at Healthy 4 Life will assist in drawing the ‘winners’ of the raffle for those who indicate interest in participation

(2) I have had the opportunity to meet, discuss, and ask questions of Deborah Pillarella regarding our cooperation for this research;
(3) Deborah Pillarella has authorized me to submit this Letter of Cooperation.

On behalf of the Department of Bariatrics at Community Hospital and St. Mary Medical Center, we look forward to cooperating with Deborah Pillarella and the University of Indianapolis on this research study. I invite you to contact me with questions or concerns.

Sincerely,

Paul Stanish, MD, FACS
Bariatric Surgeon
Medical Director – Department of Bariatric Services
Paul.Stanish@comhs.org
To: University of Indianapolis Office of Human Research Protections Program

From: Dr. Hung Dang, Bariatric Surgeon

Re: Physical Literacy and Motivation to Engage in Physical Activity after Bariatric Surgery

Date: November 20, 2022

As the authorizing official for and on behalf of Healthy 4 Life, Advanced Weight Loss Center’s Bariatric Surgeon, I submit this Letter of Cooperation to indicate our cooperation with Deborah Pillarella to conduct human subjects research within our facility(ies). I have read and/or received briefing on the research protocol, and I understand the research to entail an electronic or postal mailed Qualtrics Survey to the bariatric surgical patients who had either the Roux-en-Y Gastric Bypass or Sleeve Gastrectomy since 2016 at Community Hospital or St. Mary Medical Center. The survey will investigate whether there is a relationship between physical literacy and a patient’s motivation to engage in physical activity after bariatric surgery. In addition, I understand a raffle with incentive prizes will be offered to patients participating in this survey research.

By signing and dating this letter, I affirm and attest that:

(1) Community Hospital and St. Mary Medical Center will cooperate in the following ways;
   - Patient emails or mailing addresses will be extracted from EPIC, the healthcare system’s electronic medical system
   - The Healthy4Life email address (Healthy4Life@comhs.org) will be used to send the Qualtrics survey link
   - Registration representative at Healthy 4 Life will assist in drawing the ‘winners’ of the raffle for those who indicate interest in participation

(2) I have had the opportunity to meet, discuss, and ask questions of Deborah Pillarella regarding our cooperation for this research;
(3) Deborah Pillarella has authorized me to submit this Letter of Cooperation.

On behalf of the Bariatric Surgeon Team at Community Hospital and St. Mary Medical Center, we look forward to cooperating with Deborah Pillarella and the University of Indianapolis on this research study. I invite you to contact me with questions or concerns.

Sincerely,

Hung Dang, DO
Bariatric Surgeon
Hung.Dang@comhs.org
To: University of Indianapolis Office of Human Research Protections Program

From: Donald P. Fesko
Re: Deborah Pillarella Dissertation Entitled –
   Physical Literacy and Motivation to Engage in Physical Activity after Bariatric Surgery

Date: November 22, 2022

As the authorizing official for and on behalf of Community Foundation of Northwest Indiana, Community Healthcare System (Community Hospital and St. Mary Medical Center), I submit this Letter of Cooperation to indicate our cooperation with Deborah Pillarella to conduct human subjects research within our facility(ies). I have read and/or received briefing on the research protocol, and I understand the research to entail an electronic or postal mailed Qualtrics survey to the bariatric surgical patients who had either the Roux-en-Y Gastric Bypass or Sleeve Gastrectomy since 2016 at Community Hospital or St. Mary Medical Center. The survey will investigate whether there is a relationship between physical literacy and a patient’s motivation to engage in physical activity after bariatric surgery. In addition, I understand a raffle with incentive prizes will be offered to patients participating in this survey research.

By signing and dating this letter, I affirm and attest that:
(1) Community Healthcare System (Community Hospital and St. Mary Medical Center) will cooperate in the following ways;
   • Patient emails or mailing addresses will be extracted from EPIC, the healthcare system’s electronic medical system
   • The Healthy4Life email address (Healthy4Life@emailhs.org ) will be used to send the Qualtrics survey link
   • Registration representative at Healthy 4 Life will assist in drawing the ‘winners’ of the raffle for those who indicate interest in participation

(2) I have had the opportunity to meet, discuss, and ask questions of Deborah Pillarella regarding our cooperation for this research;
(3) Community Healthcare System (Community Hospital and St. Mary Medical Center) has authorized me to submit this Letter of Cooperation.

On behalf of Community Healthcare System (Community Hospital and St. Mary Medical Center), we look forward to cooperating with Deborah Pillarella and the University of Indianapolis on this research study. I invite you to contact me with questions or concerns.

Sincerely,

Donald P. Fesko, FACHE
President & CEO
Community Foundation of Northwest Indiana
901 MacArthur Blvd.
Munster, IN. 46321
219.513.1177
WELCOME TO OUR SURVEY!

Thank you for being a Healthy 4 Life patient. You are eligible to complete this 5-minute survey if you are between 18-65 years of age and had bariatric surgery at either St. Mary Medical Center or Community Hospital between 2016 and 2022.

My name is Debi Pillarella, a doctoral candidate in the Department of Interprofessional Health & Aging Studies at the University of Indianapolis. I am also the Director of Bariatric Services for Healthy 4 Life and am interested in understanding if there is a relationship between a concept called Physical Literacy and motivation to participate in physical activity after having bariatric surgery.

This survey is voluntary and confidential and should take approximately 5-minutos to complete.

This survey has THREE parts:
Part 1 - Demographic information (i.e. Gender, Education, Marital Status, etc.)
Part 2 - You will be asked to rate NINE (9) statements regarding Physical Literacy
Part 3 - You will be asked to rate SIXTEEN (16) statements regarding Physical Activity

At the END of the survey, you will be offered an opportunity to enter into a voluntary drawing for a $10 AMAZON GIFT CARD, five (5) gift cards awarded, where you will need to disclose your name and contact information to participate. If you choose to enter the drawing, your contact information will NOT be connected to this survey.

Your participation in this research survey is voluntary. You have the right to withdraw at any point during the study. There are no risks for participation in this survey study that are any greater than those found in everyday life. There are no penalties or consequences if you decide not to participate. You may stop answering questions and withdraw from the survey without penalty or consequence. Your completion of this survey serves as your consent to participate.

To be included in the drawing, YOU MUST RETURN pages 2-6 AND the AMAZON GIFT CARD ENTRY FORM in the pre-paid postage envelope provided to you. All parts of all questions must be answered, incomplete surveys will be excluded.

If you would like additional information about this study, please contact:

Debi Pillarella, M.Ed., CMES
Dpiliarella@comhs.org
219-703-1980
Director of Bariatric Services

Laura Santurri, PhD, MPH, CPH
Senturri@uindy.edu
University of Indianapolis
Department of Interprofessional Health & Aging Studies
By checking the circle below, you understand and acknowledge that:
Your participation in the study is voluntary. The survey research is anonymous. You are between 18-65 years of age. You had a bariatric surgery at either St. Mary Medical Center or Community Hospital between 2016-2022. You are aware that you may choose to terminate your participation at any time for any reason.

- I consent, and wish to begin the study
- I do not consent to complete the survey and understand I am ineligible for the gift card drawing

Which of the following categories represents your current age?

- 18-23
- 24-29
- 30-34
- 35-39
- 40-44
- 45-49
- 50-54
- 55-59
- 60-65

Which gender do you most identify with?

- Female
- Male
- Other
Which race/ethnicity do you most identify with?

- Asian
- African American/Black
- Caucasian/White
- Hispanic/Latino/a
- Pacific Islander/Native Hawaiian
- Native American
- Other

Do you live in Northwest Indiana (i.e. Lake, Porter, Jasper, Newton, LaPorte counties)

- Yes
- No

What is your current marital status?

- Married
- Divorced
- Widowed
- Single (not married)
- Never married

What is the highest level of education you have completed?

- 8th grade or less
- Some high school
- High school graduate or GED
- Some college
- College graduate
- Graduate/Professional degree
Which bariatric surgery did you have?

- Gastric Bypass (Roux-en-Y)
- Sleeve Gastrectomy

Approximately how many years since your bariatric surgery? (round to nearest whole number)

- Less than 1 year
- 1 year
- 2 years
- 3 years
- 4 years
- 5 years
- 6 years

In your opinion, how safe do you feel in your community? (i.e. how well do you feel your community is protected from dangerous situations)

- Very safe
- Somewhat safe
- Somewhat unsafe
- Very unsafe

In your opinion, how accessible are recreational areas for physical activities like walking, playing, hiking, biking, etc. in your community?

- Very good access
- Good access
- Somewhat good access
- Somewhat poor access
- Poor access
- Very poor access
How would you describe your motivation to participate in physical activity?

In your opinion, what type/amount of physical activity should post-bariatric surgical patients participate in?

Is there anything else you would like to share about your post-bariatric surgical experience? If so, please share here.

Please take your TIME and answer HONESTLY. Mark the box that BEST matches your understanding of the statement.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Comment</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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</thead>
<tbody>
<tr>
<td>I am physically fit in accordance to my age</td>
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<td>I have a positive attitude and interest in physical activity</td>
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<td>I appreciate myself or others doing physical activity</td>
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<td>I possess self-management skills for physical activity</td>
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<td>I possess self-evaluation skills for health</td>
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<td>I have strong social skills</td>
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<td>I am confident in natural/wild survival</td>
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<td>I am capable of handling problems or difficulties</td>
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<td>I am aware of the benefits of physical activity for health</td>
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</table>
Please take your TIME and answer HONESTLY. How does the statement below RELATE TO (i.e. correspond) why you are/would engage in physical activity? Please mark ONE box for each line.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Not at all</th>
<th>Very little</th>
<th>A little</th>
<th>Moderately</th>
<th>Enough</th>
<th>A lot</th>
<th>Exactly</th>
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<tbody>
<tr>
<td>Because I think this activity is interesting</td>
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<td>Because I am doing it for my own good</td>
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<td>Because I am supposed to do it</td>
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<td>There may be good reasons to do physical activity, but I personally don't see any</td>
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<td>Because I think this activity is pleasant</td>
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<td>Because I think this activity is good for me</td>
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<td>Because it is something that I have to do</td>
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<td>I do this activity, but I am not sure it is worth it</td>
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<td>Because this activity is fun</td>
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<td>By personal decision</td>
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<td>Because I don't have any choice</td>
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<td>I don't know; I don't see what this activity brings me</td>
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<td>Because I feel good when doing this activity</td>
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<td>Because I believe this activity is important for me</td>
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<td>Because I feel that I have to do it</td>
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<td>I do this activity, but I am not sure it is a good idea to pursue it</td>
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Appendix F

AMAZON GIFT CARD ENTRY

Thank you for completing the survey and expressing interest in entering this voluntary, one-time, random drawing for a $10 Amazon gift card.

By completing the items below, you agree to voluntarily provide your name and mailing address to the survey researcher for the sole purpose of drawing the $10 Amazon gift card winners.

This entry ticket MUST be mailed in WITH your completed survey in the pre-paid postage envelope provided in order to be included in the drawing.

This entry ticket is not transferrable and is only available to qualified Healthy 4 Life post bariatric surgical patients.

Five (5) winners will be randomly selected on Monday, February 20, 2023.

Winners will be notified on Tuesday, February 21, 2023, via the mailing address provided below.

PRINT NAME:

PREFERRED PHONE NUMBER:

MAILING ADDRESS:

**********************************OFFICE USE ONLY**********************************

DATE RECEIVED: INITIALS: