SUCCESS AND FAILURES IN IMPLEMENTING HEALTH-RELATED CHANGES

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PUBLISHED IN: Frontiers in Psychology

frontiers Research Topics

frontiers

ISSN 1664-8714
ISBN 978-2-88974-768-9
DOI 10.3389/978-2-88974-768-9

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SUCCESS AND FAILURES IN IMPLEMENTING HEALTH-RELATED CHANGES

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Citation: Baldacchino, A. M., Czabała, J. C., Jelonkiewicz, I., Kaunonen, M., Matthys, C., Pasternak, A., Poraj-Weder, M., Zabłocka-Żytka, L., eds. (2022). Success and Failures in Implementing Health-Related Changes. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88974-768-9

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frontiers in Psychology

EDITORIAL
published: 04 March 2022
doi: 10.3389/fpsyg.2022.848049

Editorial: Success and Failures in Implementing Health-Related Changes

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Keywords: health-related changes, pro- and anti-health behaviors, effectiveness of the health behavior change, health behavior outcomes, future directions in research and practice

Editorial on the Research Topic

Success and Failures in Implementing Health-Related Changes

OPEN ACCESS

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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *03 January 2022*
Accepted: *21 January 2022*
Published: *04 March 2022*

Citation:
Poraj-Weder M, Jelonkiewicz-Sterianos I, Pasternak A, Zabłocka-Żytka L, Kaunonen M, Matthys C, Baldacchino AM and Czabała JC (2022) Editorial: Success and Failures in Implementing Health-Related Changes. Front. Psychol. 13:848049. doi: 10.3389/fpsyg.2022.848049

The presented Research Topic is intended to provide a platform for showcasing the latest research on the psychological determinants and correlates of effectiveness in the health behavior change process in relation to both physical and mental health. Although, in recent years, a crisis in health promotion has been observed, especially in Western Europe (Woodall et al., 2018; Woodall and Freeman, 2020), the rise of civilization diseases affecting physical and mental health and the health crisis related to the COVID-19 pandemic (Abel and McQueen, 2020; Van den Broucke, 2020; Di Ruggiero and Ardiles, 2021) undoubtedly indicate the need for further research and recommendations regarding health psychology.

The Research Topic contains nine articles (eight research papers and one opinion) that address four areas: motivation to change (Poraj-Weder et al.; Rowicka), intrapersonal factors conducive to maintaining change (Burnos and Skrobowski; Mierzyńska et al.; Zawadzka et al.), the effectiveness of interventions (Iwon et al.; Skarin et al.), and the unhealthy behaviors and their determinants (Starosta et al.). Finally, due to the fact that, today, a key factor leading to changes in health behavior is the COVID-19 pandemic, this theme was also included (Dobrenko). The presented series of articles illustrates the diversity of Research Topics realized in the field of health psychology.

One important factor responsible for successes or failures in the process of changing health behavior is the quality of motivation to change (Poraj-Weder et al.; Rowicka). In the study of Poraj-Weder et al. an attempt was made to construct and validate a tool for measuring pro-health behavior motives, in the paradigm of Self-Determination Theory (Ryan and Deci, 2000, 2017). The problem of motivation to change in the specific context of recovery from alcohol addiction was addressed by Rowicka. In this study, two measurement tools were also adapted to assess the quality of motivation to change. Designing (Poraj-Weder et al.) and validating (Poraj-Weder et al., Rowicka) research tools does not only allow a better understanding of the underlying mechanisms of implementing health changes, but also a better selection of interventions. It is worth emphasizing that we are still lacking valid instruments to measure the effectiveness of health behavior change.

The unhealthy behaviors and their determinants are the subject of a study by Starosta et al. The authors engaged in finding the predictors of the problematic viewing of TV series by young adults. The results indicate a significant relationship between anxiety-depressive syndrome and the motivation to watch TV series and problematic series viewing. Several other articles (Burnos and Skrobowski; Mierzyńska et al.) focus on intrapersonal factors that facilitate change maintenance in a group of chronically somatically ill patients and in adolescent functioning (Zawadzka et al.). Patient engagement and adherence to medical recommendations is currently an important issue that has been addressed in many publications (Gu et al., 2021; Newman et al., 2021). Committing to health behaviors after heart transplantation is a crucial task in view of maintaining good health and the need to follow medical advice. Mierzyńska et al. concentrate on intrapersonal factors affecting health, such as personality traits, health behaviors, self-efficacy, and a health locus of control. Among the examined resources, the best predictors of caring about health were a health locus of control and the level of conscientiousness, according to Big Five concept. Among the various forms of health-relevant habits, maintaining a healthy diet proved to be the most difficult for heart transplant patients. In turn, in the group of patients with metabolic disorders (Burnos and Skrobowski), the moderating role of personality and temperamental traits was confirmed with regard to changes in health behavior and quality of life after the application of a motivational intervention. Higher Sensory Sensitivity, lower Perseveration, and higher Agreeableness enhanced positive change in health behaviors.

The importance of interpersonal factors in resisting negative environmental influences was investigated by Zawadzka et al. The authors analyzed the role of self-esteem, in a group of adolescents, in counteracting four sources of social materialism: that introduced by the mother, the father, peers, and the media. Ultimately, it was revealed that balanced self-esteem, as an element of mental health (Lehtinen, 2008), reduces the impact of materialism displayed by peers on the materialism of the adolescents in question.

Another problem addressed by the authors (Iwon et al.; Skarin et al.) was the effectiveness of interventions in the context of sustaining pro-health behavior. Skarin et al. used mixed-methods. Summarizing and integrating quantitative data (questionnaires and BMI measure) and qualitative data (pre-interviews and follow-up-interviews), they showed that the extension and maintenance of behavior change depends primarily on the subjective experience of goal achievement, combined with a reinforcing conversation before beginning the intervention.

The study by Iwon et al. examined changes in subjective well-being (happiness, life satisfaction, and self-esteem) in women who had just started engaging in, did engage in, or did not engage in physical activity. Upon re-measurement, an improvement in subjective well-being was found after 4 weeks in those who began physical activity.

The understanding of health was significantly influenced by the COVID-19 pandemic, provoking reflection on the need to make changes and take action to promote health (Duhigg, 2012; Ingram et al., 2020). Citing a number of research findings and her own experience as a psychotherapist and a psychologist supporting personality development, Dobrenko describes the process of forming attitudes that promoinge healthy behavior and stresses its automatic nature. According to Dobrenko, it is advisable to choose new habits based on the needs that are currently inadequately met, including affiliation, stimulation, activity, and rhythm. These newly developed healthy habits can work to our long-term advantage once they become automatic, which requires finding a cue that will trigger a habit, developing a routine that can be habitually followed, and defining the reward).

The collected papers, addressing change in health and disease, clearly demonstrate that health promotion should be committed to both salutogenesis and pathogenesis (Woodall and Freeman, 2020). The distinction between health promotion and disease prevention (Tengland, 2010) seems artificial in the context of contemporary challenges and emerging disease outbreaks (Laverack, 2017), including COVID-19. Because implementing sustainable change is difficult, research must identify the determinants of effective intervention (Conner and Norman, 2017). There is also a need for methods to identify the motivational status of the person who undertakes change so that it can be effective and, above all, sustainable (Poraj-Weder et al., 2021). Carrying out research in a mixed-method approach seems very promising in this context.

The analysis of the collected material indicates the usefulness of models integrating both conscious, reflexive processes and unconscious, automatic ones. Research taking into account the influence of motivational (e.g., behavioral intention), volitional (e.g., planning) and automatic (e.g., habits) processes on health behaviors allows us to better predict the intention to undertake health behaviors and regulatory strategies that will actually work (Arnautovska et al., 2017).

We hope that the articles presented in the issue "**Success and Failures in Implementing Health-Related Changes**" will inspire further research and reflection in the area of health psychology and health behavior change and maintenance, as well as effective interventions in this area.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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frontiers in Psychology

ORIGINAL RESEARCH
published: 18 June 2021
doi: 10.3389/fpsyg.2021.688192

Maintaining or Losing Intervention-Induced Health-Related Behavior Change. A Mixed Methods Field Study

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The aim of this mixed methods field study was to gain a better understanding of how psychological factors can contribute to success in intervention-induced behavior change over time. While it can be difficult to change behavior, the use of interventions means that most participants succeed in change during the intervention. However, it is rare for the immediate change to automatically transform into maintained behavior changes. Most research conducted on health-related behavior change interventions contains quantitative studies that investigate key intervention components on a group level. Hence, to bring more knowledge about maintained intervention-induced behavior change, there is need for a study approach that enhances the understanding of individual participants' experiences during and after the intervention. Therefore, the present study, which was conducted in Sweden, used a mixed methods design (triangulation) consisting of pre-, post-, and follow-up quantitative data (questionnaires and body measurements) and qualitative data (interviews), where the individuals' accounts are used to broaden the understanding of the intervention and the behavior change process. All study participants were enrolled in a volitional (fee-based and non-manipulated) intervention given by certified gyms. The quantitative data collection included 22 participants who completed questionnaires and body measurements before and after the intervention, plus 13 complete body measurements 6 months after the intervention. The qualitative data included pre-interviews with 12 participants and six follow-up-interviews. The questions in both questionnaires and interviews related to expectations, efficacy, motivation, goals, achievements, behavior change, and future. Overall, the results show that levels of expectations, efficacy, and motivation cannot be used in isolation to predict maintained intervention-induced behavior change. To successfully extend and maintain immediate change, it was crucial to experience goal achievement (but not BMI change). Furthermore, *enabling talk* was salient in the pre-interviews with participants reporting successful immediate (and maintained) change. By contrast, pre-interview *disabling talk* turned out to be evident in interviews, with participants not responding to follow-up. When the qualitative and quantitative results are summarized and integrated, it appears that subjective goal achievement, combined with enabling self-talk, were crucial factors in successful maintained behavior change.

Keywords: health-related change, motivation, goal achievement, eating behavior, physical activity, intervention-induced change, maintained change

OPEN ACCESS

Edited by:
Christophe Matthys, KU Leuven, Belgium

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Naomi Kakoschke, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *30 March 2021*
Accepted: *26 May 2021*
Published: *18 June 2021*

Citation:
Skarin F, Wästlund E and Gustafsson H (2021) Maintaining or Losing Intervention-Induced Health-Related Behavior Change. A Mixed Methods Field Study. Front. Psychol. 12:688192. doi: 10.3389/fpsyg.2021.688192

INTRODUCTION

Health-related behavior change is topical during a time where a pandemic has forced us to take responsibility for our health and make changes accordingly. Physical activity and eating behaviors are fundamental for good health in all individuals. Regular physical activity and healthy eating promote good health and wellbeing and develop resilience against illness (Public Health Agency of Sweden, 2020). Poor physical activity and eating behaviors are linked to obesity (BMI > 30), which brings an increased risk of illness and premature death (Statistics Sweden, 2021). More than two billion people in the world—almost one-third of the entire human race—are obese. In Sweden, which has 10.5 million residents (Statistics Sweden, 2021), the yearly cost for obesity is equal to US$8 billion and is growing. According to a prognosis by The Swedish Institute of Health Economics from 2018, the yearly cost could grow by $2 billion by 2030 (Public Health Agency of Sweden, 2020). To break the downward trend of sedentary lifestyle and unhealthy eating, which has negative consequences for both individuals and societies, policy makers and other stakeholders arrange health-related behavior change interventions. While it can be difficult to change behavior in general, the use of health-related behavior change interventions means that most participants do change their behavior successfully. However, such immediate change experienced during an intervention do not automatically transform into maintained behavior change (Anderson et al., 2001; Curioni and Lourenço, 2005). Therefore, the aim of the present study is to investigate which psychological factors influence the maintenance of immediate behavior change.

Health-related behavior change interventions that aim to help participants implement lifestyle changes that lead to weight loss typically include primarily change of physical activity behavior, changes to eating behavior, and some kind of behavior education or behavior therapy (Khaylis et al., 2010). Learning to change eating behavior includes processes that are both cognitive and automatic. Conscious diet choices, such as adding more healthy foods and reducing amounts and less healthy foods, is an example of a cognitive process competing with automatic responses to stress, or competing goals (such as having the short-term goal of enjoying sweets vs. the longer-term goal of losing weight) (Marteau et al., 2012). Learning to change physical activity behavior might be less multifaceted, since implementing a physical activity routine could be something to manage just once a day. Regardless, maintaining change is complex and previous reviews on maintained intervention-induced behavior change (Avenell et al., 2004; Curioni and Lourenço, 2005; Greaves et al., 2011) have shown that the best maintained weight loss results come from interventions focusing on physical activity and healthy eating in combination, as opposed to one at a time. In studies that focus on important intervention components, recurring factors for successful maintained intervention-induced behavior change include motivation, expectations, and goal achievement (Elfhag and Rössner, 2005; Teixeira et al., 2015).

Maintenance

The concept of maintenance has been used to refer both to the maintenance of a newly adopted behavior (change) and to the maintenance of an established behavior (habit). However, intervention studies of behaviors like weight control normally focus on maintenance of change rather than on maintenance of individuals who already hold a healthy weight. Physical activity intervention studies usually operationalize successful intervention-induced maintained behavior as engaging in regular physical activity for at least 6 months after the intervention (Dunn et al., 1999). A recent review by Nordmo et al. (2020) suggested that the time-span for maintenance is longer, since the average weight regain back to pre-intervention weight was reached at about 4 years post-intervention. In the present paper, the concept of maintenance will be used to describe the sustenance of immediate behavior change resulting from the participation in a behavior change intervention, which means that intervention-induced behavior change has continued after the intervention. Further follow-ups are needed to tell what happens years forward.

Although the primary goal for both intervention participants and intervention originators is usually behavior change that maintains, rather than immediate change that fades, the latter has been more frequently investigated than the former (Fjeldsoe et al., 2011; Kwasnicka et al., 2016). Recent reviews that have investigated intervention-induced maintained change have highlighted goal setting, an autonomy supportive approach (Samdal et al., 2017), and a clear plan for maintenance (Greaves et al., 2011) as key factors for maintained change. Greaves et al. (2011) conducted a systematic review of reviews on intervention components associated with increased effectiveness in physical activity and healthy eating interventions. This meta-review included 30 reviews and showed maintained behavior change results regarding both physical activity (30–60 min/week of moderate activity at 12–18 months) and weight loss (3–5 kg at 12 months). The intervention effectiveness was increased by targeting both physical activity and eating behavior and using well-established behavior change techniques. Samdal et al. (2017) conducted a systematic review of effective behavior change techniques for physical activity and healthy eating, including the perspective of maintained change. The review included 32 long-term reports and showed that goal setting and self-monitoring through the use of step counters predicted maintained changed behavior. While that type of research shows, on a group level, what type of intervention components are better to include in a health-related behavior change intervention, it does not further our understanding of the individual experiences of a behavior change journey. As proposed in previous research (see, for instance, Greaves et al., 2011), it is important to investigate the underlying process and causality of all proposed behavior change models. Therefore, in addition to comparing interventions and intervention components, it is necessary to hone in on the intervention participants in order to optimize the opportunity for each individual to succeed in changing and maintaining a healthy behavior.

Goal Setting and Achievement

A fundamental part of changing and maintaining a healthy behavior is the setting and achieving of goals. Locke (1968) introduced the Goal Setting Theory, which shows that setting specific (difficult) goals leads to better performance than setting general (easy) goals. Locke and Latham (1994) developed the Goal Setting Theory, presenting five goal-setting principles that improve the chances for better performance: clarity, challenge, commitment, feedback, and task complexity. Setting a specific goal that includes these principles provides greater clarity, which makes it possible to better notice progress and achievements, and thus monitor and measure change. An example of general (outcome) goal could be to lose weight, while an example of specific (behavior change) goal might be walking for an hour three times a week.

Since the original goal theories, more recent research has found that different types of goals led to different behavior and affective consequences (Deci and Ryan, 2000). Central goal types to make a distinction between are behavior change goals (also called learning goals) vs. outcome goals (also called performance goals) (Dweck, 1986) and approach goals vs. avoidance goals (Carver and Scheier, 1998). Approach goals entail that behavior is driven toward a desired stimulus, while avoidance goals entail that behavior is driven away from an undesired stimulus to avoid negative consequences (Wimmer et al., 2018). Behavior change goals involve implementing a new activity, while outcome goals include a desire to achieve a result. Research shows that people who set outcome goals are more likely to interpret negative outcomes or obstacles to a lack in their own ability, which tends to weaken their continuous effort, leading to repeated adversity. By contrast, people who set behavior change goals tend to interpret negative outcomes or obstacles as a reason for increased effort or the need to modify a used strategy, which tends to lead to improved outcomes (Ames, 1984). Focusing on progress rather than outcome increases the likelihood of improving and maintaining effective strategies when facing obstacles (Bandura and Schunk, 1981). Therefore, in order to successfully change behavior, it is preferable to set specific goals related to the desired activity.

In addition to the configuration of the behavior change goals, the individual's expectations regarding goal achievement are paramount for successfully changing behavior. According to Bandura (1997), expectations can be divided into two types: self-efficacy and outcome expectancy. Self-efficacy is an individual's belief in their own ability to perform a certain behavior (Bandura, 1997). Locke and Latham (2002) argued that self-efficacy is important for goal setting and goal achievement in several ways: people high in self-efficacy generally set higher goals, are more committed to the goals, find better strategies to achieve them, and respond better to negative feedback than those with low self-efficacy. It has also been argued (Byrne, 2002; Elfhag and Rössner, 2005) that self-efficacy is an important factor for maintained behavior change. Outcome expectancy, on the other hand, relates to an individual's belief that a certain behavior will actually lead to a certain outcome. Hence, outcome expectancy affects the anticipated result of performing the desired activity. In short, self-efficacy is belief in one's own ability and outcome efficacy is belief in the behavior leading to the desired outcome. On an overall level, both of these aspects of expectancy relate to an expectation of actually achieving a desired outcome, which has been described as an individual's level of goal expectancy.

The early perspective of goal-directed behavior, including the Goal Setting Theory from the 1960s, which focused on goal-related efficacy as a drive for motivating behavior, has now evolved to include psychological needs. Deci and Ryan (2000) argued that to fully understand goal-directed behavior it is necessary to include psychological needs. They clarified that there is a psychological process, including psychological development and wellbeing behind goal setting, which influences goal pursuit. These psychological needs are cornerstones of Self Determination Theory (SDT), which is a macro-theory of human motivation, development, and health (Deci and Ryan, 1985). For a behavior to occur, motivation is needed. In everyday language, motivation is often referred to in terms of level; thus, high vs. low motivation. However, Deci and Ryan (2008) emphasized the distinction between motivation level and motivation type, showing that type of motivation is more important than amount of motivation for predicting many important outcomes, such as wellbeing and effective performance. According to Deci and Ryan (2008), the most central distinction in SDT is between autonomous and controlled motivation. Paying money to participate might be the most highly volitional form of intervention participation. However, paying money to participate might also influence participants' expectations. Thus, in addition to investigating participants' levels of motivation in terms of their goals and experienced efficacy, it is necessary to look into their types of motivation (Deci and Ryan, 2008).

Research Gap

In order to better understand how intervention-induced immediate behavior change can be maintained, it is necessary to include longer-term post-intervention follow-up measurements, as opposed to only immediate post-intervention measurements (Whitt-Glover et al., 2014). Additionally, collecting field-data in a non-influenced real-world setting leads to a higher ecological validity. Since most previous research has focused on group-level findings on intervention components (e.g., Greaves et al., 2011; Samdal et al., 2017), it is essential to include intervention-experience data on individuals' level. In order to gain a better understanding of which psychological factors affect an individual's chances of maintaining an intervention-induced behavior change, it is necessary to gain a deeper understanding of the individual's experience of participating. This is only possible by combining qualitative and quantitative data. Mixed methods design is both a methodology and method that mixes quantitative and qualitative approaches in data collection and analysis, and interprets the results from the analyses together. Collecting the quantitative and qualitative data at the same phase, giving them equal importance and interpreting them simultaneously is called a convergent parallel mixed method (Creswell and Plano Clark, 2011) and can be used to build understanding

by presenting interview stories (narrative data) complementing links and numbers of statistical data (Creswell, 2013).

In sum, we argue that, to follow previous directions of future studies on maintained behavior change, interpreting quantitative links together with qualitative narratives from post- and follow-up measurements are required to create a better understanding of each individual's experience. In so doing, we are able to investigate how to optimize each individual's intervention journey to succeed in desired maintained changed behavior.

Against this background, the aim of the present study was to answer the following research questions:

RQ1: Do intervention participants' levels of expectations, efficacy, and motivation predict intervention-induced immediate and maintained behavior change?
RQ2: How do intervention participants' perceptions describe their expectations, efficacy, motivation, and goals in relation to intervention-induced immediate and maintained behavior change?

STUDY OVERVIEW

Against the backdrop of research showing that intervention-participants given incentives are not as autonomously motivated to maintain the intervention-induced change as volitionally participating individuals (Deci et al., 1999; Gneezy et al., 2011; Arien et al., 2012), the present study was conducted with the aim of including participants who were not persuaded by any incentives whatsoever. Hence, the present study only includes participants who volitionally engaged in the intervention and even invested their own money by paying a participation fee.

Methods

Both data collections were based on a 3-month lifestyle change intervention given by certified gyms where participants were recruited for the study. The study was conducted on a current intervention concept based on the typical lifestyle change program foundation: eating and physical activity inspiration, education and individual plans including goal setting, tools, and monitoring/results check-ups. The intervention groups consisted of six participants and were directed by licensed personal trainers certified in the intervention concept. The concept included two small-group personal training (PT) sessions per week, recurrent group-coaching sessions each week, diet advice, and recipes. The enrollment fee was equivalent to USD 650 for these 3 months of combined program. The monthly cost (650/3 = 216) can be compared to the monthly cost of an offer at one of Sweden's most commonly used gym, including a similar amount of small group PT sessions on weight loss but without the other features. Gym fees (entrance only) differ widely between gyms and subscription time, but an average range is between 36 and 72 USD per month on a 12-month subscription (Gym Guide, 2021). One PT session costs about 120 USD.

The participants in the present study vary in physical activity background, but a recurring factor is no regular engagement in physical activity before the intervention. Maintenance of change—that is, when participants sustained the intervention-induced behavior more than 6 months—is referred to as maintained or long-term change (of eating and physical activity behaviors). Due to availability, the quantitative data collection and the qualitative data collection were made on different participants, but all were participants in the same lifestyle change program. All interviews were conducted by the same researcher (FS) to maintain consistency between the interviews.

The type of mixed methods design used in present study is triangulation (also referred to as convergent or concurrent nested mixed methods design). Data for the quantitative and qualitative studies were collected concurrently and analyzed after both collections were completed. Post-measurements were used to measure intervention-induced immediate behavior change, while follow-up measured maintained change. See **Table 1** for study overview intervention timeline.

THE QUANTITATIVE DATA COLLECTION AND RESULTS

To investigate intervention component links and importance for change, the quantitative data collection was conducted by contacting gyms offering the current behavior change intervention and starting to recruit participants to the study. We chose to collect data from three gyms in two cities in Sweden, with the aim of widening the perspective from investigating just a specific gym depending on only a few personal trainers.

Methods

Procedure

At the first day of the intervention, 39 participants were asked to voluntarily enroll in the study by filling out a consent form. The participants ($n = 38$) then answered pre-questionnaires about expectations, efficacy, motivation, and goals. On the last day of the intervention, the participants filled out post-questionnaires with questions about the same components as in the pre-questionnaire, as well as about goal achievement and experiences during the intervention. Additionally, the participants approved the researchers collecting (de-identified) body measurements data measured by the personal trainer at the gym before and after the intervention, as well as at a follow-up 6 months after the intervention.

Participants

The data collection resulted in 22 complete pre- and post-questionnaires (100 percent female, age: $M = 50$, Range = 28–71, SD =11.8) and 13 participants participated in the follow-up body measurements; see **Figure 1** for recruitment and drop-out details. The average BMI of the participants was 29.91 (SD = 2.98), ranging from 25.78 to 37.57. The response rate for all measures was 33.3 percent.

Material

The pre-questionnaires included efficacy level, level of goal expectancy, and motivation level. In order to minimize the effort needed to participate in the study, the data collection was conducted with single-item measures as much as possible. The

TABLE 1 | Study overview intervention timeline.

	Pre	Post	Follow-up
Quantitative data collection	Questionnaire + body measurements	Questionnaire + body measurements	Questionnaire + body measurements
Qualitative data collection	Interview		Interview

validity of single-item scales has been shown to be satisfactory in general (Bergkvist and Rossiter, 2007, 2009). More specifically, single-item scales have been used to measure self-efficacy (e.g., Hoeppner et al., 2011), expectancy (e.g., Ilgen et al., 1981; Wanous et al., 1997), and motivation (Skarin and Wästlund, 2020). The measurements are presented in further detail below.

Efficacy Level

We used *efficacy,* a merged measure of self-efficacy and outcome efficacy, to measure the participants' overall belief in their own ability to change behavior and their belief that the changed behavior would lead to their desired outcome. The efficacy measure was calculated by means of answers to the following questions: "Regarding the overall intervention, how strong is your belief that you have the ability to succeed in reaching your goals?" (self-efficacy) and "Regarding the overall intervention, how strong is your belief that the intervention content and design will help you reach your goals?" (outcome efficacy). Both questions used a seven-point Likert scale ranging from 1 ("not at all") to 7 ("fully").

Goal Expectancy

Given that previous research regarding expectancy is diverse in both the conceptualization and focus constructs (Klein, 1991), we chose to complement the pre-measurements with goal expectancy, with the aim of capturing the participants' expectancy of actually reaching their specific goals. While one can have a general belief in their own ability, as well as in the intervention design, life circumstances play a role when it comes to expectancy in reaching specific goals. Therefore, we asked the participants to report their belief in reaching their specific goals of eating, weight, and other (the latter was intended to cover individual goals of various types). These goal expectancies were each measured with seven-point Likert-scale questions— "How well do you think you will reach your goals regarding eating?" "How well do you think you will reach your goals regarding weight?" and "How well do you think you will reach your goals regarding what you reported above as other goals?" —ranging from 1 ("not at all") to 7 ("fully"). We measured total goal expectancy based on these expectancies.

Motivation Level

In line with Markland and Hardy (1997), motivation was measured to indicate the participants' level of motivation to accomplish the intervention. Before the intervention, motivation level was measured with the question "*How motivated are you to implement the intervention?*" on a seven-point Likert Scale ranging from 1 ("not at all") to 7 ("very motivated").

The post-questionnaires included motivation type, goal achievement, and BMI change compared to before the intervention.

Motivation Type

In line with Deci and Ryan (2008), after the intervention the participants were asked to report their motivation type during the intervention. In order to obtain a clear outline of motivation type, in relation to each other, we wanted to take both goal-directed behavior (Locke and Latham, 2002) and autonomous vs. controlled motivation into consideration (Deci and Ryan, 2000). Therefore, we chose to collect the motivation reports as ratio of motivation orientation between doing it for a fun experience and doing it to reach goals, measured by the question "*Now in retrospect, what motivated you to accomplish the intervention?*" on a seven-point Likert Scale ranging from 1 ("fun experience") to 7 ("reach goals").

BMI Change

Body mass index (BMI) is an objective measurement of bodily change, which should not be used to assess detailed body composition (Beechy et al., 2012), but is a commonly used measurement of weight loss used in many weight-loss studies. BMI (calculated by body weight in kilos divided by body height in meters squared, or kg/m^2) was measured before and after the intervention. BMI change was calculated by subtracting the post-measurement BMI from the pre-measurement BMI.

Goal Achievement

In a meta-analysis from 2016 (Harkin et al., 2016), significant effect sizes for monitoring goal progress were shown across a range of behavior outcomes. In addition, the amount of research showing that goal-focused outcome measures support reliability, validity, and clinical utility is growing (see, for instance, Elliott et al., 2016; Sales and Alves, 2016). Further, previous research has suggested using more idiographic tools when measuring goal achievement, such as including self-reporting (Lloyd et al., 2019). In the present study, the personal trainers instructed the participants to set eating behavior goals, physical activity goals, weight goals, and other goals before the intervention started. Post-intervention, the participants were asked to report their goal achievement regarding each of these goals (eating, physical activity, weight, and other) on a seven-point Likert Scale ranging from 1 ("not at all") to 7 ("fully"). Overall goal achievement used in the correlational analysis was calculated by means of these four goal achievement reports and is thus the participants' self-reported experience of intervention-induced immediate behavior change.

The follow-up data collection was conducted to measure maintained change.

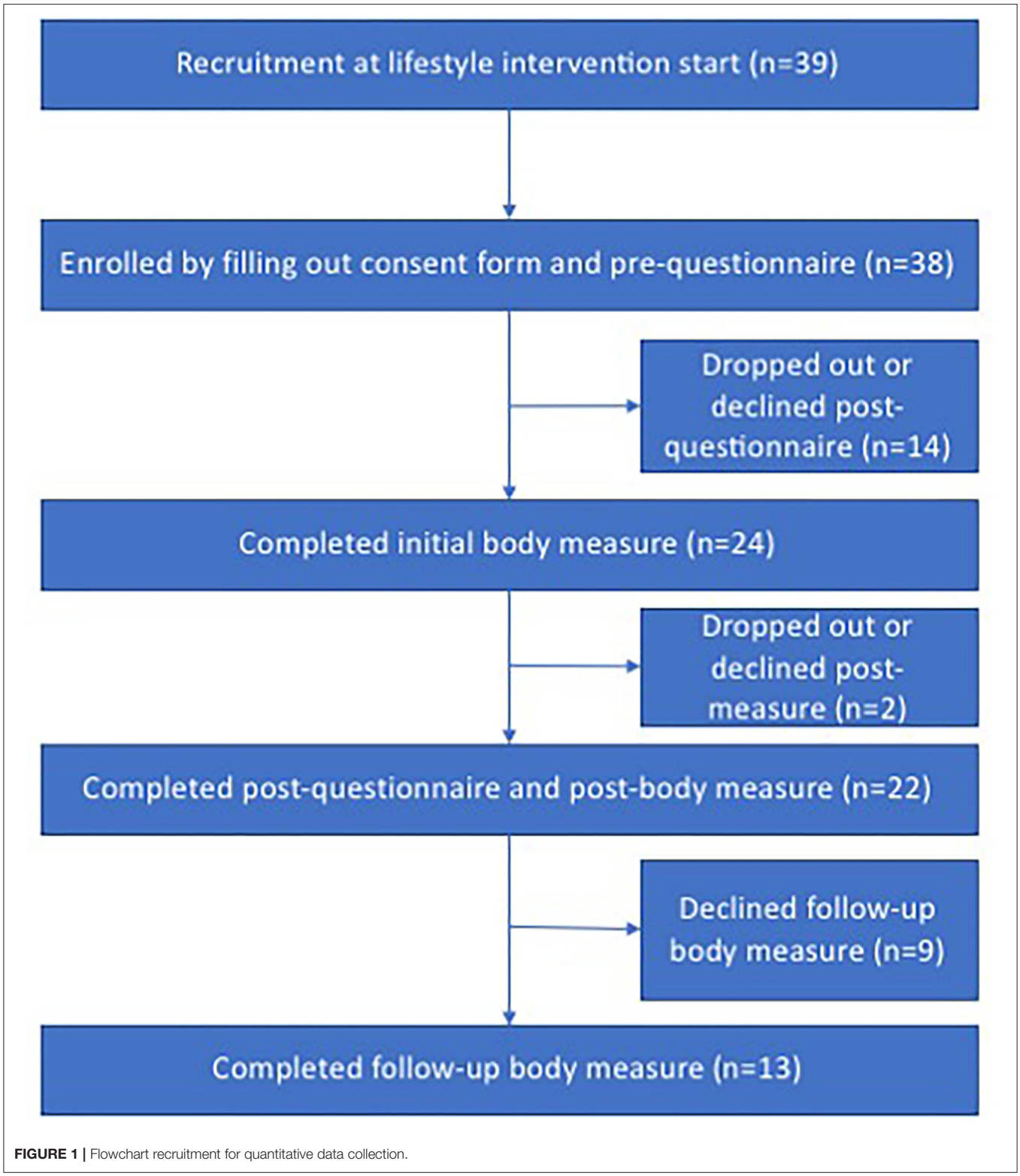

FIGURE 1 | Flowchart recruitment for quantitative data collection.

Maintained Change

When referring to successful maintenance, intervention studies usually operationalize with the criterion of engaging in regular physical activity for at least 6 months after the intervention (Dunn et al., 1999). Six months after the interventions ended, the personal trainers invited the participants to a

TABLE 2 | Means (M) and Standard deviations (SD) for variables included in the analysis.

	N	M	SD
Goal expectancy	22	6.09	0.78
Efficacy level	22	5.95	0.89
Motivation level	22	6.45	0.91
Motivation type	22	5.77	1.34
Goal achieve	22	5.05	1.12
BMI change	22	−2.67	1.40
Maintained change	22	1.73	0.83

free follow-up full body measurement identical to the pre-intervention body measurement they had all had. Comparing post-intervention body weight in kilos (that is, at the end of the intervention) and follow-up body weight with the pre-intervention body weight provides objective measurements of the results of the participants' immediate and maintained results of behavior change.

Results From Quantitative Data Collection

In order to answer Research Question 1 ("Do participants' levels of expectations and motivational factors predict immediate and maintained behavior change?"), a Spearman's rho correlational analysis was conducted to clarify the levels of expectation and motivational factors' connection to immediate and maintained change, as well as their relationships, respectively (see **Table 2** for descriptive results). Additionally, a Mann-Whitney U Test was conducted to investigate which specific goal achievement (physical activity, eating behavior, weight, or other), if any, is associated with maintained change. All statistical analysis was conducted with IBM SPSS Statistics for Windows, Version 21.0.

Correlations

To illustrate relationships and chronology, a timeline of correlations (**Figure 2**) and a correlations table (**Table 3**) are presented below. The correlational analysis shows that the three factors measured before the intervention—levels of goal expectancy, efficacy, and motivation—are strongly correlated. Surprisingly, these three factors did not correlate with any other factors measured later: motivation type, goal achievement, BMI change, or maintained change. The correlational analysis also shows that displaying a higher post-BMI-drop was, quite expectedly, correlated with higher goal achievement. Motivation type and goal achievement were correlated (that is, the more goal-orientated, the more goal achievement), and goal achievement was correlated with maintained change.

Mann-Whitney U Test

An independent samples Mann-Whitney U Test was conducted to compare the participants who participated in the follow-up measurements with those who chose not to do so, regarding the four measures of goal achievement (physical activity behavior, eating behavior, weight, and other). The results show that those participants who responded to follow-up measurements reported a significantly ($U = 98.5$, $p = 0.036$) higher level of goal achievement regarding physical activity than those who did not respond. With regard to eating behavior, the results showed that those who responded reported almost significant ($U = 96.5$, $p = 0.055$) higher levels of goal achievement than those who did not respond. While the reported levels of goal achievement regarding weight loss and other goals were not significant (ps > 0.05), they followed the same pattern in that those who responded for follow-up measurement reported higher levels than those who did not respond (see **Table 4** for M and SD).

Quantitative Discussion

The pre-measurements of goal expectancy, efficacy, and motivation levels correlate with each other respectively, but do not predict either immediate or maintained behavior change. To successfully extend immediate change into maintained change, experiencing goal achievement (but not BMI-change) is crucial. This means that to succeed in maintained behavior change, the experience of goal achievement during the intervention is more important than outcomes the goal achievement produces (weight loss). The results of the Mann-Whitney U Test on goal achievement categories clarify that the most important goals to achieve during the intervention are behavior change goals such as learning new physical activity behavior- and eating behavior routines. Thus, experiencing the achievement of outcome goals such as weight loss is less important. In sum, both outcome goals and outcome results are less important than behavior change goals when aiming to succeed in intervention-induced maintained change. These are intriguing findings since behavior change is usually desired because of its consequences or outcomes. Focusing too much on the intervention-induced immediate outcomes will not help maintain behavior change, which means that desired maintained outcomes will remain absent. Therefore, focusing on setting behavior change goals such as physical activity behaviors and eating behaviors, and achieving these behavior change goals, are essential for maintaining intervention-induced behaviors and their outcomes. A noteworthy question that remains after the quantitative analysis is why the pre-measurements are highly related to each other, but do not seem to be related to the post-measurements regarding the effects of the intervention.

THE QUALITATIVE DATA COLLECTION AND ANALYSIS

Previous research in the area is dominated by quantitative studies investigating which intervention components result in the biggest success. Our aim is to understand more about the process of each individual's intervention journey in order to be able to support each one to maintain intervention-induced behavior change. From choosing the focus of understanding the individuals' experiences to be able to suggest better ways of support, the mixed method design includes a qualitative data collection conducted in the form of interviews, which complements the quantitative data collection presented above. The presentation of the qualitative data collection and analyses are divided into

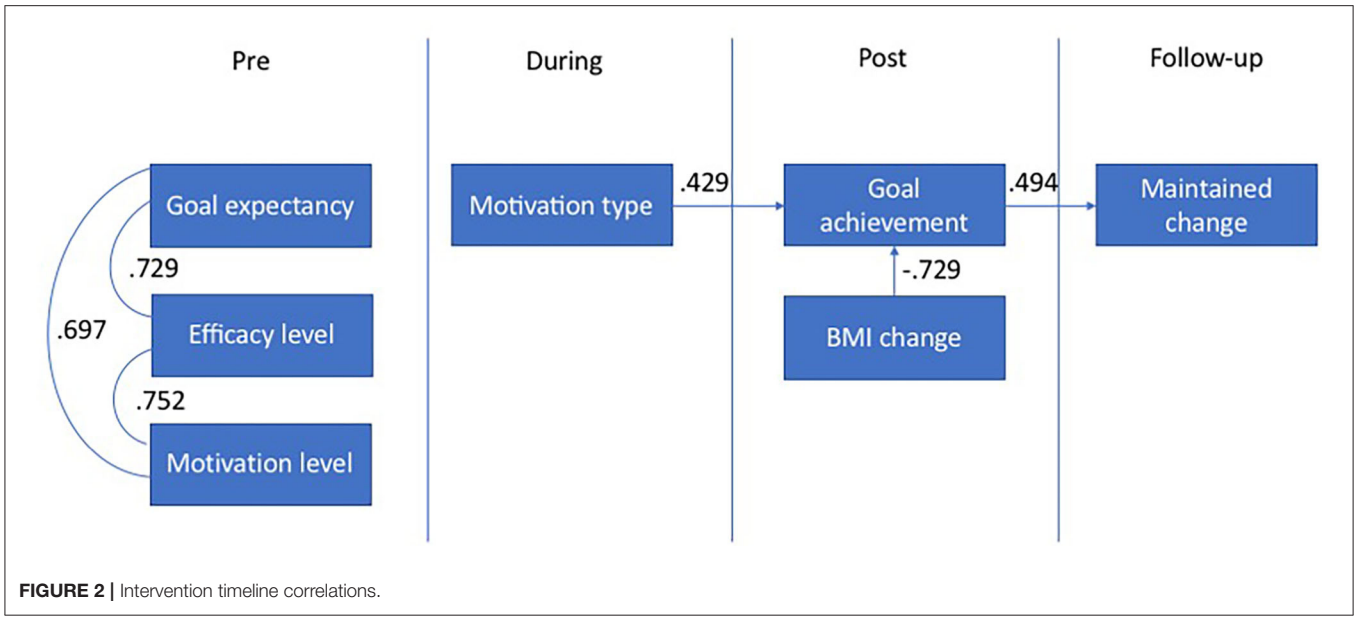

FIGURE 2 | Intervention timeline correlations.

TABLE 3 | Correlation measurements (Spearman's rho).

		Goal expectancy	Efficacy level	Motivation level	Motivation type	Goal achieve	BMI change	Maintained change
Goal expectancy	Correlation Coefficient	1	0.729**	0.697**	0.265	−0.037	−0.04	−0.002
	Sig. (2-tailed)	.	0	0	0.234	0.871	0.861	0.992
	N	22	22	22	22	22	22	22
Efficacy level	Correlation Coefficient	0.729**	1	0.752**	0.355	0.008	−0.151	0.016
	Sig. (2-tailed)	0	.	0	0.105	0.97	0.501	0.942
	N	22	22	22	22	22	22	22
Motivation level	Correlation Coefficient	0.697**	0.752**	1	0.373	0.137	−0.321	−0.147
	Sig. (2-tailed)	0	0	.	0.087	0.545	0.145	0.514
	N	22	22	22	22	22	22	22
Motivation type	Correlation Coefficient	0.265	0.355	0.373	1	0.429*	−0.412	−0.081
	Sig. (2-tailed)	0.234	0.105	0.087	.	0.041	0.05	0.713
	N	22	22	22	23	23	23	23
Goal achieve	Correlation Coefficient	−0.037	0.008	0.137	0.429*	1	−0.729**	0.494*
	Sig. (2-tailed)	0.871	0.97	0.545	0.041	.	0	0.017
	N	22	22	22	23	23	23	23
BMI change	Correlation Coefficient	−0.04	−0.151	−0.321	−0.412	−0.729**	1	−0.322
	Sig. (2-tailed)	0.861	0.501	0.145	0.05	0	.	0.134
	N	22	22	22	23	23	23	23
Maintained change	Correlation Coefficient	−0.002	0.016	−0.147	−0.081	0.494*	−0.322	1
	Sig. (2-tailed)	0.992	0.942	0.514	0.713	0.017	0.134	.
	N	22	22	22	23	23	23	23

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

TABLE 4 | Means (M) and Standard deviations (SD) comparing participants who participated in the follow-up with participants who did not.

Goal completion	Follow up (Yes/No)	N	M	SD
PhysActivity	No	11	5.18	0.98
	Yes	12	6.08	1.00
Eating	No	11	4.27	1.68
	Yes	12	5.58	1.38
Weight	No	11	4.27	1.79
	Yes	12	5.08	1.38
Other	No	11	4.82	1.33
	Yes	12	5.50	0.80

two parts: the pre-interview and the follow-up interview parts. For both pre-interviews and follow-up interviews, the analysis of the transcribed data was conducted by following the six phases of thematic analysis (Braun and Clarke, 2006). The qualitative software used was NVivo (version 12.2.0.443), which helped keep the data organized and made the process of coding and analysis more transparent and easier to replicate. All interviews were conducted by the primary investigator, who conducted the initial coding and categorization of themes. The second and third authors then reviewed the categorization and acted as "critical friends," asking questions during the analysis and promoting alternative explanations and interpretations of the data (Marshall and Rossman, 2006).

Method

Procedure

At the first day of the intervention, 12 participants were asked to voluntarily enroll in the study by filling out a consent form. The participants ($n = 12$) were then booked for pre-interviews about expectations, efficacy, motivation, and goals. The pre-interviews were held within the first 2 weeks of the intervention. Six months after the intervention, the participants were contacted again to book date and time for follow-up interviews.

Participants

The qualitative data analysis entailed 10 (one male and nine female) complete initial interviews, and five (one male and four female) responses to the follow-up interviews six months after the intervention (see **Figure 3**). One participant who did not reply to the follow-up reported that she dropped out from the intervention itself due to lack of time. The other four participants who did not reply to follow-up did not report a reason; instead they made themselves unavailable. The interviews were held at places that suited the participants; either at their workplace, at the university or at a public café or library.

Note: Two posts were eliminated due to medical issues, see section Analysis of Pre-interviews.

Material

The interviews were based on the same topics as the questionnaires in the quantitative part. Thus, the pre-interviews included questions about motivation, efficacy, expectancy, and goals, and the follow-up interviews included questions about motivation, goal achievement, BMI change, and health-related behavior change. The open-ended nature of interviews gave the participants opportunities to express themselves in their own words, which provided a broader and deeper representation of their answers. The pre-interview was divided into two sections, starting with a brief history of the participant and reasons for participating in the intervention, moving on to current eating behavior and physical activity behavior, goals, and expectations about participating in the intervention. The follow-up was divided to first focus on goal achievement (that is, eating and physical activity behavior today), then moving on to success factors, motivation type, and eventual goals for the future.

Pre-interviews

The data analysis, discussion, and results from the pre-interviews are presented below.

Analysis of Pre-interviews

The aim of the pre-interviews was to collect narratives that could be utilized to increase our understanding of intervention-induced immediate and maintained behavior change. Hence, in order to answer Research Question 2 ("Do participants' narratives regarding expectations and motivational factors predict immediate and maintained behavior change?"), pre-interview data was collected and thematized, and is presented in a form that reveals the flavor of the discussion and defines the essence of distinctions in discussions between the main themes. The themes that arose through analysis of the pre-interviews are presented below, followed by a description of the analysis process.

The first phase of thematic analysis involves familiarizing oneself with the data (Braun and Clarke, 2006), which was done by entering the transcript interviews into NVivo and reading through them carefully several times to assemble an initial list of ideas about what is especially interesting. In Phase 2, the first codes were created from concepts we found appropriate to describe patterns and noteworthy parts of the data at that point. This led to 30 nodes filled with extracts of data. In Phase 3, we started searching for themes among the codes. A few similar codes were merged into the same, and a few others were eliminated because they were beyond the scope of the research question (for example, what made the participants overweight). The remaining codes were organized into three candidate themes (negative talk, positive talk, and success factors). In Phase 4, we

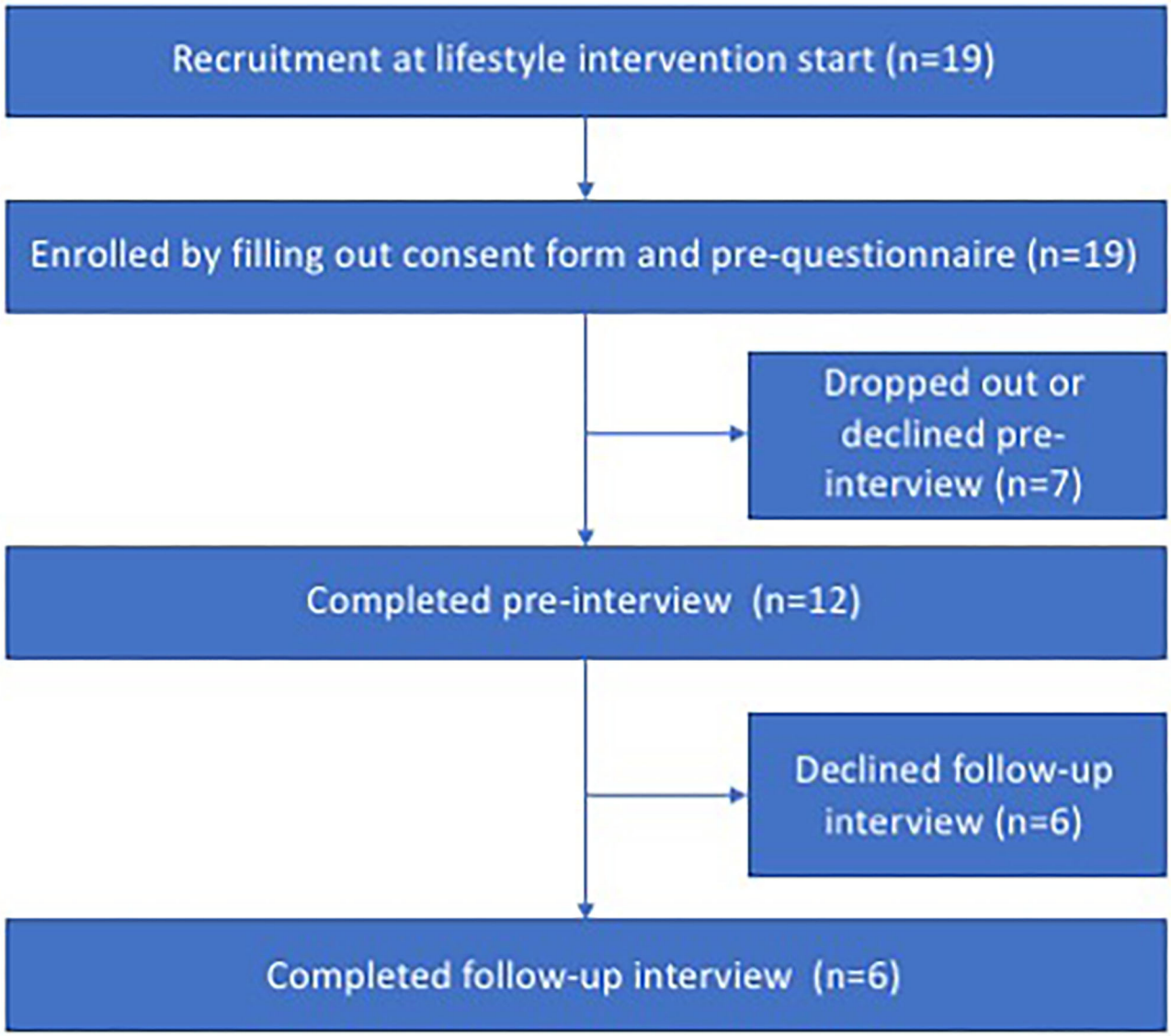

FIGURE 3 | Flowchart recruitment qualitative data collection.

reviewed the themes in order to refine them and condensed them into themes that represented the data set properly and were in line with the research question. In the second level of phase four, we reread the entire dataset and decided to subtract two posts because they did not "accurately reflect the meanings evident in the data set as a whole" (Braun and Clarke, 2006). Thus, two data posts were eliminated due to medical issues, since they would have skewed the picture of intervention participation.

In Phase 5 we wanted to identify the essence of each theme and the stories they tell, in line with Braun and Clarke (2006). This defining and refining resulted in *success factors* being merged into *positive talk*, since those were identical. *Negative* and *positive talk* were then renamed as *disabling* and *enabling talk*, which became the final main themes. In Phase 6 the themes were described verbally, writing the report in connection with the thematic map. See **Figure 4** for the final thematic map.

To describe the content of **Figure 5**, **Table 5** provides definitions of each sub-theme and short description of the characteristics for both disabling talk and enabling talk on each sub-theme.

For each sub-theme, there is disabling talk and enabling talk, which are described in more detail with descriptive extracts from the interviews below.

Target

When answering questions about reasons for engaging in the intervention, talk characterized by difficulty in defining a clear target for participating in the intervention or why this would be

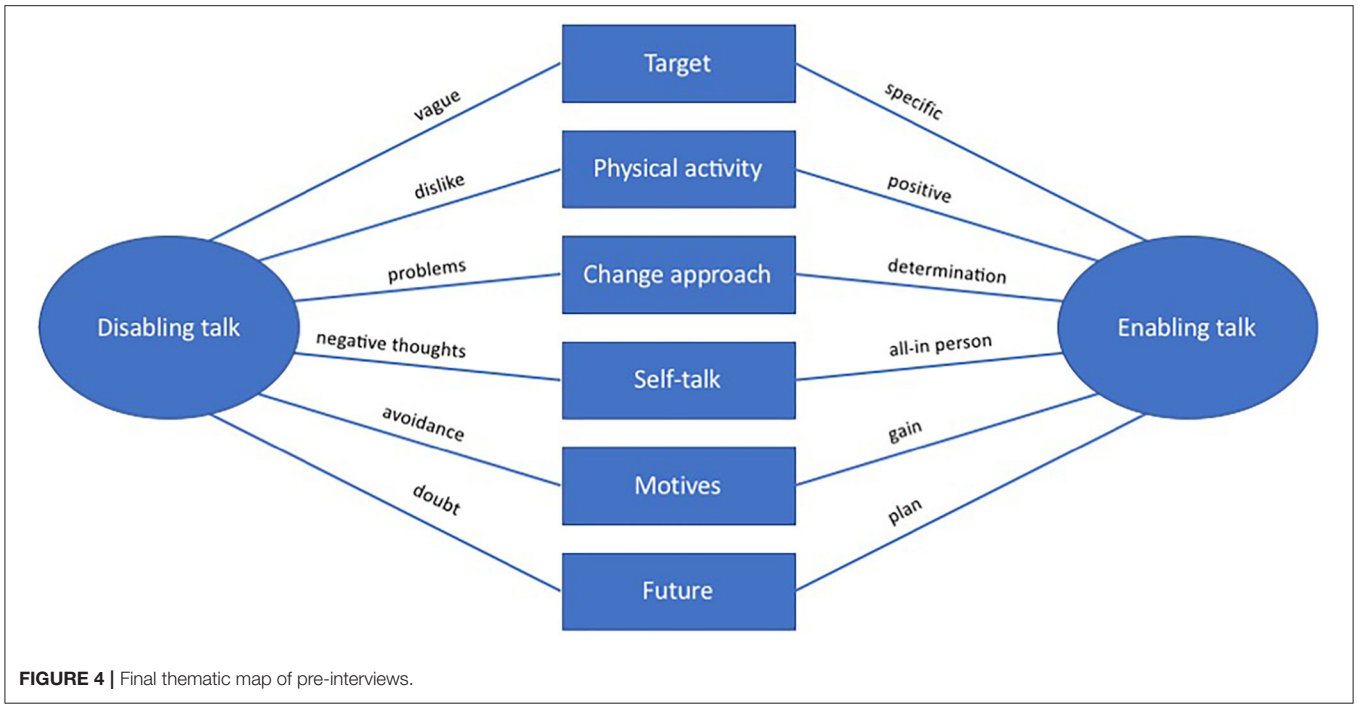

FIGURE 4 | Final thematic map of pre-interviews.

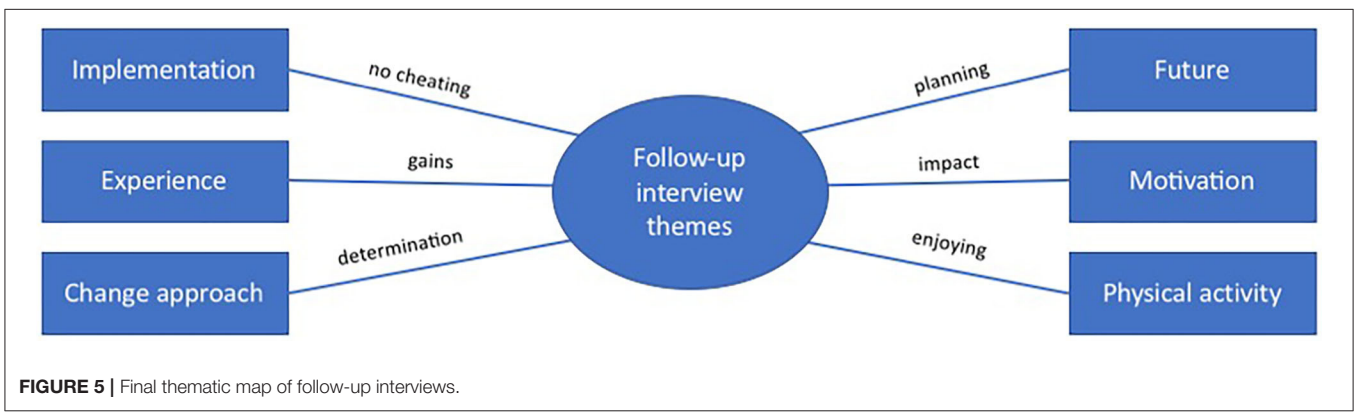

FIGURE 5 | Final thematic map of follow-up interviews.

TABLE 5 | Defintions of sub-themes and their main themes characteristics.

Sub-theme	Definition	Disabling talk characteristics	Enabling talk characteristics
Target	Reported reasons for joining the intervention	Difficulty defining a clear target	Refer to this as a specific time where change seems especially necessary and possible
Physical activity	Spontaneous reflection about physical activity	Express dislike and anxiety	Express enjoyment and liking
Change approach	Spontaneous reflections about change	Problems and how hard it is to change	Change is about determination and creating routines
Self-talk	Spontaneous reference to what kind of person they are	Recurring talk about negative thoughts	Refer to oneself as an all-in person
Motives	Reasons for wanting change	Avoidance	Gain
Future	What is your plan for the future to successfully maintain change?	Express doubt or difficulty to change and maintain change	Plan for maintaining new behaviors and managing upcoming obstacles

a better time than any other was categorized as disabling talk. Descriptive quotes for such vagueness include: *"Well, no, I… No, I don't know, it's hard. I don't know"*.

Talk characterized by clear reasons and this period of life as a specific time where this change seems especially necessary and possible was categorized as enabling talk. Descriptive quotes include: *"It's just now I feel I have the strength and the support to make it"*.

Physical Activity

During the interview, the participants came to talk about physical activity, since that was one of the main behavioral changes that the intervention aimed to help them with. This topic opened the way for spontaneous expressions about whether they liked it or not. Talk characterized by a dislike for physical activity or the gym was categorized as disabling talk. Defining quotes included: *"I don't like it [physical activity]"*.

Talk characterized by positive emotions regarding physical activity was categorized as enabling talk. The positive words about physical activity were very pronounced and clear in these interviews. Examples include: *"I can notice right after a work-out that I get more energy, right away. So it's very instant"*.

Change Approach

The change perspective of engaging in an interview clearly opened up the participants to talk spontaneously about their approach regarding the bigger picture of change. Talk characterized by failure and the difficulty of changing were categorized as disabling talk. Descriptive quotes include: *"I've tried by myself and failed over and over again"*.

Talk characterized by arguments for change as a product of planning, priority, and determination to actually change lifestyle behaviors was categorized as enabling talk. An example quote is: *"That's it really, that I just have to want to"*.

Self-Talk

During the interviews, the participants spoke spontaneously about what kind of person they are and how they talk to themselves. Talk characterized by how negative thoughts hinder behavior change, how negative thoughts are used to punish oneself, and an exhausted wish to change these negative thoughts was categorized as disabling talk. An example quote is: *"I get stuck in negative thought paths that makes me end up thinking" "why should I go to the gym?"*

Talk characterized by descriptions of oneself as an "all-in person" who commits fully to the things they decide to do was categorized as enabling talk. A descriptive quote for this category include: *"I'm like when I've decided something, then I go all-in so to speak"*.

Motives

Answers to the question "Why do you want change?" were dominated by avoiding something (such as disease or early death), and were categorized as disabling talk. An example quote is: *"If I don't lose weight, in a couple of years I will have diabetes, I know that. I have severe risk for it"*.

Answers dominated by gaining something (positive feelings, alertness, strength) were categorized as enabling talk. A descriptive quote is: *"… It made a lot for alertness and mood* [when cycle commuting to work], *that I had more energy even when I got home even if I got temporarily tired legs, I got a lot of energy out of it. And that's another strong reason that I'm doing this, that I want to be more alert basically, more energized and more alert"*.

Future

When talking about the future, including planning for maintenance of intervention-induced behaviors, the participants reflected spontaneously on this topic. Comments that were characterized by doubt and that continuing physical activity and new eating behaviors in the future will be difficult were categorized as disabling talk. A descriptive quote included: *"If I had a structured plan, then maybe I'd be able to reach my goal, but now after April I will be on leave and travel around the world and then I know it's really hard to… I won't train, and it will be really hard to eat [well] too"*.

Talk characterized by planning how to reach goals, including how to solve upcoming hindrances, which involves lessons learned from the past and how to overcome soft spots, was categorized as enabling talk. An example quote is: "*When it comes a… [hinder] It's not* ***if****, it's when. But then it will… then I will call my brother again [which works every time], and then just go to the gym and see what happens"*.

Results and Discussion Pre-interviews

The two main themes (enabling talk and disabling talk) on each of the six sub-themes describe the essence of how the participants express themselves when being exposed to the same questions about motivation, efficacy, expectancy, goals, and post-intervention plan.

In sum, the themes arising in the pre-interviews were enabling or disabling talk about target, physical activity, change approach, self-talk, motives, and future.

The disabling talk category orbited problem orientation and hindrances for change. This talk appears to be flavored by the statement "Why I will fail," expressing vagueness, problems, and/or negativity. The fail flavor consists of spontaneously expressed doubt and hindrances for change in each specific sub-theme. Examples of the fail flavor in a more general expression are: *"I don't think I will lose that much [weight] within 3 months"* and *"If I'm stressed, even if I've gone to the gym and when I'm done I don't think it mattered. I didn't feel satisfied or that I succeeded, or happier"*.

The *enabling talk* category signal determination, power, and/or structure and orbit solution orientation, and reasons for succeeding in changing behavior, and appear to be flavored by the statement "Why I will succeed" in each specific sub-theme. Some example quotes of spontaneously expressed progress in general, credit to oneself, and things that speak to success regarding changing behavior are: *"I walk around and, in my head, push myself all the time now"* and *"The easiest way to say it is that I am different now. It's me who changed, it's me who has will and drive to make sure it will be a change"*.

Follow-Up Interviews

This section presents analysis, discussion, and results from the follow-up interviews.

Analysis Follow-Up Interviews

The purposes of the follow-up interviews were to follow-up the intervention-induced immediate change and to gather a better understanding of the intervention process as well as the post-intervention process. The follow-up interview analysis was conducted through the same course of action as the thematic pre-interview analysis described above (Braun and Clarke, 2006).

The first phase of familiarization with the data was done by entering the transcript interviews into NVivo and reading them through carefully for an initial list of intriguing matters. The second phase led to 14 nodes filled with data extracts. In the third phase, the codes were placed into sub-themes and, after some merging and elimination, the codes were organized into sub-themes on the most prominent matters. In Phase 4, the sub-themes were refined to six, which represented the data set properly and were in line with the aim of the follow-up interview analysis: to understand the individuals' intervention process in order to provide additional keys for supporting successful intervention-induced goal achievement and maintained change. In Phase 5 we refined the caption of the main theme from *keys for maintained change* to *follow-up interview themes,* which we found better describes the story it tells. In Phase 6, the main theme and sub-themes were described by verbally writing the report in connection with the thematic map (see **Figure 5**).

Results and Discussion Follow-Up Interviews

All follow-up interviews included reports of immediate and maintained behavior change success. The pre-interview enabling talk quotes were all extracted from interviewees reporting maintained change at follow-up. Likewise, all of the disabling talk quotes were extracted from interviewees who did not respond to the follow-up. This meant that those interviewees who did not respond to the follow-up were likely to be less successful at maintaining the intervention-induced behavior change. For all follow-up interviewees, the maintained behavior change led to maintained or continuous weight loss.

The follow-up interview analysis revealed that key factors for being able to maintain intervention-induced change are as follows: not cheating during the intervention, experiencing positive gains with the new behaviors, seeing change as a determination issue, enjoying physical activity, using the intervention-induced impact (with emphasis on the positive emotions the new behaviors bring) as motivation to hold on and continue, and planning food and training. Descriptions of each sub-theme and supporting quotes are provided below.

Implementation

The talk among those who successfully maintained change concerned strictness during the intervention, which included not cheating. A descriptive quote is: "*Yeah, I followed the program and I followed it pretty… or, I actually didn't miss a single meeting*".

Experience

Experiencing positive aspects and gains from the intervention-induced behaviors was prominent in the talk for being able to maintain change. Experiencing the intervention-induced eating behavior changed as something that the participants could live with in their everyday life, rather than a sacrifice, and experiencing the intervention-induced physical activity behavior as something that feels so good that the participant did not want to be without it, rather than a burden. Example quotes are: *"No, I don't think it is [a sacrifice to eat diet food], no"; "I get so full that I… yeah, I'm good on it [the diet food]. And that's what makes me believe that I will be able to continue this, that I find food that works okay";* and *"… this with changing to train more and eat better, I don't think it's been hard, I haven't experienced it as hard at all actually"*.

Change Approach

Determination was a key word that arose among conversations about change. Viewing change as a determination issue was important for maintaining intervention-induced change. Illustrative quotes are: *"… when I come to that point, 'No—Now I'm determined' then I do it"*; and *"Now I have something I need to complete. I can't just quit. That's not me"*.

Physical Activity

Enjoyment of physical activity clearly stood out in all of the follow-up interviews, expressed both as pure enjoyment and happiness of finding that source of energy, and for being a key to continuous engagement in physical activity day after day. The fact that enjoying physical activity is a factor in successfully maintaining behavior change means that it can be understood by seeing it as a behavior driven by autonomous motivation, which gives instant internal reward. Enjoying physical activity means that the behavior itself creates positive emotions, which makes it satisfying to continue. Descriptive quotes for enjoying engaging in physical activity include: *"And now I train regularly and it feels very good too, and now I get frustrated if I can't train and that's something I haven't felt before, that's where I wanted to be";* and *"… That I feel good, that I get happy from it. I feel that I do something that is good for me"*.

Motivation

Among talk about motivation to proceed and maintain intervention-induced behavior change, experienced gain from the intervention was prominent. Gains were described as a positive impact on physical and psychological wellbeing from achieving goals, experiencing bodily change, obvious relief of pain and earlier health problems, pride in own accomplishments, and generally feeling better about oneself. Example quotes expressing gains that motivate maintained behavior include: *"I mean, now I have worked for something that I think is worth keeping and I don't want to ruin. And I notice how much better I feel; I'm more satisfied with myself and I'm more alert, have more energy…"* and *"I've lost 20 kilos so I have a lot… no pain in the knees and stuff, can climb stairs again, which I haven't done in many years because it's been hurting and such*".

Future

Discussions about the future highlighted the importance of planning for physical activity and eating. Techniques to maintain the intervention-induced behaviors include deciding before a meal to only have one portion instead of two, planning dinner ahead to avoid energy level influencing the decision in the moment, or training regardless of energy level. An example quote is: *"… I go [training] without thinking about whether I have the energy or not; I just go"*.

Qualitative Discussion

The qualitative analyses display experiences of individuals' intervention journeys. All *enabling talk* extracts come from pre-interviews with participants who, at follow-up, reported successfully maintaining behavior change. However, the content of the *enabling talk* theme can be utilized to detect how those who successfully maintained intervention-induced behavior change already resonate before the intervention. Consequently, they understand more about true motivation, expectations, efficacy, and future aims, leading to intervention-induced maintained change. Focus areas before and during the intervention that have been shown to have a positive impact on immediate and maintained behavior change are: having a specific target, having a positive attitude to physical activity, seeing change as a determination issue, engaging in positive self-talk, focusing on gains, and planning for the future. These themes could be developed and supported before and during the intervention to help each individual succeed in intervention-induced maintained behavior change. During and after intervention, focus areas to be supported are: not cheating during the intervention, paying attention to experiences of gains with the new behavior, continuing to view change as a determination issue, enjoying physical activity, planning for the future, and using intervention-induced positive impacts for further and continuous motivation to maintain the desired behavior. See **Table 6** for a summary of the qualitative results.

GENERAL DISCUSSION

The aim of the present study was to further the understanding of participants' intervention journey to find helpful ways of supporting intervention-induced maintained behavior change. This was done by asking the two following questions: (1) Do levels of expectations and motivational factors predict immediate and maintained change? (2) How do intervention participants' perceptions describe their expectations, efficacy, and motivation in relation to intervention-induced immediate and maintained behavior change?

On an overall level, the study produced three main results. Firstly, the quantitative data showed that the pre-measurements of goal expectancy, efficacy, and motivation levels correlate with each other, but did not predict either immediate or maintained behavior change. Significant correlations were found between goal achievement (but not BMI change) and maintained behavior change. Secondly, the qualitative data showed that *enabling talk* was salient in the pre-interviews, with participants reporting successful immediate (and maintained) change. By contrast, pre-interview *disabling talk* turned out to be evident in interviews, with participants not responding to follow-up. Thirdly, when the qualitative and quantitative results are summarized and integrated, it appears that subjective goal achievement, in combination with enabling self-talk, are crucial factors for successfully maintaining behavior change.

Although aspects seen in previous research (e.g., Greaves et al., 2011)—such as behavior change models, processes leading to participation in interventions, and types of components that interventions should include—are important, the present study broadens the understanding of participant experiences linked with successful intervention-induced maintained behavior change.

In line with previous research (Anderson et al., 2001; Curioni and Lourenço, 2005), the results from the qualitative data show that most participants in present study succeeded in (immediate) behavior change during the intervention, resulting in weight loss. However, fewer succeeded in maintaining the intervention-induced behavior change or weight. It is noteworthy that while the motivational levels reported prior to the intervention correlated as expected, they did not predict either immediate or maintained change. While this is most likely a ceiling effect, given that participants who enroll in an intervention are highly motivated, it still indicates that levels of motivation, expectation, and efficacy alone are insufficient for understanding how to support each individual's intervention journey to maintain behavioral change.

Looking at the qualitative data, the results from the pre- and post-interviews show that participants who successfully maintained their behavior change engaged in *enabling talk*, whereas participants who did not maintain change engaged in *disabling talk*. This result shows that focusing on participants' experiences of interventions and their self-talk is a better way of supporting them in maintaining behavior change than their levels of motivation, expectation, and efficacy.

Interpreted together, the quantitative and qualitative data show the importance of setting attainable behavior goals in combination with enabling self-talk in order to maintain intervention induced behavior change (see **Table 7** for a summary of the key findings, divided into quantitative and qualitative results). With the qualitative analysis results in hand, the question raised by the quantitative analysis results was how to understand that the pre-measurements are linked with each other as expected, but cannot explain either immediate or maintained change. The findings indicate that an answer might be found in deeper layers of the components that explain maintained change. The qualitative analysis results clarify that the quantitative pre-measurements do not explain immediate or maintained change because they do not capture each individual's actual motivation, expectation, or efficacy. Rather, the quantitative levels of motivation, expectation, and efficacy represent wishes for desired outcomes.

In line with Deci and Ryan (2008), the level of motivation does not correlate with goal achievement, but the motivation type does. Motivation level is the quantity of motivation (high to low), while motivation type is a description of the kind of motivation

TABLE 6 | Summary of qualitative results.

Pre-interviews	Target	Physical activity	Change approach	Self-talk	Motives	Future
Disabling vs. enabling talk	Vague vs. clear	Dislike vs. positive attitude	Focus on difficulty vs. determination	Doubtful vs. positive	Avoidance vs. gain	Hinders vs. plan for maintenance
Follow-up interviews	Implementation	Physical activity	Change approach	Experience	Motivation	Future
Maintenance factors	No cheating	Enjoyment	Continuous determination	Focus on positive self-talk and gains	Utilizing positive impacts from new behavior	Planning for maintenance

TABLE 7 | Summary of key findings.

	QUANT results (questionnaires + body measurements)	QUAL results (face-to-face interviews)
Pre-measurements	Correlations: Expectation, efficacy, and motivation levels correlate with each other, but not with post or follow-up measures	Themes: Enabling vs. disabling pre-talk about target, physical activity, change approach, self-talk, motives, future when exposed to the concepts of expectation, efficacy, and motivation
Post-measurements	Correlations: Motivation type—goal achievement BMI change—goal achievement Goal achievement—maintained change *T*-test: Achievement of physical activity goals and eating behavior goals are more important for maintaining change than weight goals and other goals	Clarify that goal orientation during the intervention leads to maintained change Enabling pre-interview talk turned out to be extracted from interviews with participants reporting successful immediate (and maintained change). Disabling pre-interview talk turned out to be extracted from interviews with participants not responding to follow-up
Follow-up measurements	Correlations: Goal achievement—maintained change	Themes associated with maintained change: Not cheating during intervention Paying attention to gains with the new behavior Continuing to see change as a determination issue Enjoying physical activity Planning for the future Using the achieved results for further motivation to maintain the desired behavior

and what it consists of. All of the participants in the present study reported rather high levels (in both quantitative and qualitative data collection) of motivation, expectancy, and efficacy. While high-level reports throughout may generate a ceiling effect, the high-level reports of the present study might equally be a matter of cognitive dissonance (Festinger, 1957). In short, cognitive dissonance is the urge to behave in line with identified beliefs and attitudes. It would be illogical to invest money to join a behavior change intervention and, at the same time, report a low level of motivation to change. In the *disabling talk* category, high motivation level reports are not reflected in the same participants' motivation type reports. On the contrary, while they claim to have a high motivation level, they also display disabling talk regarding implementation describing avoidance, hindrances, and negative thoughts. Thus, from the perspective of cognitive dissonance, reports of high-level motivation by participants from the *disabling talk* category (which did not respond to follow-up) strive to maintain congruence between attitude (wanting to change) and action (signing up for a change intervention) rather than a fair picture of the behavior change commitment needed to successfully maintain behavior change. The explanation of striving to uphold congruence between attitude and action is supported by noteworthy differences regarding talk about motivation and goals between the *enabling talk* category and the *disabling talk* category. The *disabling talk* reported outcome goal focus (such as losing weight: *having* a lighter body), while the *enabling talk* reported emphasized behavior change goals (for example, *do* new activities, which will lead to a lighter body). Having set a behavior change goal, it seems more natural to be able to describe more details about the motivation; that is, why this is a good time to start and why the goals will be attained. When one has an outcome goal, the urge is to *have* rather than to *do*, which is why it is more problematic to define a detailed description of motivation to change behavior.

The same reasoning seems to be true regarding the overall high-level reports of goal expectancy and efficacy. Just like motivation level, these data were collected right before the start of the intervention. At this point, the participants had just invested their time, money, and energy in the intervention (action), and therefore they *should* have high expectations about reaching their goals and a high level of belief in themselves and the intervention (attitude). When looking at noteworthy differences in talk about future and change between the *enabling talk* category and the *disabling talk* category the real relationships

between attitude and action are revealed. The overall high-level reports of goal expectancy and efficacy in the *disabling talk* category are contradicted in their talk about change and future, consisting of doubt, problems, difficulties, and hindrances for changing and maintaining change. These are obviously not characteristics of high expectancy, as compared to the *enabling talk* on change and future, which refers to change as creating routines and that change is about determination, including plans for how to maintain changed behaviors and how to tackle upcoming obstacles. Likewise, characteristics of high efficacy are trust and belief in self, but the *disabling talk* category was characterized by negative self-talk. This reveals a picture of actual low efficacy when complementing straight figures of level reports with story-telling narrative data.

The importance of making a distinction between level and type is prominent in SDT regarding motivation. The present study supports this theory when investigating motivation, and adds that the same is true regarding expectation and efficacy levels and types. Therefore, it is important to include types rather than solely high or low levels to build an understanding of actual motivation, expectancy, and efficacy, to enable optimized support in intervention-induced maintained change. However, instead of focusing only on motivation, expectancy, and efficacy levels, the results of this study suggest that it is better to focus on change approach, goals, future, self-talk, and motivation type, which give a more extensive representation of important factors for intervention-induced behavior change and its maintenance. It is better to focus on the individuals' narrative regarding the possibility to attain goals than more abstract notions of motivation.

Previous research has highlighted the importance of distinguishing between outcome goals and behavior change goals (Dweck, 1986), as well as avoidance vs. approach goals (Carver and Scheier, 1998). The present study supports the importance of making these distinctions and clarifies that outcome goals often are associated with avoidance motivation, while behavior change goals are associated with approach motivation. Further, outcome goals, as a set weight, are easy to measure and have a clear reaching point. Behavior change goals are more complex since they do not have a clear end point. It is satisfying to tick a box when something is completed, but behavior change is about continuity and can easily be measured in terms of the number of activities or experienced goal achievement. Hence, it is better to avoid avoidance motivation prior to approach motivation and to make continuous boxes to tick, both in order to monitor progress and accomplishment and to maintain the intervention-induced behavior and its gains.

In short, the results of the integrated qualitative and quantitative analysis show that individuals who focus on attainable behavior goals and whose narrative regarding themselves contain *enabling talk* are more likely to sustain an intervention-induced changed behavior.

From a practical perspective, the results of the present study can be utilized to help intervention participants succeed in intervention-induced maintained behavior change by early actions and resources invested at the right time and place. This can be achieved by firstly focusing on the actual behavior changes and setting behavior-related goals, rather than focusing on overall outcomes of the intervention. Secondly, it can be done by building personalized action plans and support based on individual needs and preferences. This can be done by focusing on the *enabling talk* themes before and during the intervention and the *follow-up* themes during and after the intervention.

Limitations and Future Recommendations

With the high ecological validity benefits of a field study design, where no manipulations whatsoever are made to fit the study, the participants are in a natural environment (that is, intervention program), although there are also less favorable aspects. These include reduced control of extraneous variables and, in this case, fewer participants (for example, due to difficulties adding more participants to the intervention) and different samples of participants for the quantitative and qualitative aspects of the study. However, utilizing the quantitative data to suggest quantitative relationships and interpreting the quantitative data together with qualitative data helps to cover such a potential lack of power and create valuable synergy. Additionally, the participants in the qualitative data collection add to the total number of study participants. Another product of the field study origin is that the age span of the participants is limited to include more middle-aged participants. However, the ages ranged from 28 to 70 years.

We chose single-item measures for the quantitative aspect of the study, which could be compared to multi-item measures with potential benefits in reliability or capturing more information. However, we made this choice based on the benefits of single items' practicality and avoiding common methods bias (see, for instance, Bergkvist and Rossiter, 2007). Our choice of self-reported measures could also be a limitation. We compensated for that choice by combining self-reported measures with objective measures like body weight and BMI. However, objective measures could also be limitations. Maintained change is measured by body weight, which is an outcome rather than an actual behavior change. However, keeping a lower body weight (or continuing to lose weight) requires a change in either or both physical activity and eating behaviors, which is why we chose this objective measurement together with interview data, rather than solely a subjective self-report of behavior change.

Previous research (Ulen, 2008; Nordmo et al., 2020) has shown that weight loss usually peaks close to the intervention, before relapsing within a few years. Therefore, the follow-up in the present study—6 months after the intervention—might be quite early. However, while we have shown what happens before, during, and after the intervention with established maintenance measurements, future research may indicate what will happen years into the future. Further research is needed on the pre-eminent ways to enable genuine positive self-talk that maintains. However, the most comprehensive suggestion, to increase the possibility of maintaining intervention-induced behavior change, is to stimulate an enabling mindset (including seeing that change really *is* about determination).

Participation in the intervention was based on a monetary cost. On one hand, this leads to study participants being

autonomously motivated to the degree that they invest their own money and time in an intervention without being given any incentives whatsoever. On the other hand, participants with a low income are likely to be less represented in the sample. However, the monetary cost was large compared to a regular gym membership including gym entrance only, but still an amount most people with priority could save up for in some months despite rather low income.

Lastly, collecting more demographic information about the participants would have been preferable for present study. And for future studies could interviewing the personal trainers be a way of capturing an additional perspective of the intervention-induced behavior change and course of events.

CONCLUSION

Levels of expectations and motivational factors cannot be used alone to predict intervention-induced maintained change, but interpreting those results together with participants reasoning before the intervention can build an understanding of the intervention journey to form a guide for further directions on support and focus for successful maintained change.

To help improve successful intervention-induced maintained change, our results suggest that instead of focusing too much on increasing levels of expectancy, efficacy, and motivation prior to an intervention, it is better to identify and focus on strengthening each participant's individual weak spots. This includes individual support in structuring effective goal setting and future plan making, as well as a constructive approach toward key issues including monitoring goal attainment. More specifically, steps toward practically applying these findings include helping participants with the infrastructure to create clear behavior change goals (as compared to outcome goals) with detailed intervention plans, including support in organizing post-intervention plans. Working with approach and attitude toward the intervention-induced behaviors, change, and self are further actions toward successful maintained change. For instance, helping participants find physical activities that fit their personal preferences is probably the best way of supporting participants to create or increase a positive attitude to, and enjoyment of, physical activity.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

FS contributed to the data collection, data analysis, and manuscript writing. EW contributed to the data collection, analysis and interpretation of the results, and critical reviews of the manuscript. HG contributed to the analysis and interpretation of the results, and critical reviews of the manuscript. All three authors have contributed to the article and approved the submitted version.

FUNDING

This study was funded by Region Värmland through DigitalWellResearch project grant number HNT 2017/279.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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ORIGINAL RESEARCH
published: 16 July 2021
doi: 10.3389/fpsyg.2021.689944

Anxiety-Depressive Syndrome and Binge-Watching Among Young Adults

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In recent years, binge-watching becomes a highly popular way of spending free time. Even though binge-watching usually is related to entertainment, there are concerns about some negative and unhealthy outcomes of excessive form of this behavior. The study examined the predictive value of anxiety-depressive syndrome in explaining the symptoms of problematic binge-watching and the tendency to adopt a specific motivation to watch series. Research group consists of 645 Polish young adults. The State-Trait Anxiety Inventory, Depression Measurement Questionnaire, Viewing Motivation Scale, and Questionnaire of Excessive Binge-Watching were used in this study. The results of the path analysis show that anxiety-depressive syndrome and motivation to watch TV series are the significant factors in the manifestation of all symptoms of problematic binge-watching. Moreover, there is a significant relation between anxiety-depressive syndrome and motivation to watch TV series, which especially concerns escape motivation and motivation to deal with loneliness. Furthermore, motivation to deal with loneliness, escape motivation, and motivation to spend free time have mediating effect on the relationship between anxiety-depressive syndrome and problematic binge-watching. Results of this research show that there could be not only normative binge-watching behavior but also unhealthy and problematic form of this behavior.

Keywords: binge-watching, anxiety, depression, motivation, problematic binge-watching, behavioral addiction

OPEN ACCESS

Edited by:
Magdalena Poraj-Weder, The Maria Grzegorzewska University, Poland

Reviewed by:
Bernadeta Lelonek-Kuleta, The John Paul II Catholic University of Lublin, Poland
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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *01 April 2021*
Accepted: *21 June 2021*
Published: *16 July 2021*

Citation:
Starosta J, Izydorczyk B and Wontorczyk A (2021) Anxiety-Depressive Syndrome and Binge-Watching Among Young Adults. Front. Psychol. 12:689944. doi: 10.3389/fpsyg.2021.689944

INTRODUCTION

In recent years, there have been numerous changes in the way media is consumed, an example of which is the development of streaming platforms and the growing popularity of binge-watching (Flayelle et al., 2020; Jay, 2021). According to the definition given by Netflix (2013) itself, binge-watching is a phenomenon of watching at least two episodes of a TV series during one session. The phenomenon was also defined in this way in this article. It is worth noting, however, that in the constantly expanding literature on the subject, there are many definitions of this phenomenon, which refer to both the number and length of watched episodes and the way they are consumed (Flayelle et al., 2020).

Due to the popularity of the case, the scientific literature increasingly disputes whether excessively intense binge-watching can be considered in terms of anti-health behavior with symptoms of behavioral addiction (Orosz et al., 2016; Trouleau et al., 2016; Flayelle et al., 2020; Starosta et al., 2020). Undoubtedly, binge-watching can be a positive way of spending

free time. However, some studies indicate that there is a thin line between healthy and unhealthy binge-watching (Flayelle et al., 2020). Socioecological model of health indicates that social and cultural phenomenons contribute to the variability of individual's health (Słońska, 1994). The development of streaming platforms led to growth of popularity of binge-watching and changed the way how people consume television (Boca, 2019). Similarly to other addictions to technologies, binge-watching could be perceived as a behavior which usually is not associated with high levels of social harm (Grzegorzewska and Cierpiałkowska, 2018; Ort et al., 2021). However, some studies indicate that excessive forms of binge-watching could be related to negative health and social consequences (Riddle et al., 2017; Flayelle et al., 2019b; Steins-Loeber et al., 2020). The newest studies search for the answer how healthy way of spending free time can change into the problematic binge-watching. The occurrence of anti-health form of binge-watching could be related to the new construction of narrative created by streaming platforms, characteristics of video on demand platforms, and individual psychological predispositions to development of problematic use of media (Alter, 2017; Grzegorzewska and Cierpiałkowska, 2018; Boca, 2019; Brand et al., 2019). Research has shown that binge-watching is an event that is very engaging both emotionally and cognitively, which may lead to loss of control over the number of watched episodes (Schweidel and Moe, 2016; Flayelle et al., 2017; Granow et al., 2018). The aforementioned loss of control is undoubtedly related to the production of series with a comprehensive narrative that keeps the viewer's attention (Alter, 2017). It could also be related to the specificity of the streaming platforms themselves, which allow you to watch series without commercial breaks and automatically turn on the next episode of the series just after few seconds the previous episode has ended (Ahmed, 2017; Flayelle et al., 2019b). In addition, the easy availability of series on numerous devices – TV sets, desktops, tablets, or telephones as part of the wide range of streaming platforms (Trouleau, 2016; Sung et al., 2018) – may also play a role. Losing control over the amount of time spent on binge-watching may affect the entire functioning of an individual in the sphere of relations with other people, fulfilling duties, or taking care of health (Orosz et al., 2016; Chambliss et al., 2017; Exelmans and Van den Bulck, 2017; Riddle et al., 2017; Flayelle et al., 2019a, b). These issues are related to the criteria of Internet gaming disorder included in section III of DSM-5 by American Psychiatric Association (2013) and the criteria of gaming disorder distinguished by WHO (2018) in ICD-11. On this basis, it can be concluded that there are some similarities between addiction to new technologies and excessive binge-watching.

So far, there has been little research into the psychological determinants of excessive binge-watching. According to the researchers, the reasons for engaging in binge-watching behaviors, including those of a problematic nature, should be sought in personality traits, ways of regulating affect, and the motivation manifested by the individual (Flayelle et al., 2019b, 2020; Starosta and Izydorczyk, 2020). The undertaken research focused on the impact of the anxiety-depressive syndrome on binge-watching behavior and the mediating influence of the manifested motivation to watch TV series. There are many studies of fundamental behavioral addictions that link the problematic use with anxiety and depression (Mehroof and Griffiths, 2010; Van Rooij et al., 2014; Liu et al., 2018). The problematic use of social media or video games, as well as psychoactive substances, can be used to regulate affect by anxious and depressive persons in order to obtain positive gratification and protect themselves from negative affect (Cheetham et al., 2010; Nikmanesh et al., 2014). The same may be the case with problematic binge-watching behaviors (Flayelle et al., 2019a). Research conducted by Wheeler (2015) and Ahmed (2017) showed that there is a positive relation between the higher frequency of binge-watching behaviors and depression and a sense of loneliness. The existence of a similar relation is also indicated by studies by Sun and Chang (2021). In turn, Steins-Loeber et al. (2020) indicated that depressive symptoms are a clear predictor of losing control over binge-watching. On the other hand, the results obtained by Tefertiller and Maxwell (2018) showed no relation between depression and loneliness and binge-watching. As can be seen, there are not many studies on the relationship between anxiety and depression and the tendency to manifest excessive binge-watching behaviors. On the other hand, those that are known contain contradictory results. In connection with the above, it is worth investigating the role of anxiety-depressive factors in the manifestation of problematic binge-watching.

The factor involved in regulating affect is the individual's motivation to watch TV series. Research on motivation is most often based on the uses and gratifications theory (Rubin, 1983; Steiner and Xu, 2018). This theory states that people are using media, such as television or the Internet, to meet certain needs and achieve certain goals (Pittman and Sheehan, 2015). Viewers watch series for various reasons, the most common of which is entertainment, relaxation, and social motivation (Pittman and Sheehan, 2015; Panda and Pandey, 2017; Rubenking and Bracken, 2018). Individuals watch series to get or maintain a positive affect. Another motivation indicated by researchers is cognitive motivation – an individual watches series because of the desire to obtain information (Shim and Kim, 2018). On the other hand, the research also shows a very large role of motivation to cope with loneliness and escapism, which enables the individual to escape from problems and regulate negative emotions (Panda and Pandey, 2017; Rubenking and Bracken, 2018; Flayelle et al., 2019a, b). It is worth noting that the phenomenon of escapism into the virtual world and using it to regulate affect is a characteristic pattern of behavioral addictions (Kim et al., 2017; Sprong et al., 2019). Investigating the motivations accompanying binge-watching behaviors and their determinants is extremely important for understanding the essence of problematic/excessive binge-watching. It is also important to understand how depressive and anxious features affect the individual's motivation to watch TV series.

The path model of behavioral addictions by Blaszczynski and Nower (2002) or I-PACE model of addiction by Brand et al. (2019) shows that there are multiple ways to develop behavioral dependency. These models indicate personality traits, and affective disorders could be psychological predisposition

of engaging in excessive forms of some behaviors or substance addictions. Multiple research on the problematic use of technology showed that there is bidirectional relationship between anxiety, depression, and problematic use of Internet or social media (Mentozoni et al., 2011; Männikkö et al., 2015; Mérelle et al., 2017; Krossbakken et al., 2018). As was mentioned before, there are some studies which indicate similar results in case of binge-watching (Ahmed, 2017; Sun and Chang, 2021). However, due to the dearth in the literature on this subject, the further research is needed. In relation to path model (Blaszczynski and Nower, 2002) and I-PACE model (Brand et al., 2019), these psychological predispositions could affect individual's needs and motivations to engage in excessive forms of binge-watching. Multiple studies show that specific motivation to binge-watching is usually defined on the basis of Uses and Gratification Theory. Achieving individual's goal and gratifying their needs could enhance the behavior and lead to developing problematic binge-watching.

It seems important to conduct research on the role of anxiety, depression, and motivation for the manifestation of problematic binge-watching as the constant increase in the popularity of binge-watching behaviors and the indications appearing in the scientific literature about the possibility of the existence of excessive forms of the phenomenon, characterized by features similar to behavioral addictions, can be observed. The study of the relations between the variables is important to understand the determinants underlying excessive forms of binge-watching and thus to understand the characteristics underlying anti-health behaviors. Furthermore, understanding the mechanism of problematic binge-watching is significantly important in the population of young adults. The entering the adulthood is a period of life with high risk of development of substance and behavioral addictions (Sussman and Arnett, 2014; Lopez-Fernandez et al., 2017). Statistical research shows that young adults tend to binge-watch on daily basis, which makes them population with higher risk of developing tendency for excessive binge-watching (Sabin, 2018). The results may have an impact on the development of preventive and therapeutic measures toward people prone to problematic binge-watching. In addition, the results of the research will contribute to a better understanding of the phenomenon of binge-watching, which, although it was established in 2013, is still an unexplored phenomenon from a psychological perspective.

Research Objective and Questions

According to path model of behavioral addictions (Blaszczynski and Nower, 2002) and I-PACE (Brand et al., 2019), there are psychological predispositions, such as personality, psychopathology, and tendency, to present special motivation and needs can lead to the development of behavioral addiction.

As you can see in the model presented in the **Figure 1**, the explanatory variable has been called the anxiety-depressive syndrome. According to the literature, anxiety and depressive traits are invariably correlated, because anxiety is both a characteristic symptom of anxiety and depressive disorders (Butcher et al., 2020). Often people suffering from anxiety disorders are also characterized by the coexistence of depressive disorders. The personality trait-neuroticism is also associated with anxiety and a tendency to experience negative, depressed mood, as well as a tendency to rumination. The anxiety-depressive syndrome was defined with reference to the structural model of Cicchetti et al. (1995) as a cognitive-affective structure related to the individual's tendency to react with anxiety and depressive mood in various life situations. These dispositions affect the cognitive and emotional functioning of an individual, the motivation manifested by them, and their behavior. The anxiety components of the anxiety-depressive syndrome are based on the theory of Spielberger (1966), who distinguished anxiety-state and anxiety-trait. In turn, the depressive components refer to the International Classification of Diseases (ICD) and Diagnostic and Statistical Manual of Mental DIsorders (DSM) criteria for understanding depression.

The first component of the anxiety-depressive syndrome is state anxiety. A given factor is defined as a subjective and conscious feeling of tension accompanied by the stimulation of the autonomic nervous system at a specific point in time (Spielberger, 1966). State anxiety is thus understood as the state of tension currently experienced by the individual. The second component of the anxiety-depressive syndrome is trait anxiety, defined as a behavioral disposition to react with disproportionate high anxiety despite the lack of objective danger and perceiving harmless situations as causing anxiety. Another factor included in the anxiety-depressive syndrome is cognitive deficits and energy waste, which determine the subjective sense of difficulty of an individual in the functioning of his cognitive processes and the feeling of energy loss to act and carry out everyday activities. The fourth factor is thinking about death, pessimism, and alienation, which are defined as the subjective feelings of hopelessness, emotional emptiness, alienation, and isolation. The fifth factor was guilt and tension, which describes the level of intensity of negative emotions, such as sadness, guilt, being punished, and anxiety, and also measures the individual's tendency to rumble. Another factor was Psychosomatic Symptoms and Loss of Interests, which were defined as the severity of one's own health deficits–activities, such as sleep, wakefulness, movement, and sex. This variable also measures the level of decline in pleasure derived from various activities and interests. The last component is self-regulation, which is defined as the level of an individual's cognitive-emotional resources to deal with negative emotions.

The variable explained is the problematic binge-watching, which was defined on the basis of the model of behavioral addiction proposed by Griffiths (2005), the criteria of gaming disorder (WHO, 2018), and Internet gaming disorder included in section III of DSM-5 (American Psychiatric Association, 2013). The criteria of abovementioned disorders focus on the impaired control over the individual's behavior, preoccupation, tolerance, continuation, and escalation of the behavior despite negative consequences and using the behavior to relieve negative moods (Griffiths, 1996; American Psychiatric Association, 2013; WHO, 2018). On the basis of these criteria, problematic binge-watching is defined as persistent and excessive binge-watching,

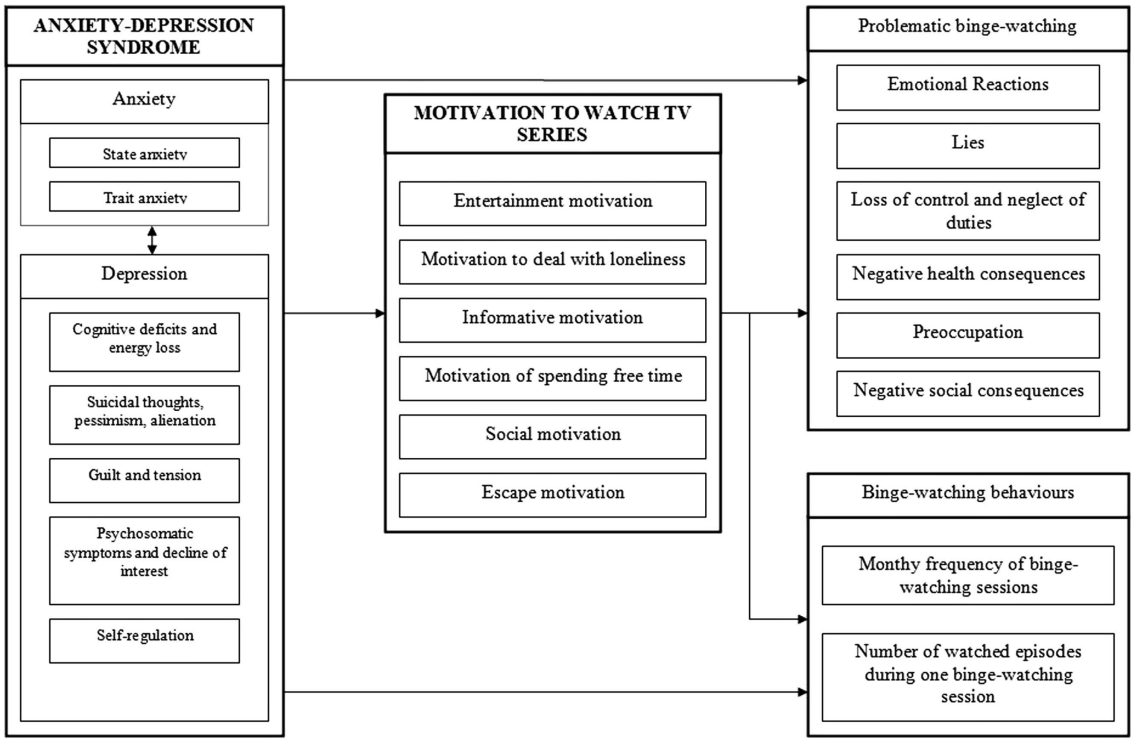

FIGURE 1 | Theoretical model.

characterized by a loss of control over the manifested behavior in order to obtain gratification and escaping negative emotions, excessive cognitive-emotional preoccupation, and loss of other interests in favor of binge-watching. The behavior of an individual has an impact on the performance of duties and is associated with negative social and health consequences.

The problematic binge-watching consists of six components, also known as symptoms. The first one, called emotional reactions, is associated with defining binge-watching as a source of positive emotions, as well as a way to regulate negative emotional states. It also includes an emotional discomfort (feeling of anger, anxiety, and depression) in a situation in which the individual cannot binge-watch. The second component is lie, defined as the tendency of an individual to hide the truth about the amount of time spent on binge-watching. The third component is loss of control and neglect of duties, defined as the loss of control over the amount of time spent on binge-watching, which may result in the neglect of employee, family, or educational duties by an individual. The fourth component is negative health consequences. This variable measures the intensity of sleep problems and irregular and unhealthy diets that are a consequence of excessive binge-watching. The fifth symptom is preoccupation, and it is a variable expressing the cognitive and emotional fascination with binge-watching, manifested by involvement in binge-watching itself, as well as searching for additional information about series. The last component is negative social consequences, which express the intensity of the subjective assessment of the deterioration of relationships with other people as a result of the amount of time spent on binge-watching.

The next variables explained are binge-watching behaviors which consist the frequency of binge-watching sessions during a month and the number of watched episodes during one binge-watching session. These variables measure the intensity of undertaken behaviors and the number of watched episodes.

The motivation to watch TV series is the variable mediating the relation between the anxiety-depressive syndrome and problematic binge-watching, the frequency of sessions, and the number of episodes watched during one session. The definition of this variable was based on the uses and gratifications theory (Rubin, 1983; Steiner and Xu, 2018). This theory says that the use of media, such as television or computer, directs the behavior of an individual to meet their needs and achieve goals.

On the basis of Rubin's (1983) motivation to watch TV series, the following six motivations were distinguished. Entertainment motivation is defined as watching series in order to relax and to have fun and arouse positive emotions. Motivation to deal with loneliness is defined as a behavior undertaken by an individual to avoid feeling lonely. The characters of the series become "companions" for the individual, thanks to which the individual lowers his sense of isolation and sadness caused by the lack of the company of other people. A different factor is informative motivation, defined as watching a series induced by the cognitive needs of an individual. The viewer watches the series to get information

about the world, other people, and himself. Another type of motivation is motivation to spend free time, which describes watching TV series as a habitual activity aimed at counteracting the feeling of boredom. There is also social motivation – by watching serials, an individual initiates, maintains, and deepens relationships with other people. As a result, the person spends time with them, is part of the group, and can exchange opinions about the series with other people. The last component of the mediating variable is escape motivation, which characterizes individuals who use series to escape from the problems of the everyday world. That way individuals are able to distract themselves from negative feelings.

The aim of this article is to identify the predictive role of the anxiety-depressive syndrome in the tendency to manifest symptoms of problematic binge-watching and the tendency to adopt a specific motivation to watch series. Another goal of the article is to determine how the motivation to watch series influences the symptoms of problematic binge-watching. Furthermore, the goal of the study is to identify the mediating effect of motivation to watch TV series on relationship between the anxiety-depression syndrome and the symptoms of problematic binge-watching.

In connection with the above, the following research questions were asked:

1. Does anxiety-depressive syndrome explain the symptoms of problematic binge-watching among young adults and to what extent?
2. Does anxiety-depressive syndrome explain the occurrence of particular types of motivation to watch TV series among young adults and to what extent?
3. Do and to what extent the motivations to watch TV series mediate the relation between the anxiety-depressive syndrome and the symptoms of problematic binge-watching among young adults?
4. Does anxiety-depressive syndrome and motivation to watch TV series explain the binge-watching behaviors – monthly frequency of binge-watching session and the number of binge-watched episodes in one sitting?

Due to the exploratory character of this research, it was decided to not provide specific hypothesis. However, on the basis of the abovementioned studies, it can be assumed that the anxiety-depressive syndrome indirectly influences the symptoms of problematic binge-watching.

MATERIALS AND METHODS

Methods

The Polish adaptation of the STAI – State-Trait Anxiety Inventory by Spielberg and Lushene (Wrześniewski and Sosnowski, 1996) – was used to study the anxiety-depressive syndrome. The inventory is a tool designed to measure the severity of state anxiety and trait anxiety. The inventory is characterized by satisfactory psychometric indicators. Internal reliability coefficient of the individual scales in Polish adaptation by Wrześniewski and Sosnowski (1996) is between 0.88 and 0.91. The Polish adaptation of the questionnaire consists of 40 items. People participating in the study are asked to rate their answers on a 4-point scale. The respondents were given the following types of statements to choose from depending on the scale tested: 1– "definitely not"/"almost never," 2 – "rather not"/"sometimes," 3 – "rather yes"/"often," and 4 – "definitely yes"/"almost always."

The second tool measuring the anxiety-depressive syndrome was the Depression Measurement Questionnaire by Łojek et al. (2015). The tool allows you to measure feelings, thoughts, and depressive behavior. It consists of the following five scales: cognitive deficits and energy loss; thinking about death, pessimism, and alienation; guilt and anxiety tension; psychosomatic symptoms and loss of interest; and self-regulation. The questionnaire also consists of an overall score, which is the sum of the first four scales (cognitive deficits and energy loss; thinking about death, pessimism, and alienation; guilt and anxiety; psychosomatic symptoms and loss of interest). This result determines the intensity of depressive symptoms in the examined person. The Depression Measurement Questionnaire has satisfactory psychometric indicators. The reliability coefficients ranged from 0.73 to 0.96 (Łojek et al., 2015). The questionnaire consists of 75 questions. The respondents are asked to rate their answers on a 4-point scale, where in the case of 66 items 1 – "always"/"constantly," 2 – "often," 3 – "sometimes," and 4 – "never." In the case of 9 items, the respondent chooses from the following answers: 1 – "very," 2 – "significantly," 3 – "slightly," and 4 – "not at all."

The Polish adaptation of Viewing Motivation Scale by Rubin was used to measure the level of the motivation for watching TV series (Rubin, 1983; Starosta, et al., 2019). The Polish adaptation of the questionnaire consists of 27 items and six scales: entertainment motivation, motivation to deal with loneliness, informative motivation, motivation of spending free time, social motivation, and escape motivation. The Cronbach's α coefficients for the abovementioned scales ranged from 0.69 to 0.88 in Polish adaptation. It indicates satisfactory reliability of the tool. The intercorrelations between the constructs ranged between 0.09 and 0.43 ($p < 0.001$). Respondents rate their answer on a 5-point Likert scale, where 1 means – "completely untrue," 2 – "a bit true," 3 –"very likely," 4 –"true," and 5 – "definitely true."

Another method used in this study was the Questionnaire of Excessive Binge-Watching created by Starosta et al. (2019). The questionnaire was used to examine the symptoms of problematic binge-watching, which can be the symptoms of the behavioral addiction. The authors of the tool conducted Exploratory Factor Analysis (EFA) which enables to distinguish 6 subscales from 30 items: emotional reactions, lies, loss of control and neglect of duties, negative health consequences, preoccupation, and negative social consequences. The Cronbach's α coefficients calculated on the basis of Polish population for the whole method and separate subscales of the questionnaire ranged from 0.67 to 0.89 which indicate satisfactory psychometric characteristic of the tool. The intercorrelations between the constructs ranged between 0.26 and 0.61 ($p < 0.001$). Participants of the study

mark their answers on the 6-point Likert scale: 1 – "never," 2 – "sporadically," 3 – "rarely," 4 – "sometimes," 5 – "often," and 6 – "always." The Questionnaire of Excessive Binge-Watching can also be used to measure the level of intensity of problematic binge-watching among the Polish students. The total score of this method determines whether risk of occurring symptoms of excessive binge-watching is low (0–60), medium (61–120), or high (121–180).

Data Analytic Procedures

Firstly, descriptive statistics were measured in terms of the intensity of all variables and their indicators included in the research model. Secondly, the research model was tested by using path analysis – analysis of structural equations. The results were obtained by using AMOS-SPSS (Arbuckle, 2014) software. Due to the improvement of readability of the result, the path analysis model consists only significant paths. The obtained results of the analyses are presented in a section results.

Characteristics of the Research Group

The study was conducted from September 2020 to January 2021. The research was carried out in the form of an individual study online using the Microsoft Teams platform. The study was voluntary, and the respondents consented to participate. The study was anonymous, and no personal data were collected during the study. Selection for the research group was deliberate. The criteria for inclusion in the group were declaring watching TV series – watching two or more episodes of TV series in one sitting, being between the ages of 18 and 30 declaring no information about the occurrence of diagnosed mental illness, such as affective, psychotic, or anxiety disorders, substance dependence, and occurrence of treatment – psychotherapy and/or pharmacotherapy – of abovementioned disorders. The exclusion criteria were related to not watching TV series or watching less than two episodes of TV series, being under the age of 18 or over 30 and having diagnosed mental illness (affective, psychotic, and anxiety disorders, substance dependence, occurrence of mental illness treatment – psychotherapy and pharmacotherapy). A study of 600 people was planned. In developing the research model, the authors estimated the minimum size of the research sample (n = 384). Initially, the research sample consisted of 752 people, but due to the failure to meet the inclusion criteria and the deficiencies in the supplement to the questionnaire, 107 people were removed from the research sample.

The research group consisted of 645 people. The study included 537 women (83.26%), 98 men (15.19%), and 3 transgender men (0.47%). It is worth mentioning that seven people decided not to give their gender (1.09%). The average age of the respondents was 20 years. The half of the respondents are people who only study (54.11%). In turn, people who study and work at the same time constitute 32.40% of the studied group. On the other hand, working people constitute 13.49% of all respondents. The percentage distribution of individual fields of study among the respondents is as follows: social sciences – 49.92%, humanities – 28.68, exact sciences – 6.36%, and medical sciences – 3.88%. People who did not study accounted for 10.23% of the research group. Another characteristic of the research group was their relationship status. This variable divides the group in half because at the time of the study, 49.30% of the respondents were single, while 50.70% were in a relationship.

Characteristic of Binge-Watching Among Polish Young Adults

The next stage of the research was to collect the characteristics related to binge-watching. The vast majority of respondents admit that binge-watching happens (95.66%). The analysis of the respondents' responses indicates that most of the respondents watch from two to five episodes during one binge-watching session (81.55%). It should be noted, however, that the remaining group of respondents – as many as 18.45% – indicated that they watch from 6 to 20 episodes during one binge-watching session. In terms of the number of binge-watching sessions, the majority of respondents indicated that binge-watching was performed 1–5 times a month (66.82%), while the remaining respondents (33.18%) admitted that they sometimes binge-watch 6–30 times a month. In terms of the preference of where to watch series, all respondents replied that they perform binge-watching at home. Only 9.61% of respondents admitted that they binge-watch while traveling, and 2.33% answered that they sometimes binge-watch at work. The vast majority of respondents prefer to binge-watch alone (83.72%). Only 30.52% of respondents answered that they sometimes watch TV series with a partner, 9.92% indicated that binge-watching is carried out by the whole family, and only 6.98 replied that they were watching series with friends. The most common binge-watching genres among the respondents were comedies, crime stories, action/sensational series, sci-fi/fantasy series, and drama series.

RESULTS

In the first stage of the statistical analysis of the obtained results, descriptive statistics were measured in terms of the intensity of all variables and their indicators included in the research model. The obtained results are presented in **Table 1**.

Based on the obtained descriptive statistics, it can be concluded that the research group is characterized by a moderate level of anxiety – both trait and state, and a moderate intensity of depressive traits. The participants of the study show an average intensity of the distinguished motivations to watch the series. Most of the respondents are characterized by an average intensity of symptoms of problematic binge-watching. People tested on average five times a month binge-watching. The average number of episodes watched during one binge-watching session is four.

The next stage of the research was conducting the path analysis. To make the presentation of the results clear, only the relevant paths are presented in **Figure 2**. The variables distribution is normal. Due to the amount of method used in the study which were described on various point scales, variables were standardized to perform the path analysis. The standardized β coefficients ranged from −1 to 1. The chi-squared

TABLE 1 | Descriptive statistics for the intensity of researched variables.

Variables	*n*	*M*	Me	Min	Max	*SD*
State anxiety	645	41.76	41.00	21.00	77.00	11.087
Trait anxiety	645	46.47	46.00	20.00	76.00	10.615
CDEL	645	42.23	41.00	19.00	74.00	11.228
STPA	645	28.18	26.00	15.00	60.00	9.825
GT	645	35.58	35.00	16.00	63.00	9.749
PSDI	645	20.85	20.00	10.00	40.00	5.716
S	645	40.84	41.00	21.00	58.00	6.812
ODSS	645	127.68	122.00	64.00	233.00	33.268
EM	645	34.63	35.00	9.00	45.00	7.308
MDWL	645	7.32	7.00	3.00	15.00	3.471
IM	645	12.04	11.00	5.00	25.00	4.546
MSFT	645	13.01	13.00	4.00	28.00	4.271
MS	645	5.14	5.00	2.00	10.00	2.550
EM	645	9.03	9.00	3.00	15.00	3.376
RE	645	17.33	16.00	8.00	48.00	7.380
L	645	5.23	4.00	3.00	15.00	2.568
LCND	645	17.90	17.00	7.00	37.00	6.647
NHC	645	11.17	10.00	5.00	27.00	4.067
P	645	11.49	11.00	4.00	24.00	3.772
NSC	645	5.17	4.00	3.00	18.00	2.645
GBW	645	68.28	66.00	30.00	157.00	21.75
Frequency of BW session in a month	645	5.26	3.00	1.00	30.00	5.48
The number of episodes in one BW session	645	4.18	4.00	2.00	20.00	2.01

CDEL, cognitive deficits and energy loss; STPA, suicidal thoughts, pessimism, and alienation; GT, guilt and tension; PSDI, psychosomatic symptoms and decline in interest; S, self-regulation; ODSS, overall depression severity score; EM, entertainment motivation; MDWL, motivation to deal with loneliness; IM, information motivation; MSFT, motivation to spend free time; ESM, escape motivation; RE, emotional reactions; L, lie; LCND, loss of control and neglect of duties; NCHC, negative health consequences; P, preoccupation; NSC, negative social consequences; GBW, general result of excessive binge-watching behavior; and BW, binge-watching.

coefficient (Chi = 17.84; $df = 72$, $p < 0.05$) indicates that there is no significant differences between research model and obtained results of the analysis. Furthermore, the rest of the obtained indicators of the goodness of fit test, such as GFI = 0.976, AGFI = 0.929, and CFI = 0.950, allow the conclusion that this model is well represented by the correlation matrix which will be based on the collected empirical data.

Based on the results presented above, it can be concluded that trait anxiety, cognitive deficits and energy loss, suicidal thoughts, pessimism, and alienation, and guilt and anxiety tension are the variables which load the anxiety-depressive syndrome most significantly.

The obtained results of the analysis show that the anxiety-depressive syndrome has a direct and significant effect on all variables that are symptoms of problematic binge-watching. Anxiety-depressive syndrome is the strongest predictor of such variables as: loss of control and neglect of duties ($\beta = 0.55$***), negative social consequences ($\beta = 0.53$***), emotional reactions ($\beta = 0.51$***), and negative health consequences ($\beta = 0.51$***). The β coefficient for the variable preoccupation ($\beta = 0.42$***) indicates that the predictive value of anxiety-depressive syndrome is medium. Furthermore, this syndrome has also medium predictive value for the variable lies ($\beta = 0.26$**). The greater the intensity of the depression-anxiety syndrome, the greater the intensity of the symptoms of excessive binge-watching will be. The obtained analysis did not show that the anxiety-depressive syndrome was a significant predictor of the frequency of binge-watching sessions per month or the number of episodes watched during one binge-watching session.

The anxiety-depressive syndrome also influences the motivation shown by an individual to watch TV series. The highest β values were recorded in the case of escape motivation ($\beta = 0.66$***). This will mean that the greater the intensity of the anxiety-depressive syndrome, the greater the escape motivation to watch TV series. The anxiety-depressive syndrome is also a significant and strong predictor of motivation to deal with loneliness ($\beta = 0.50$***) and medium for the motivation to spend free time ($\beta = 0.25$***). The anxiety-depressive syndrome has positive effect on the all abovementioned variables. This mean that the greater the intensity of the anxiety-depressive syndrome, the higher the intensity of motivation to deal with loneliness and spending free time displayed by the respondents. The analysis shows that there is no significant relation between anxiety-depressive syndrome and such motivations as entertainment, informative, and social motivation to watch TV series.

In addition, the analysis of the matrix of total effect showed that the motivation to watch TV series has a weak mediating effect on the relationship between anxiety-depressive syndrome, symptoms of problematic binge-watching, and the frequency of binge-watching sessions within 1 month. The direct impact of anxiety-depression syndrome is medium and strong (β ranged from 0.26** to 0.55***). The indirect influence of anxiety-depressive syndrome is weak. The obtained β coefficients ranged from −0.098* to 0.080*, and most of them had negative impact which leads to the assumption that mediating effect of motivation may reduce the influence of anxiety-depressive syndrome on the problematic binge-watching. Due to that, it can be assumed that some motivation can weaken the effect of anxiety-depressive syndrome on problematic binge-watching.

The results of path analysis show that motivation to deal with loneliness, motivation to spend free time, and escape motivation mediate between anxiety-depression syndrome and symptoms of problematic binge-watching. Motivation to deal with loneliness had weak indirect impact on the emotional reactions ($\beta = 0.12$*). Another variable indirectly influencing the symptoms of problematic binge-watching is escape motivation, which negatively affects preoccupation ($\beta = -0.17$**) and negative health consequences ($\beta = -0.13$*). A person with high anxiety-depressive syndrome while manifesting escape motivation when watching TV series may have lower preoccupation and lower health consequences, such as insomnia and eating unhealthy food. The last motivation that has an indirect effect on the problematic binge-watching is the motivation to spend free time, which has the least impact on the negative health consequences variable ($\beta = 0.09$*).

Although no significant direct effect of the anxiety-depressive syndrome on the frequency of binge-watching sessions during 1 month was observed, the results show that it has weak

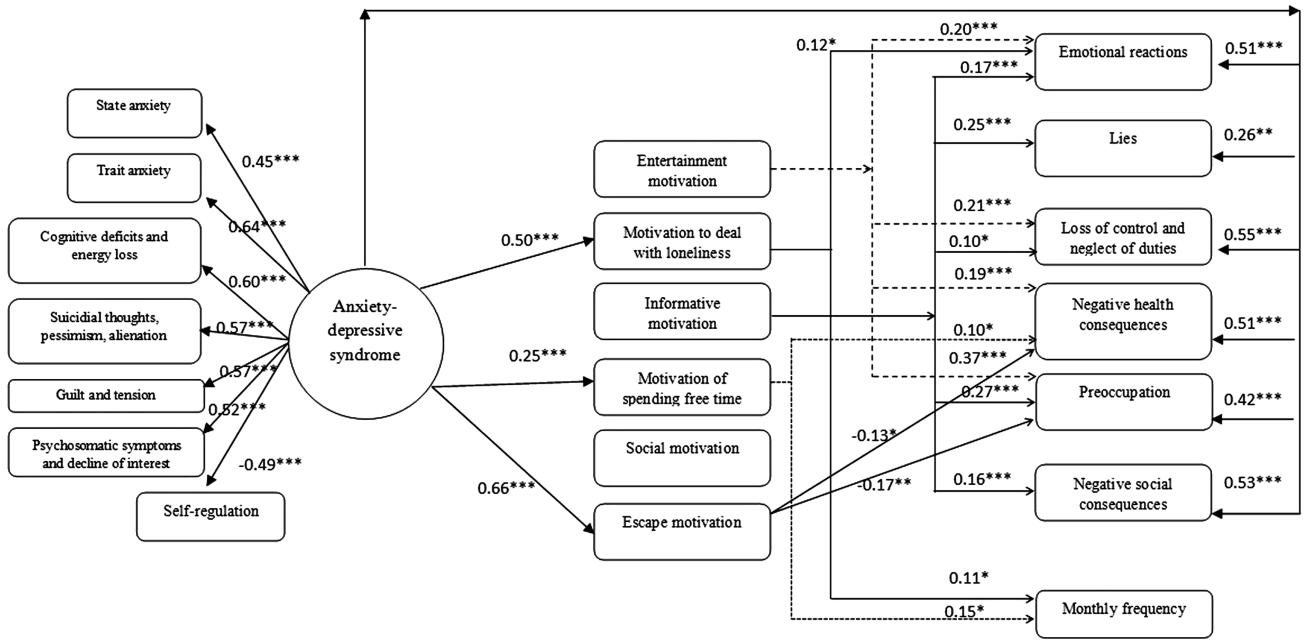

FIGURE 2 | Path analysis model. $^{*}p \leq 0.05$; $^{**}p \leq 0.01$; $^{***}p \leq 0.001$.

indirect impact through the motivation to spend free time (β = 0.15*) and motivation to deal with loneliness (β = 0.11*). This means that people with high levels of anxiety-depressive syndrome who watch TV series to cope with loneliness or do it out of habit tend to binge-watch more frequently.

The entertainment motivation significantly and directly influences such symptoms of problematic binge-watching as preoccupation (β = 0.37***), loss of control and neglect of duties (β = 0.21***), emotional reactions (β = 0.20***), and negative health consequences (β = 0.19***). This means that the more an individual is motivated by entertainment, the greater their cognitive and emotional preoccupation with a TV series binge-watching, and they experience a greater intensity of positive emotions when watching a series and negative emotions when binge-watching is not possible. In addition, people with entertainment motivation are more likely to lose control over the amount of time they spend watching TV series, which may result in neglecting their duties or their health. Another variable which has direct effect on symptoms of problematic binge-watching is informative motivation. The informative motivation has the medium impact on the preoccupation (β = 0.27***) and lies (β = 0.25***). The relationship between this motivation and such variables as emotional reactions (β = 0.17***), negative social consequences (β = 0.16***), and loss of control and neglect of duties (β = 0.10*) was significant but weak.

The results show that social motivation does not affect the symptoms of problematic binge-watching or the frequency of binge-watching sessions during the month.

Although the theoretical model takes into account the number of episodes watched during one binge-watching session, the obtained results show no impact of the anxiety-depressive syndrome or motivational variables on this variable.

DISCUSSION

The results of the analysis show that there is a significant direct impact of the anxiety-depressive syndrome on the symptoms of problematic binge-watching. It can therefore be concluded that the stronger the intensity of anxiety-depressive symptoms, the greater the intensity of symptoms of problematic binge-watching. The research therefore confirms the results obtained by Wheeler (2015), Ahmed (2017), and Sun and Chang (2021), which also highlighted the existence of a relationship between depression and excessive binge-watching behaviors. The anxiety-depressive syndrome was strong predictor of such symptoms of problematic binge-watching as emotional reactions, loss of control, and negative social and health consequences. Perhaps, people with a higher intensity of anxiety and depression more often treat binge-watching as a source of positive affect. Individuals can consume a large number of episodes of a TV series in order to receive positive gratification and to escape from the negative emotional state they are in (Panda and Pandey, 2017; Rubenking and Bracken, 2018; Flayelle et al., 2019a, b). Moreover, emotional distress in the situation of not being able to watch TV series may exacerbate their basically depressed mood, which may induce individuals to take actions aimed at changing this state. The use of substances or excessive forms of behavior to regulate affective states is characteristic of all addictions (Nikmanesh et al., 2014; Mascia et al., 2020). Research has shown that in the case of behavioral

addictions, the most common symptoms of abstinence are emotional tension, mood changes, the need for stimulation and craving, and Fear of missing out (FOMO) (Billieux et al., 2015; Anghelcev et al., 2020; Fernandez et al., 2020). Emotional reactions are also associated with distress when binge-watching is blocked. It is possible that in the case of compulsive viewing of series, similar symptoms of abstinence occur as in the case of other behavioral addictions. However, in order to confirm this relationship, further research on the problematic binge-watching is undoubtedly needed.

Additionally, research has shown that the anxiety-depressive syndrome is associated with a greater frequency of loss of control over binge-watching behaviors and neglect of duties. At this point, it is worth mentioning that problems with self-control and neglect of duties are characteristic of a low level of conscientiousness, which in turn is characteristic of individuals exhibiting excessive binge-watching behavior (Govaert, 2014; Chambliss et al., 2017; Tóth-Király et al., 2017; Anghelcev et al., 2020). An individual escapes from negative emotional states by watching TV series. This behaviour can be both a distraction and a source of the positive gratification. Consequently, the viewer can lose control over the amount of time spent on binge-watching, and as a result they can neglect their duties related to work, school, or home, which may lead to the release of further negative emotions. A vicious circle mechanism characteristic of addictions is created (Woronowicz, 2009; Grzegorzewska and Cierpiałkowska, 2018; Cierpiałkowska and Chodkiewicz, 2020). Furthermore, research by Panda and Pandey (2017) indicates that if an individual experiences guilt or fear after the end of a binge-watching session, they are more likely to quickly re-engage in binge-watching behaviors in order to temporarily avoid negative feelings. Researchers indicate that as a result of this phenomenon, individuals may become increasingly dependent on binge-watching. At this point, it should also be mentioned that the results of the research indicated that the anxiety-depressive syndrome is an important predictor for the manifestation of escape motivation – an individual watches series in order to escape from everyday problems and negative emotions. The literature on the subject describes research that emphasizes the importance of escape motivation for displaying excessive binge-watching behaviors (Panda and Pandey, 2017; Castro et al., 2019; Flayelle et al., 2019b; Ort et al., 2021). Interestingly, the results of the research showed no significant effect of the anxiety-depressive syndrome on the entertainment, social, and informative motivation. Perhaps, seeking entertainment is not significant for the people with anxiety-depressive syndrome. However, it is important to mention that the entertainment motivation has direct positive effect on the symptoms of problematic binge-watching. Research in the literature shows that the entertainment motivation is the most frequently indicated motivation among binge-watchers (Pittman and Sheehan, 2015; Panda and Pandey, 2017; Rubenking and Bracken, 2018; Castro et al., 2019; Flayelle et al., 2020; Starosta and Izydorczyk, 2020). People binge-watch because they want to relax and be entertained. Furthermore, it is important to mention that social motivation is the only type of motivation to watch TV series which have no effect on problematic binge-watching. The anxiety-depressive syndrome also had no predictive value for social motivation. The lack of interactions between those variables and significance of motivation to deal with loneliness could be explained by the occurrence of interpersonal problems characteristic for people with high intensity of anxiety and depression (Butcher et al., 2020). It can be assumed that creating parasocial relationships with fictional character may be easier and less threatening than engaging in real social interactions (Wheeler, 2015; Bernhold and Metzger, 2020).

The anxiety-depressive syndrome is a strong predictor of problematic binge-watching symptoms, such as negative health consequences, preoccupation, and negative social consequences. So far, not many studies have been carried out on the impact of binge-watching on the health of individuals, but few studies in the literature have shown that binge-watching is associated with worse sleep quality and unhealthy, and irregular diet (Exelmans and Van den Bulck, 2017; Vaterlaus et al., 2019; Anghelcev et al., 2020; Dixit et al., 2020). On the other hand, research indicates that individuals prefer to binge-watch alone so the quantity of time they spend watching TV series may affect their interpersonal relationships by further reducing the number of contacts with other people (Wheeler, 2015; Sun and Chang, 2021). At this point, it is worth mentioning that depressive and anxious people often feel lonely and often may not be motivated to keep in touch with other people (Butcher et al., 2020). The lack of energy necessary for social interactions combined with a simultaneous sense of social isolation explains such a strong positive relation between the anxiety-depressive syndrome and the motivation to cope with loneliness caused by watching TV series and the negative relation with social motivation. The characters of the series replace social connections so that individuals do not feel so lonely (Starosta et al., 2019; Bernhold and Metzger, 2020; Ort et al., 2021). The results gathered by Erickson et al. (2019) highlight that people who binge-watch more are characterized by creating stronger parasocial bonds with the characters of the series. Moreover, research by Rosaen and Dibble (2015) points out that the desire to belong and attachment anxiety are predictors of parasocial relation formation.

It should be mentioned that the research results presented an indirect influence of the motivation to deal with loneliness and spending free time on the frequency of sessions within 1 month. Perhaps, individuals with such motivations are characterized by a greater frequency of sessions undertaken, because they do it out of habit and boredom, or they treat the series as a companion when they feel lonely. The literature on the subject confirms the existence of such dependencies (Pittman and Sheehan, 2015; Flayelle et al., 2020). Research by Sung et al. (2018) indicates that people who watch series to "pass the time" more often show higher levels of binge-watching.

Interestingly, informative motivation has a direct impact on most of the problematic binge-watching symptoms, in addition to negative health consequences. Informative motivation is related to the desire to meet the cognitive needs of an individual by watching TV series. The greatest impact of informative motivation surfaces in case of preoccupation and emotional

reactions, which is understandable because this scale describes the emotional and cognitive involvement of an individual in binge-watching as well as looking for additional information about TV series. Perhaps, such a strong role of informative motivation is associated with FOMO – fear of missing out, the role of which for binge-watching behaviors is highlighted by Conlin et al. (2016) in their research. These authors assume that binge-watchers with high intensity of fear of missing out want to collect information that will enable them to participate in social discourse and prevent them from being ostracized in conversation with others (Conlin et al., 2016). However, research conducted by the authors of this article did not confirm the role of the social motivation mentioned by Conlin et al. (2016). Maybe problematic binge-watchers focus on cognitive and not on social aspects of this behavior. Interestingly, people who binge-watch more, the so-called "heavy binge-watchers," experience FOMO more frequently (Anghelcev et al., 2020). Another explanation for the role of informative motivation is the use of the immersive function of binge-watching as a behavior that strongly engages the cognitive and emotional processes of an individual, which may be associated with a sense of being lost in a fictional world (Conlin, 2015; Petersen, 2016; Walter, 2018, Erickson et al., 2019). It is worth mentioning that the informative motivation influences lying and, to a lesser but still significant extent, negative social consequences and emotional reactions. It is possible that an individual who desires cognitive impressions involved cognitively in binge-watching has a greater tendency to hide the truth about the amount of time spent on binge-watching.

Another interesting finding of this research is that motivation to watch TV series has weak mediating effect between the anxiety-depressive syndrome and the symptoms of problematic binge-watching. Anxiety depressive syndrome has significant and weak indirect effect through motivation to deal with loneliness, motivation to spend free time, escape motivation on symptoms of problematic binge-watching, and frequency of binge-watching sessions. The direct effects of independent variable were strong and medium. It seems that motivation can weaken the effects of anxiety-depressive syndrome. Due to the fact that motivation to watch TV series has also direct effect on the problematic binge-watching, it can be assumed that they may have more predictive than mediating value for explaining binge-watching. However, it requires further research.

Limitations of the Study

An unquestionable limitation of the study was applying the stratified sampling method of the research group. As a result, we are not able to generalize the collected results to the entire population. They mainly concern young people between the ages of 18 and 30. In the future, it will be necessary to conduct research on other age groups in order to check whether the discussed dependencies will also be characteristic of adolescents, middle-aged people, and seniors. Another limitation of the study was the predominance of women (n = 537) compared to men (n = 98). It is very likely that the underlying reason is conducting the study among students mainly of humanities, where more women than men study. According to the data of the Central Statistical Office (2019), (GUS, 2020) and the report of the Ministry of Education and Science (2020), Polish women not only study particular disciplines more often, but also more often decide to undertake higher education. The predominance of women in the research group could also be caused by the greater willingness of women to participate in the research (Smyth, 2008; Lobato et al., 2014). In addition, the results of systematic review show that women more often took part in research on binge-watching than men (Flayelle et al., 2020; Starosta and Izydorczyk, 2020). Perhaps, binge-watching itself is a more interesting research topic for women than for men, which is why they take part in research on this phenomenon more often. In the future, it will undoubtedly be valuable to conduct studies on a larger population of men in order to confirm the results obtained in the discussed study. Another research limitation was conducting it during the global COVID-19 pandemic, which undoubtedly influenced the emotional state of the subjects and their activities. As a result of the lockdown, the activity of the respondents was limited to tasks and entertainment undertaken at home. It is therefore possible that as a result of the lack of alternatives, people binge-watched more often than they would have done in other circumstances. Research by Dixit et al. (2020) has shown that people binge-watched more during the pandemic than before. The popularity of the given activity during the pandemic may also be proved by statistics, such as the subscribers increase of one of the streaming platforms. Netflix had 183 million subscribers worldwide in the first quarter of 2020, while that number went up to 204 million in the fourth quarter (Jay, 2021). The results of the study showed that the respondents were binge-watching out of boredom and because they felt lonely (Dixit et al., 2020). Binge-watching has become a way of coping with stress, which was supported by the high availability of streaming services and granting immediate gratification. The authors of the research indicate that resorting to binge-watching in situations of emotional distress may not disappear with the end of the pandemic, indicating the existence of a developing risk of behavioral addiction to binge-watching (Dixit et al., 2020; Kar et al., 2020). Due to the undoubted impact of the pandemic on the frequency of binge-watching and the motivation to watch TV series, it will be necessary to conduct comparative studies after the end of the pandemic in order to check whether the drawn conclusions are still valid in the post-pandemic situation.

Implications

Studies imply that binge-watching can be both entertaining and potentially addictive behavior (Flayelle et al., 2020; Starosta and Izydorczyk, 2020). This research shows that such personal factors as anxiety-depressive syndrome and specific motivations to watch TV series are important conditions of problematic binge-watching. Such factors may hinder the healthy and harmonious engagement in binge-watching. Moreover, it is important to mention that problematic binge-watching can also harmfully affect other health-related behaviors, such as healthy diet, sleep, and physical activity (Exelmans and Van den Bulck, 2017; Vaterlaus et al., 2019; Anghelcev et al., 2020; Dixit et al., 2020). Consequently, engaging

in problematic binge-watching may inhibit the healthy lifestyle changes. The occurrence of problematic binge-watching implies the need of creating some preventive and therapeutic interventions. However, health-related changes in relation of problematic binge-watching may encounter some obstacles. Firstly, binge-watching usually is not perceived as socially harmful behavior (Grzegorzewska and Cierpiałkowska, 2018; Ort et al., 2021). Secondly, the accessibility of new technologies and some structural factors of streaming platforms are made to keep viewer's engagement which can lead to loss of the control (Alter, 2017; Flayelle et al., 2020). Thirdly, there is still inconsistency in defining "normal" and problematic binge-watching (Flayelle et al., 2020; Starosta and Izydorczyk, 2020). Due to that, gaining further knowledge about psychological conditions of problematic binge-watching may be important for the future diagnostic, preventive, and therapeutic implementations.

Conclusion

In recent years, binge-watching has become one of the most popular forms of pastime among the young generation. Research shows that binge-watching can be both a typical hobby and a possible anti-health behavior, with some similarities to other behavioral disorders. Developing easily accessible streaming platforms and new ways of creating narrative of TV series changed the way people consume the media. Such factors and the individual psychological predispositions could change the harmless and entertaining way of spending free time, and contribute to the development of problematic viewing. The results of this study showed that the anxiety-depressive syndrome is a strong predictor of the problematic binge-watching symptoms. Thus, it influences the activities undertaken by an individual. In addition, anxiety-depressive syndrome is also a strong predictor of specific motivations to watch TV series. The anxiety-depressive syndrome correlates positively with the escape motivation, the motivation to deal with loneliness, and the motivation to spend free time. These motivations mediate between the anxiety-depressive syndrome, syndrome of problematic binge-watching, and frequency of binge-watching session during 1 month. Informative and entertainment motivations directly influence the symptoms of problematic binge-watching. There is no effect of social motivation on the symptoms of problematic binge-watching. Motivation to cope with loneliness and the motivation to spend free time indirectly influence the frequency of binge-watch sessions during 1 month. The research results contributed to the increase of knowledge about the psychological determinants of binge-watching. Excessive binge-watching behaviors can be used as an element of affective self-regulation and may also condition the functioning of an individual in society and carrying out one's duties. Nevertheless, further studies on various populations are necessary to confirm the obtained results. Further research on the phenomenon and delineation of the boundaries between healthy and harmonious binge-watching, and unhealthy-problematic binge-watching is important both in order to take possible preventive and therapeutic measures and to avoid excessive degeneration of everyday life.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Institute of Applied Psychology, Faculty of Management and Social Communication, Jagiellonian University, Cracow, Poland. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JS: research idea, research design, conceptualization, literature review, data collection, data interpretation, and draft manuscript. BI: research design, conceptualization, work supervision, and revision of work. AW: data collection and data interpretation. All authors contributed to the article and approved the submitted version.

FUNDING

This article was funded by a subsidy of the Faculty of Management and Social Communication dedicated to research activities.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

OPINION
published: 03 September 2021
doi: 10.3389/fpsyg.2021.711143

How to Shape Healthy Habits Within Pandemic-Related Constraints?

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Keywords: positive health behavior change, habit (automatism), psychological need frustration, COVID-19, pandemic constraints

INTRODUCTION

Incorporating healthy habits during the COVID-19 pandemic will help us to better survive this unusual time and may even stay with us for longer. Furthermore, new socialization, self-care, and exercise habits will continue to promote our health after the pandemic is over. While for many people the current situation is not very favorable, it is certainly quite new; as such, the environment is conducive to habit change (Duhigg, 2012; Ingram et al., 2020). It is up to each individual to decide whether or not to build healthier habits; however, in the context of the constraints imposed by the pandemic, most of us have had to significantly change our daily activities anyway (Maltagliati et al., 2021). An increasing number of people are seeking psychological help, and they link their reduced well-being directly to the pandemic imposing different ways of functioning than before. This reduced well-being is not surprising in specific crisis situations, such as job loss or health issues related to COVID-19. However, most people are simply uncomfortable with the long-term constraints of the pandemic. They find it difficult to organize their lives in the new conditions, including the ongoing satisfaction of their basic needs. This article explores the main areas of concern regarding the current constraints and lists ways to meet our most important psychological needs. The deprivation of these needs in periods longer than a few weeks is associated with negative consequences, and these consequences can already be observed.

In the first one and a half years of the pandemic, many published studies tackled the subject of the functional and psychological conditions of various groups affected by COVID-19 precautions. The most commonly reported symptoms were decreased sleep quality (Franceschini et al., 2020), changes in appetite (Shailaja et al., 2020), increased intake of alcohol and sleeping pills (Ingram et al., 2020; Pinkham et al., 2020), exacerbation of anxiety and depression symptoms, increased stress levels, and decreased well-being (Anyan et al., 2020; Shailaja et al., 2020; Paredes et al., 2021; Saddik et al., 2021). Many of these studies were conducted in the first few weeks of the lockdown, when the resources for coping with stress had not yet been depleted (de Zepetnek et al., 2021; Fernandez-Abascal and Martín-Díaz, 2021; Saddik et al., 2021). However, a study conducted on a large group of students in June and July of 2020 showed that, after several months of pandemic, the anxiety and depression indicators of the participants were almost twice as high as the corresponding values for the general population (Villani et al., 2021). Interestingly, people who were constantly coping with psychological conditions did not report any noticeable changes in symptoms related to mood shifts or even psychotic episodes from the period preceding the pandemic (Pinkham et al., 2020).

Psychological resilience is an important factor responsible for the reduction of the aforementioned effects of the COVID-19 pandemic (Anyan et al., 2020; Huffman et al., 2021; Kocjan et al., 2021; Paredes et al., 2021). Activities promoting health, concentrating on the formation of healthy habits such as physical activity, regular sleep patterns, or positive interactions

OPEN ACCESS

Edited by:
Aneta Pasternak, Warsaw Management University, Poland

Reviewed by:
Daria Biechowska, Institute of Psychiatry and Neurology (IPiN), Poland
Ewa Trzebińska, University of Social Sciences and Humanities, Poland

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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *18 May 2021*
Accepted: *06 August 2021*
Published: *03 September 2021*

Citation:
Dobrenko KA (2021) How to Shape Healthy Habits Within Pandemic-Related Constraints? Front. Psychol. 12:711143. doi: 10.3389/fpsyg.2021.711143

with other people, can facilitate an increase in psychological resilience (Matvienko-Sikar et al., 2020; Brog et al., 2021; Strahler et al., 2021). Thus, the focus of the article is on the formation of attitudes that promote healthy behaviors in circumstances that are less favorable than usual.

WHY ARE THESE NEW MODES OF FUNCTIONING DIFFICULT FOR MANY PEOPLE?

When the first lockdowns started in Europe in the spring of 2020, rapid and temporary adaptation to the new reality prevailed. Scientific journal databases already contained texts describing the negative consequences of pandemic-related constraints (Clemente-Suárez et al., 2020; Filipas et al., 2020; Franceschini et al., 2020; Gismero-González et al., 2020; Ingram et al., 2020; Shailaja et al., 2020).

As a psychotherapist, researcher, and psychologist supporting personality development, I wondered what might be helpful and accessible to those affected by the current situation. For about a year, I have been collecting ways to offset the negative consequences of the protracted pandemic. In this text, I share what tends to be difficult for the people I work with and what methods I have found helpful in coping with the constraints imposed by COVID-19. Most of the ideas listed here are easily accessible and relatively simple to implement independently.

Change as a Source of Stress

Let me start by recalling a simple principle of the psychology of stress: Every change is a source of stress, and the bigger the change, the higher the level of stress that accompanies it (Terelak, 2008; Clemente-Suárez et al., 2020). It should be added that for many, pandemic stress has already crossed the threshold into chronic stress. This stress, which has persisted long enough to put a significant strain on our coping resources, can lead to health problems (Terelak, 2008).

Knowing that there is more stress now than before the pandemic, additional ways of coping can be implemented, and methods that have worked well so far can be intensified. We should also remember to think positively, which already reduces our levels of stress (Fredrikson, 2011). Other useful practices for stress relief include simple and varied relaxation exercises (e.g., focusing on relaxing specific parts of the body), physical activity (e.g., regular walks), meditation (e.g., basic mindfulness), and other activities that can serve the relaxation state (e.g., reading or knitting).

Contact With Other People

We are social animals, as Aronson (2001) writes in the title of his book on social psychology. As a species, we are evolutionarily adapted to live in groups (Gazzaniga, 2011). According to Maslow's (Maslow, 2017) pyramid of needs, a person's social needs are just below their physiological and safety needs in terms of importance. This means that a person who is well-fed and well-rested and whose direct safety is not threatened needs socialization with other people to maintain a basic psychological balance.

A recent study found that the social support experienced by pregnant women during the pandemic was significantly lower than the support experienced by pregnant women before the pandemic (Matvienko-Sikar et al., 2020). This is an important observation, as the emotional state of a mother during pregnancy influences the development of the child in its fetal and neonatal periods (Schore, 1994; Grzegołowska-Klarkowska, 2018).

It is therefore advisable to at least look for substitute social supports. Telephone conversations with friends and virtual meetings in small groups are available options. We can also spend quality time with our family members or occasionally hang out with friends on a one-on-one basis. We should make sure that the time we spend together is productive. Conversations with others can be a good way of providing support in the current situation, as long as we avoid catastrophic themes—scaring each other (Terelak, 2008). These conversations should focus on sharing how to cope with the current circumstances, positive thinking, and humor.

Paradoxically, among members of a shared household, spending time apart can be a challenge. People differ in their needs to be alone; however, most people require some time for this kind of intimacy. Household members should avoid sharing the same room for 24 h a day, as this generates additional tension, especially in small spaces. Sometimes the need for solitude can be satisfied simply by going for a walk alone.

Need for Stimulation

Working from home can mean spending a lot of time in a much quieter environment than the office. However, your home environment can be much louder if you have children who by nature make a lot of noise. In either situation, it is worth considering how your current level of stimulation—sensory impressions coming to you from the outside—compares to the level you are accustomed to, and how it relates to your personal preferences (Terelak, 2008; Cyniak-Cieciura et al., 2016).

The optimal state of stimulation for productivity can be defined by growth motivation theory in the context of "flow" (Csikszentmihalyi, 2005). Flow is characterized by the performance of tasks in an effective way. The flow state is found between boredom (when the level of stimulation is too low) and overload (when the level of stimulation is too high) (Katahira et al., 2018; Yazidi et al., 2020). Csikszentmihalyi (2005) theory can be useful, as it contains practical skill building suggestions related to gaining and prolonging a flow state. Such skills are commonly used by athletes trying to perform at their best. Flow is also increasingly recognized as facilitator of mental work (Katahira et al., 2018).

Need for Activity

Due to remote work and the closure of leisure and entertainment facilities, many people have reduced their (already normally limited) physical activity (Maltagliati et al., 2021). In one study, about 50% of the respondents reported reduced physical activity, and only about 17% indicated an increase (Ingram et al., 2020).

Research findings suggest that there is a positive association between physical activity and psychological well-being (Filipas et al., 2020; Gismero-González et al., 2020; Ingram et al., 2020). Currently, the simplest and most available form of exercise is daily walking. It is also possible to exercise at home, supported by instructional workouts that can be easily found online.

Need for Rhythm

People are by nature more or less rhythmic in terms of their bedtimes, meal times, and other daily routines (Cyniak-Cieciura et al., 2016). Under normal circumstances, we have far more rigid time frames imposed on us from the outside. Normally, most of our lives run according to a fixed schedule; however, remote working is characterized by much greater flexibility. When working from home, it can be difficult to separate the professional and personal spheres of life. Nowadays, many people are working, dealing with day-to-day household chores, relaxing, and finding entertainment within the same environment. Therefore, when working remotely, it is advisable to control office hours and avoid extending them.

Small rituals can help separate your work life from your home life, especially if the two share the same space. For instance, when you finish work, it is advisable to rearrange your surroundings slightly. These few minutes spent organizing your workplace in the morning and tidying it up in the afternoon are habitual signals similar to going to or leaving the office under normal circumstances. The function of such signals can also be fulfilled by going for a walk after work or performing any other form of activity clearly different from your work activities.

HOW TO SHAPE HEALTHY HABITS?

Most of the things we do on a routine basis become automatic and habitual (de Houwer, 2019). Our brain looks for "shortcuts" in action patterns wherever possible. This saves energy for activities that cannot be done according to a well-worn pattern (Gazzaniga, 2013). Habits enable us to function efficiently. What we should know is that the automation process that underlies habit formation requires a lot of effort, but only for a short time—once a habit becomes automatic, it works on its own, with minimal effort from the subject (Jarymowicz and Ohme, 2002; Khaneman, 2011). Once trained, a habit can serve us for years if we find the time for it in our daily schedule.

We can distinguish two basic paths of habit formation. The first pathway is to change an existing habit into a new one that includes a routine we are interested in. The second pathway is to form a new habit where there was no existing custom. A third pathway, extinguishing a bad habit, should also be mentioned; it should be stressed that it is easier to swap an old habit for a new one than it is to extinguish an old habit entirely. By swapping a habit for a different one, we simply replace the routine when our minds are in a "what instead" mode. Here, I will focus on the first two paths mentioned, both of which can lead to the formation of healthy habits.

First of all, we need to consider the habits we want in our lives and whether they will actually serve us over a long period. This reflection is all the more important when considering that it is much easier to form a new habit than to get rid of it later. Secondly, developing a new habit must involve the emotional, cognitive, and physical spheres of motivation. It takes a lot of motivation to form a habit, and if we want something wholeheartedly, it is easier to strive toward (Jarymowicz, 2009; Jarymowicz and Szuster, 2017).

Our brain's process of habit formation constitutes a three-step loop of the components, cue, routine, and reward. A cue should be simple, clear, and unambiguous. A routine could be a habitual action that works to our advantage, e.g., an hour of physical activity, doing specific work tasks, household chores, or even creative work. The reward is usually the satisfaction of an important need (e.g., contact with other people, stimulation or activity). If a given action stimulates the reward system in our brain, there is good incentive to repeat the action in the future (Gazzaniga, 2013). This is why it is prudent to support the initial phase of habit training with additional external rewards that we find pleasant. However, external rewards should sporadic and in moderation so that they don't become an intrinsic part of the newly formed habit—the habit must provide gratification by itself.

Replacing an old habit with a new one may require careful self-observation and self-analysis to determine which important need was satisfied by the old habit and how it can be taken care of in the context of the new routine. While we are altering the routine, we can leave the old cue (e.g., the specific time or circumstance when the need appears), so that the way we satisfy the need becomes healthier (e.g., by eating something healthy instead of junk food). The reward (gratification) can also remain unchanged. If everything goes according to plan, the cue will be an effective signal to the brain as to which behavioral patterns it should trigger, and after the routine is completed, we will get the reward we need. The cycle will recur regularly. With time, the satisfaction resulting from the effects of the new habit will start to add to its total gratification (Duhigg, 2012).

We should often return to the question of why we want this habit in our life. It will remind us that the hardship of the present moment is part of a bigger plan, and this thought will stimulate self-motivation. The company of others is also helpful; being involved in a group that praises a particular habit or whose members already have it or want to work on building it together can be an additional, important source of motivation for us. In addition, we can support ourselves with modern technologies. There are more and more useful apps that work according to the habit formation process. These apps can remind us of our daily routine, give us praise for completing it, and monitor our progress.

DISCUSSION

The new circumstances in which many people are currently functioning due to the COVID-19 pandemic encourage the formation of new habits. This novel situation can be an opportunity to make small changes to the way we live our daily

lives. In this way, firstly, we can better cope with the restrictions, and secondly, we can take better care of our health in the long term. It is advisable to concentrate new habits around the needs that are currently inadequately met: contact with other people, stimulation, activity, and rhythm. Finally, it is important to add to, review, and intensify our daily methods of coping with stress so that we can have moments of relaxation every day.

Habit formation is a simple mechanism that is based on the process of automation. To use it for our purposes, we must find a simple, unambiguous cue that will trigger a habit. Next, we must develop a desired routine that can be habitually followed. After that, we should clearly define the reward. Once such a cycle becomes automatic, the habit can work to our long-term advantage with minimal effort.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

FUNDING

This study was supported by Maria Grzegorzewska University.

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frontiers in Psychology

ORIGINAL RESEARCH
published: 03 September 2021
doi: 10.3389/fpsyg.2021.706495

The Development and Validation of the Health Behavior Motivation Scale

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The article presents the construction and validation process of the *Health Behavior Motivation Scale* (HBMS), which measures the motivation toward pro-health behaviors in population of healthy adults. The tool is conceptually based on Self-Determination Theory (SDT) and more precisely on one of its subtheories—Organismic Integration Theory (OIT). In the first stage of the construction, the linguistic validation with competent judges procedure allowed to eliminate the items which were not correctly formulated. Next, the psychometric properties of the HBMS were assessed in three studies. In Study 1 (N = 323, M_{age}= 31), the factorial structure of the HBMS was assessed with CFA. Since the preliminary structure was rejected, in order to identify the dimensionality of the items, EFA and Horn's Parallel Analysis were performed. The results showed that the HBMS scale has 5–dimensional structure (intrinsic regulation, integrated and identified regulation, introjected regulation, external regulation and amotivation). In Study 2 (N = 342, M_{age}= 33), the structure of the HBMS has been confirmed by conducting CFA analysis. Analyses preformed in this study provided good evidence for convergent and discriminant validity as well as the internal reliability of the HBMS subscales. Finally, in the LPA analysis two classes with distinct regulatory profiles have been extracted, which showed differences in the extend of health-related behaviors. In Study 3 (N = 60, M_{age}= 30) the test–retest reliability of the HBMS was confirmed. The scale can be therefore successfully used in future basic and applied studies as it possesses robust psychometric properties.

Keywords: motivation toward health behaviors, self-determination theory, motivational continuum, regulatory styles, questionnaire

OPEN ACCESS

Edited by:
Giulia Fioravanti,
University of Florence, Italy

Reviewed by:
Maria Anna Donati,
University of Florence, Italy
Andrea Svicher,
University of Florence, Italy

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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *07 May 2021*
Accepted: *19 July 2021*
Published: *03 September 2021*

Citation:
Poraj-Weder M, Pasternak A and Szulawski M (2021) The Development and Validation of the Health Behavior Motivation Scale. Front. Psychol. 12:706495. doi: 10.3389/fpsyg.2021.706495

INTRODUCTION

For most people, health is probably one of the most important values in life. We wish others good health on numerous occasions, and if we were asked to say what we would wish for ourselves or our nearest, health again would probably be at the top of our list. Keeping good health is not only an important value, but also an important challenge in the modern world. Even though, people generally seem to value health, many strive to keep a balanced diet and do regular physical activity. As a consequence, a considerable number of the world population, including children and adolescents, is now overweight (Bray et al., 2017) with far-reaching consequences in terms of increased risk of chronic illness. Changing and keeping the healthy diet and exercising can have as powerful positive effect on health as the best medical interventions (Djoussé et al., 2009). For example,

it is assessed that over 80% of type 2 diabetes and circulatory system diseases and at least 40% of cancer can be avoided through changes in behavior (World Health Organization (WHO), 2005). Despite the fact that in modern developed countries the good health behaviors depend mainly on us, as we decide of what kind of grocery shopping we do, and whether we spend our time on jogging or surfing through the Internet, changing our behaviors is not an easy task. One of the factors associated with the successes and failures of health behavior change is the quality of our motivation, the topic which is described and developed by the research in paradigm of Self-Determination Theory (SDT; Deci and Ryan, 2000; Vansteenkiste et al., 2009; Ryan and Deci, 2017). The aim of this research project was to create and validate a *Health Behavior Motivation Scale* (HBMS) which measures various forms of motivational regulation to undertake pro-health behaviors in the paradigm of SDT. According to SDT, and more precisely one of its subtheories—Organismic Integration Theory (OIT; Ryan and Deci, 2017)—there are six different types of motivational regulation, which vary in their antecedents, the degree of perceived autonomy, and effects on behavior. The motivational regulation styles could be represented in a form of continuum (see **Figure 1**), which represents the model of internalization and integration. The continuum starts with originally transmitted forms of external regulation and finishes with regulation fully integrated with one's values and personality, which at the same time, is full autonomous. Each type of regulation corresponds with the reason why one decides do behave in particular way. The first category, called amotivation is a state when one finds no meaning, value or eagerness to act in particular way mainly because they believe will not succeed in it (Ryan and Deci, 2017). An example of amotivation toward jogging is when one does not find it enjoyable, does not want to get fit, slim or healthy because one thinks that he or she will not succeed in jogging. Next, come the four types of extrinsic regulation, first of which is called external regulation. A behavior is regulated externally when a separable consequence—a reward, punishment or other outside pressure are its main reasons. This type of regulation is connected with external perceived locus of causality and perceiving the results of behavior as not dependent on one's actions. An adolescent who eats healthy food for additional pocket money from his parents or a person who exercises mainly to satisfy the expectations of his or hers personal trainer are examples of externally regulated pro-health behaviors.

Another type of extrinsic motivation is introjected regulation, which is a process of behavior regulation through internally demanding or pressuring force, a sense of I "must" or "should" do something. Introjected regulation is connected with feelings of anxiety and self-disparagement but can also be connected with self-pride and satisfaction. A situation when a person who feels that he or she has to go to the gym to exercise and feels wrong and ashamed if he or she didn't, may serve as an example of introjection. This type of motivation is also connected with external perceived locus of causality. Subsequent type of extrinsic motivation is identified regulation, which is associated with more

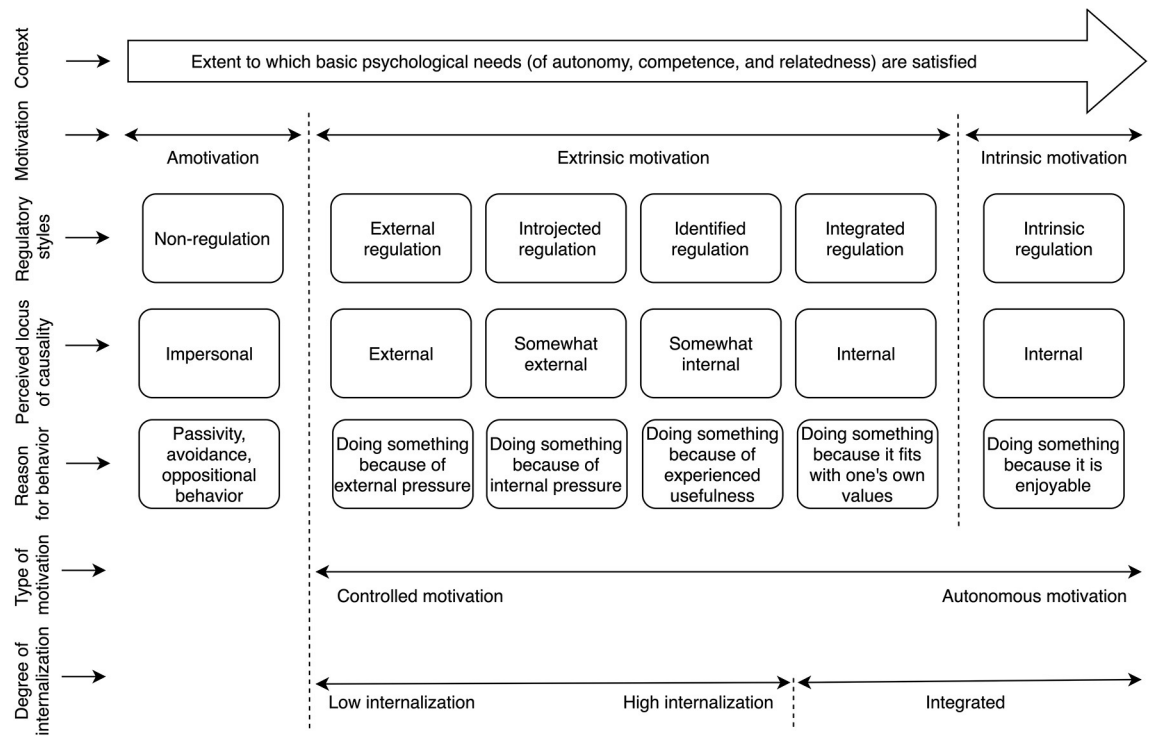

FIGURE 1 | Schematic representation of Organismic Integration Theory. Source: Poraj-Weder et al. (2021).

autonomic behaviors and internal perceived locus of control. The person regulated through identification accepts values and standards connected with the behavior and perceives them as important. Still, the behavior is a means to some goal. An example may be eating healthier food in order to reduce weight or exercise in order to look prettier. The last, and the most autonomic form of extrinsic motivation according to SDT is integrated regulation, when the pro-health activity is not only personally important and valued (as it was the case with identified regulation), but it is also a natural consequence of one's identity and system of values. For example, when one perceives him/herself as a sports person then doing sports is a natural thing to do, it's an "idea for life" which belongs to the value system. This regulation, however, is still considered external as the behavior serves achieving some external goal—creating or confirming one's identity. The sixth, and last form of regulation distinguished is the intrinsic regulation, which is a separate category of the continuum. The intrinsically motivated pro-health behavior is fun and enjoyable for its own sake, the activity is treated as play, an opportunity to discover, and expand one's competencies and capacities. In other words, intrinsic motivation, in its purest sense, means "to play or explore an activity because it's itself is interesting" (Ryan and Deci, 2017, p. 123). Playing football for fun and pure enjoyment of the game might be an example of intrinsically motivated behavior. The OIT theory assumes that the more autonomously regulated the health behavior is, the greater effort, engagement, persistence, and stability that individual is likely to evidence in that behavior (Ryan and Deci, 2017). Consequently, in order to promote more stable and persistent change (or implementation) of particular type of behavior we need a proper understanding of the mechanisms which lie underneath.

The Reasons Behind the HBMS Scale Construction

The reason behind the construction of the HBMS is the need of a measurement tool that considers motivation toward pro-health behaviors in a qualitative way and takes into consideration different styles of regulation. When developing the HBMS we referred to a category of health behaviors understood as "any activity undertaken by a person believing himself to be healthy, for the purpose of preventing disease or detecting it in an asymptomatic stage" (Kasl and Cobb, 1966, p. 531). Specifically, we concentrated on narrow category of pro-health behaviors (Conner and Norman, 1996; Sęk, 2005) composed of personal routine daily health activities, named health practices (Harris and Guten, 1979). A conceptual framework of the HBMS was also based on the SDT (Ryan and Deci, 2000, 2017) and in particular on one of its subtheories—OIT (Deci and Ryan, 2000; Vansteenkiste et al., 2009; Ryan and Deci, 2017). The HBMS was thought as an operationalization of Ryan and Deci's concept of six different types of motivational regulation. These different forms of motivational regulation are conceptualized as lying along a continuum from non-autonomous to wholly autonomous forms of behavioral regulation. For the recent 30 years, this theory has been an important research area in the field of optimal human functioning in various social situations (Levesque et al., 2007; Pittman and Zeigler, 2007; Shah and Gardner, 2008; Vallerand et al., 2008; Chrupała-Pniak and Grabowski, 2016). Nevertheless, undertaking pro-health behaviors is still an insufficiently explored issue in the context of human motivation. Poland also lacks diagnostic tools that would allow for the measurement of this theoretical construct in a health-related context. The only tools, which are currently available, measure motivation toward different then health activities, such as work (Bańka, 2005; Wojdyło and Retowski, 2012; Chrupała-Pniak and Grabowski, 2016) or study (Gózdz, 2015). The construction of the HBMS seems to fill this gap. Currently, the only questionnaire that allows to diagnose the qualitative facets of motivation (according to SDT) is the *Treatment Self-Regulation Questionnaire* (TSRQ) (Ryan and Connell, 1989; Levesque et al., 2007). The TSRQ is a tool that measures pro-health behaviors in four different contexts—quitting smoking, reducing of alcohol use, changing eating habits, and changing physical exercise patterns (Levesque et al., 2007). The tool, although widely used, has some limitations. The questionnaire is limited to only one of the four contexts of pro-health behavior and may selectively diagnose only three of the six regulative styles (amotivation, external regulation and introjected regulation) and one broader motivational composite which is autonomous motivation. Although, according to Vallerand (1997) and Vallerand and Ratelle (2002) autonomous motivation includes three regulatory styles (identified, integrated and intrinsic regulation), the TSRQ lacks items operationalizing the third one (intrinsic regulation). The tool has also varied number of items for each of the subscales and in two subscales, the number of items is too low: 3 items for amotivation subscale and 2 items for introjected regulation subscale, respectively. According to the methodological literature (Zawadzki, 2006; Brzeziński, 2007) low number of items in a scale may reduce the reliability of the tool.

The project of creating and validating of the HBMS was designed to address the limitations of the TSRQ. When developing the HBMS, we aimed to make it a valuable alternative to the TSRQ. The new questionnaire was supposed to capture all the six regulatory styles described within motivational continuum in a more generic health context. Such a scale could be used for both scientific and practical purposes, providing healthcare professionals with helpful tool for planning health promotion interventions with their patients or clients.

RESEARCH PROBLEM AND HYPOTHESES

The main goal of this study was to construct and validate the *Health Behavior Motivation Scale* (HBMS) for assessing the motivation toward pro-health behaviors in population of healthy adults. For this purpose, three studies were conducted. Study 1 served to identify the factor structure of the HBMS. In Study 2 we aimed to verify the factor structure developed in Study 1 and assess the HBMS psychometric properties (discriminant and convergent validity and the internal reliability). Study 2 also served to corroborate if in the given population it is possible to sub-groups, that would differ significantly in terms of their

regulatory profile. We also wanted to determine whether there is a relationship between the extracted HBMS profiles and health-related behaviors. Finally, in Study 3 we aimed to assess the test–retest reliability of the HBMS.

In terms of structural validity, we assumed that the factor structure of the HBMS would correspond with the OIT taxonomy of regulatory styles (Ryan and Deci, 2000, 2017) (H1). Based on the Ryan and Connell (1989) and Deci and Ryan (2000) we expected that latent variables representing individual components of the regulatory styles will be correlated with each other. We also anticipated that dimensions, representing the regulatory styles, that are closer together along the continuum will be more highly correlated than those theorized to be more distant (Ryan and Connell, 1989) (H2).

In terms of convergent and discriminant validity, four hypotheses were formulated: we expected that the HBMS subscales would be correlated with the selected subscales of the *Aspiration Index* (Kasser and Ryan, 1993, 1996), the *Promotion and Prevention Self-Regulation Scale* (Kolańczyk et al., 2013), the *Sociocultural Attitudes Toward Appearance* (Schaefer et al., 2015) and the *Multidimensional Body-Self Relations Questionnaire* (Cash, 2000). Specifically, we expected that intrinsic aspirations and health aspirations will be positively correlated with autonomous forms of motivational regulation (e.g., intrinsic or identified and integrated regulation), and negatively correlated with controlled forms of motivational regulation (e.g., external regulation) (Kasser and Ryan, 1996; Piko and Keresztes, 2006) (H3). With respect to the regulatory focus (Higgins, 1998), we expected that promotion focus will be associated with autonomous forms of motivational regulation and negatively with controlled forms of motivational regulation and amotivation. Prevention focus, on the other hand, should be related to controlled forms of regulation, especially introjected regulation. Motivation strength was expected to be negatively related to amotivation, and positively related to autonomous forms of motivational regulation (Deci and Ryan, 2000) (H4). Based on SDT theory and literature reports (De Charms, 1968; Nicholls, 1984; Williams et al., 1996; Deci and Ryan, 2000; Chrupała-Pniak and Grabowski, 2016; Raposo et al., 2020) we expected that different types of ideal appearance pressures exerted by family, media and peers will be positively correlated with controlled forms of motivational regulation (external regulation, introjected) and amotivation (H5) Based on literature reports (Williams et al., 1998; Levesque et al., 2007; Vallerand et al., 2008; Juczyński, 2012), we also expected that the positive evaluation of fitness and health, as well as orientation to these aspects of the physical self in the MBRSQ will be positively correlated with the autonomous forms of motivational regulation (intrinsic, integrated and identified regulation) and negatively with external regulation and amotivation. Moreover, positive associations were expected between health and fitness orientation and introjected regulation (Williams et al., 1998; Levesque et al., 2007) (H6). Finally, we expected that sub-groups extracted in the LPA with lower levels of autonomous forms of motivational regulation would declare lower levels of healthy eating habits, preventive health behaviors and health practices as well as less positive mental attitude toward health measured by the *Health Behavior Inventory* (Juczyński, 2012) when compared to the sub-groups with higher levels of autonomous forms of motivational regulation (H7).

Construction of the HBMS Questionnaire

The HBMS scale development was based on recommended, theoretical procedure of diagnostic measures construction (Deci and Ryan, 1985; Magnusson, 1991; Deci et al., 1994; Ryan and Deci, 2000; Zawadzki, 2006; Brzeziński, 2007; Hornowska, 2007). Seventy test items included in six scales (which constituted the operationalization of six regulatory styles) were generated based on analyzing the conceptual assumptions of SDT theory (Deci and Ryan, 1985; Deci et al., 1994; Ryan and Deci, 2000). This stage of the tool's construction process was carried out with the participation of two psychologists specializing in issues of health psychology and research on motivation based on SDT.

In the next step, the generated items were subjected to linguistic and content analyses (Hornowska, 2007). The linguistic assessment was carried out by a team of three psychologists and two Polish philologists. All the items were checked in terms of their vocabularies' degree of comprehensibility, grammatical correctness as well as length and complexity (Hornowska, 2007). Nine items that were assessed as incomprehensible or too lengthy were eliminated. The version of the HBMS, reduced to 61 items, was subjected to further content analysis aimed at determining its compliance with the theoretical construct. The analysis was conducted by a group of competent judges, consisting of three psychologists specializing in research on motivation in terms of SDT and having psychological practice in motivating people in the professional environment. The team included a certified sports psychologist of the Polish Psychological Association, a member of the Polish Olympic Committee and the Central Center of Sports Medicine. Each judge was given the definition of the six regulatory styles (presented in the theoretical introduction to the manuscript). The judges were then asked to allocate each of the 61 initial test items to one of the six regulatory styles. Kendall's W coefficient was used as a measure of the judge's score compliance. On the basis of the feedback provided by the judges, the number of items was reduced to 52. Ambiguous items, difficult to assign to one specific dimension were eliminated. The coefficient's value, $W = 0.94$, $\chi^2_{(51)} = 143{,}72$, $p < 0.001$, proved a high degree of agreement between the judges' assessment and did not provide grounds for further reducing the scale. Consequently, 52 statements were found in the HBMS' first version. At the end of this stage, the questionnaire's administrative issues were established. These included authoring an author's note and its name, clarifying the instructions contained in it, and determining the format of responses and the order of items in the questionnaire. All items contained in HBMS were given the nature of closed statements with the possibility of providing one of five categories of answers: 0–*this statement does not suit me at all*, 1–*this statement suits me very poorly*, 2–*this statement suits me poorly, 3–this statement suits me on average*, 4–*this statement suits me well*, 5–*this statement suits me very well, 6 –undecided*. The last category of answers (6–*undecided*) at the analysis stage was treated as missing data. Such prepared scale was used in three

studies in order to assess its psychometric properties: validity and reliability.

STUDY 1

The aim of Study 1 was to investigate structural validity and internal consistency of the HBMS.

Procedure and Participants

The research project was conducted on 734 healthy adults (without any chronic illnesses) recruited from a non-clinical population. Three samples were tested, Study 1 ($N = 332$), Study 2 ($N = 342$) and Study 3 ($N = 60$). The sample sizes in Studies 2 and 3 were determined in accordance with the recommendations formulated by Mundfrom et al. (2009) regarding the minimum required to perform factor analyses.

A purposive sampling approach was used in the study (Brzeziński, 2006). Inclusion criteria encompassed being 18 years of age or older, no history or presence of chronic medical. Available people—volunteers meeting the above criteria—participated in the study. There was no remuneration for participation.

Data was collected from November 2020 to February 2021. The participants of the study were recruited among university students and employees of various workplaces, enterprises and companies throughout Poland. All three studies were conducted individually, using the paper-and-pencil method, in the presence of a researcher. The project was conducted in accordance with the recommendations of the Code of Ethics for the Psychologist of the Polish Psychological Society (Polish Psychological Association [PTP], 1992). The protocol of this study was accepted by the ethics committee of the Maria Grzegorzewska University. All participants provided informed consent.

Information on the sample structure is presented in **Table 1**. Apart from the sociodemographic variables, the description of the sample (in Studies 1, 2, and 3) also includes variables describing the subjective assessment of health status and the degree of implementation of pro-health behaviors and their regularity.

Measures

Participants completed the HBMS questionnaire and the sociodemographic survey, containing questions about the health assessment and implementation of the pro-health behaviors.

Statistical Analyses

The analyzes used in Study 1 are presented in **Figure 2**. Statistical analyses were performed using IBM SPSS Statistics 26 software (IBM Corporation, 2019) and AMOS 26.0 software (Arbuckle, 2019).

Structural Validity and Internal Reliability

In order to verify the factorial structure of the 52-item version of the HBMS confirmatory factor analysis (CFA) based on the likelihood method was conducted. To determine the adequacy of the model fit, two criteria were used: RMSEA (*root mean of square error of approximation*) and CFI (*comparative fit index*). The first criterium is a measure of model-to-data mismatch (Byrne, 2010). The second one is used to assess the quality of the model's fit by comparing it with the variance-covariance matrix (Byrne, 2010). In publications devoted to structural modeling, it is assumed that the RMSEA value should be as close to zero as possible (Byrne, 2010), whereas CFI index should have values above 0.95 (Hu and Bentler, 1999, as cited in Byrne, 2010). However, the preliminary structure did not yield adequate fit. The values of fit indices were equal to $CFI = 0.84$, $RMSEA = 0.08$. Therefore, the preliminary structure was rejected, and exploratory factor analysis (EFA) was performed. The values of factor loadings acquired in the CFA are presented in **Supplementary Table 1A**.

In the next step, in order to verify identify the dimensionality of the items, the EFA was performed, using a Principal

TABLE 1 | Summary of the characteristics of the tested samples, Study 1–3.

	Study 1	Study 2	Study 3
Sample size	332	342	60
Gender			
Female	206 (62%)	179 (52.3%)	24 (40%)
Male	126 (38%)	163 (47.7%)	36 (60%)
Age in years ($M \pm SD$)	31.49 ± 12,32	33.29 ± 10.07	29.80 ± 5.01
Education			
Elementary	21 (6.3%)	10 (2.9%)	4 (6.7%)
Vocational	21 (6.3%)	23 (6.7%)	1 (1.7%)
Secondary	158 (47.6%)	135 (39.5%)	22 (36.7)
Higher education	132 (39.8%)	174 (50.9%)	33 (55%)
Place of residence			
Village or small town up to 20 thousand residents	93 (28%)	53 (15.5%)	4 (6.7%)
City 21–100 thousand residents	44 (13.3%)	41 (12%)	5 (8.3%)
City 101–500 thousand residents	35 (10.5%)	45 (13.2%)	6 (10%)
City over 500 thousand residents	160 (48.2%)	203 (59.4%)	45 (75%)

Type of validation process	Linguistic and psychometric validation	Psychometric validation		
Type of psychometric properties	Content validity	Structural validity, Internal consistency reliability	Structural, convergent and discriminant validity, Internal consistency reliability	Test-retest reliability
Type of analysis	Qualitative analysis, Kendall's concordance coefficient W	Confirmatory factor analysis (CFA), Exploratory factor analysis (EFA), Horn's parallel analysis, Cronbach's alfa and McDonald's omega coefficients	Confirmatory factor analysis (CFA), Spearman's and Pearson's correlation coefficients, Cronbach's alpha and McDonald's omega coefficients	Intraclass correlation coefficient (ICC)
Stage of analysis	The stage of constructing HBMS	Study 1	Study 2	Study 3

FIGURE 2 | HBMS validation procedure.

TABLE 2 | Eigenvalues of EFA and random data - parallel analysis using the Horn's method, Study 1.

Component	Eigenvalues (EFA)	Eigenvalues generated from random data (Horn's parallel analysis)
1	19.06	1.86
2	10.28	1.78
3	3.62	1.72
4	2.31	1.66
5	1.49	1.61
6	1.10	1.56

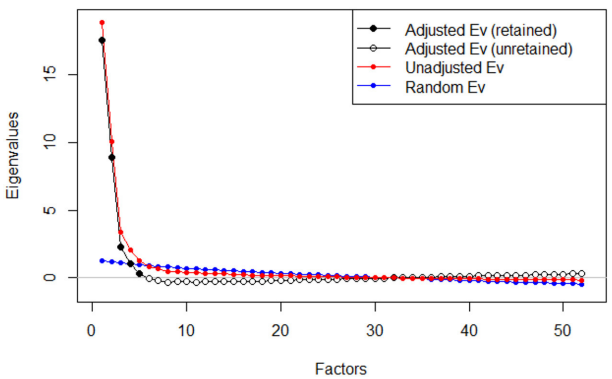

FIGURE 3 | Plot for Horn's Parallel Analysis.

Component Analysis (PCA) with Oblimin rotation and Kaiser normalization. This rotation was selected because of the assumed possibility of factor correlations (Tabachnick and Fidel, 2007). Components were identified based on sedimentation (scree plot) graphs (Izquierdo et al., 2014).

The measures of the sample selection's adequacy were satisfactory. Bartlett's Test of Sphericity was significant (χ^2 = 12,381.40, df = 1,326, $p < 0.001$), and the KMO measure of sampling adequacy was 0.94. The obtained results indicate a good fit of the model to the data and constitute the basis for the use of EFA in assessing relationships between observable variables (Field, 2005). The analysis showed six main components with an eigenvalue above one, explaining a total of 72.55% of the variance. However, due to the shape of the scree plot, clearly showing five components, Horn's parallel analysis was executed. "The method compares the eigenvalues generated from the data matrix to the eigenvalues generated from a Monte-Carlo simulated matrix created from random data of the same size" (Allen, 2017, p. 518). In Horn's Parallel Analysis, the eigenvalues of the EFA should be higher than those obtained from the parallel analysis (Horn, 1965). The eigenvalue of the fifth factor in the actual data (EFA) is 1.49 and it's <1.61 in the simulative data of Parallel Analysis. In that case, the factor five should be considered as the point at which Parallel Analysis introduces a decision about the number of factors. The results of our analyzes are presented in **Table 2** and illustrated in the **Figure 3**.

As a result of the conducted analyzes, the 5-factor solution was finally adopted. The results of Bartlett's Test of Sphericity and the KMO measure were: χ^2 = 12,381.40, df = 1,326, $p < 0.001$; 0.94, respectively. After the rotation, the first factor explained 36.67% of the variance, and the next ones were: 19.51, 6.95, 4.46, and 2.84%. The five factors derived from the EFA account for 70.44% of the common variance. In the next step, within each dimension, six items with the highest factor loadings were selected. Thus, the final version, consisting of 30 test items was obtained.

In the next analysis, the internal structure of the final version of the scale, composed of 30 statements, was examined.

Again, the five-component EFA was used, performed using the principal component method, with Oblimin rotation and Kaiser normalization. Bartlett's Test of Sphericity was significant ($\chi^2 = 6{,}765.51$, $df = 435$, $p < 0.001$) and the sampling adequacy measure was high (KMO = 0.92) (Field, 2005). The total variance explained by the model was 75.72% (Factor 1: 31.02%, Factor 2: 25.08%, Factor 3: 9.39%, Factor 4: 6.26%, and Factor 5: 3.96%). **Table 3** lists the factor loadings of the five factors extracted in the final solution.

Next, Cronbach's alpha (α) and McDonald's omega (ω) were used to assess the internal consistency of each factor. The values of Cronbach's alpha ranged 0.91–0.94, and McDonald's omega 0.83–0.94. The results indicate high reliability of the five dimensions of the HBMS (**Table 3**).

Discussion

Based on our analyses, we can conclude that the HBMS is a structurally valid and reliable tool.

TABLE 3 | Factor loadings in EFA for 30-item Health Behavior Motivation Scale (HBMS), Study 1.

HBMS dimensions	Factor 1	Factor 1	Factor 3	Factor 4	Factor 5
Intrinsic regulation					
α = 0.95, 95% CI (0.93; 0.96); ω = 0.95, 95% CI (0.93; 0.96)					
49_Because it makes me happy	0.91				
45_ Because it gives me vitality	0.90				
40_ Because it gives me vigor	0.89				
54_Because it gives me pleasure	0.84				
59_Because it's a lot of fun	0.81				
27_Because it drives me to act	0.77				
Identified and integrated regulation					
α = 0.90, 95% CI (0.88; 0.92); ω = 0.90, 95% CI (0.88; 0.92)					
9_Because I treat it as an important and ongoing task to undertake					0.86*
8_Because it's my life plan					0.83*
23_Because it is my current life choice					0.75*
15_Because it is an essential part of my life					0.73*
16_Because the "here and now" is important for me					0.72*
36_Because it is congruent with my currently set life goals					0.70*
Introjected regulation					
α = 0.91, 95% CI (0.90; 0.93); ω = 0.92, 95% CI (0.90; 0.93)					
37_Because whenever I neglect my health I feel guilty			0.91*		
46_Because I feel remorse when I neglect my health			0.91*		
42_Because I feel remorse when my health becomes less of a priority			0.84*		
30_Because I feel guilty when I stop taking care of my health			0.75*		
10_Because I feel remorse if I don't take care of my health			0.74*		
24_Because if I don't take care of my health I feel like I'm acting wrong			0.58*		
External regulation					
α = 0.93, 95% CI (0.91; 0.94); ω = 0.93, 95% CI (0.91; 0.94)					
5_Because others expect me to take care of my health				0.86*	
31_Because I want to meet others' expectations				0.85*	
25_Because I want to make others happy				0.82*	
18_Because I don't want to disappoint people around me				0.79*	
20_Because I feel pressure from my social environment				0.78*	
61_ Because I don't want others to nitpick my actions				0.77*	
Amotivation					
α = 0.93, 95% CI (0.91; 0.96); ω = 0.93, 95% CI (0.91; 0.95)					
26_I don't do it because it causes me to feel lost		0.89			
32_ I don't do it because a feeling of helplessness arises in me		0.87			
39_I don't do it because I could fail again		0.86			
58_I don't do it because I feel like I can't		0.84			
19_I don't do it because it's beyond me		0.84			
48_ I don't do it because I don't have energy		0.80			

Reversed scale.

Both, CFA and EFA with Horn's Parallel Analysis, resulted in emergence of five-factor model corresponding with the motivational continuum by Ryan and Deci (2000, 2017). The following factors were extracted: intrinsic regulation, integrated and identified regulation, introjected regulation, external regulation and amotivation. Although, the model corresponds to the theoretical OIT taxonomy of regulatory styles, the number of factors is reduced, therefore H1 was only partially confirmed. In our analysis, identified regulation and integrated regulation, which are originally distinct, constitute one dimension.

Similar difficulties encountered the authors of the TSRQ (Levesque et al., 2007). In their validation studies (Levesque et al., 2007) intrinsic, identified and integrated regulation formed one dimension (autonomous regulation). Explanations that help to understand these results can be found in the characteristics of the integration dimension and the difficulties with its operationalization, as pointed out by other researchers (Vallerand, 1997; Meyer and Gagne, 2008; Chrupała-Pniak and Grabowski, 2016). The combining the dimension of identified and integrated regulation into one general composite has its justification in the subject's literature (Deci and Ryan, 2000, 2008). Both dimensions still belong to external motivation, but already autonomously regulated. The difference between them essentially comes down to the fact that in the case of identified regulation, individuals identify themselves with a set of values and meanings, accepting them as their own, while in the case of integrated regulation a given value or meaning falls within the scope of one's identity (Deci and Ryan, 2000).

STUDY 2

The aim of Study 2 was to verify the factor structure developed during EFA and Horn's Parallel Analys is in Study 1 and assess the HBMS psychometric properties (discriminant and convergent validity and the internal reliability).

Procedure and Participants

The sample in Study 2 was comprised of 342 healthy adults. The detailed description of the sample structure is presented in **Table 1**.

Measures

Participants completed a set of six questionnaires and the demographic survey.

Aspiration Index

Aspiration Index (AI-23) is grounded in SDT and measures the content of life goals. It was created by Kasser and Ryan (1993, 1996) and adapted to Polish by Górnik-Durose et al. (2018). The AI-23 contains 23 items and seven specific subscales, which make up three categories of goals: intrinsic, extrinsic and self-transcendent. Respondents assess the importance of 23 goals on a five-point scale, ranging from 1–*not at all important* to 5–*very important*. A higher total score on each scale indicates a higher importance of certain goal category. AI-23 has satisfactory psychometric parameters (Górnik-Durose et al., 2018). In the present study, the reliability measured by Cronbach's α coefficient varied between 0.69 and 0.82. In our analyses, we referred to the intrinsic aspirations of meaningful relationships, personal growth, and community contributions, as well as aspiration of good health.

Promotion and Prevention Self-Regulation Scale

Promotion and Prevention Self-Regulation Scale (PPSS) (Kolańczyk et al., 2013) is a measure of promotion and prevention regulatory focus. The tool is based on Higgins (1987) theory, as well as on the results of the studies on emotionality of people differing in dispositional regulatory focus. It contains 27 items within three subscales: promotion, prevention and strength of motivation. Respondents assess each item on five-point scale, ranging from 1–*strongly disagree* to 5–*strongly agree*. The tool has satisfactory psychometric parameters (Kolańczyk et al., 2013). In our study Cronbach's α coefficient ranged from 0.76 (strength of motivation) to 0.82 (promotion focus).

Multidimensional Body-Self Relations Questionnaire

Multidimensional Body-Self Relations Questionnaire (MBSRQ) (Cash, 2000) is a well-validated measure of body-image attitudes. It was created by Cash (2000) and adapted by Schier, Rzeszutek, Topór, Matkowska and Pasternak (Pasternak, 2018). The tool contains 69 items and ten subscales, describing different aspects of the attitude to the body image including evaluative, cognitive and behavioral components. In the present study four subscales were used: the fitness and health evaluation subscale and the fitness and health orientation subscale. High scorers consider themselves as physically fit, healthy and try to lead a healthy lifestyle. Respondents assess each item on five-point scale, ranging from 1–*definitely disagree* to 5–*definitely agree*. The MBRSQ has satisfactory psychometric parameters (Cash, 2000). In our study, Cronbach's α coefficient for these subscales varied between 0.80 and 0.91.

Sociocultural Attitudes Toward Appearance

Sociocultural Attitudes Toward Appearance (SATAQ-4) was used to measure internalization of appearance ideals as well as perceived sociocultural pressures related to the appearance including three different aspects (family, peers and media) (Schaefer et al., 2015). In our study we used Polish adaptation. The tool contains 22 items within five subscales: internalization: thinness, internalization: muscularity, pressures: family, pressures: media and pressures: peers. In the present study only subscales regarding to pressures were used. Respondents assess each item on a five-point scale, ranging from 1–definitely disagree to 5–definitely agree. A higher total score indicates a higher pressure perceived to reach such ideals. The SATAQ-4 has satisfactory psychometric parameters (Schaefer et al., 2015). In our analyses, Cronbach's α coefficient for these subscales ranged between 0.92 and 0.96.

Health Behavior Inventory

Health Behavior Inventory (IBH) is a (Juczyński, 2012) measure of health-related behaviors. It contains 24 statements within four subscales: healthy eating habits, preventive health behaviors,

health practices and positive mental attitude toward health, connected with avoiding strong emotions, tensions and stresses. Respondents assess each item on five-point scale, ranging from 1–almost never to 5–almost always. A higher total score indicates a higher frequency in implementing health-related behaviors. The inventory has good statistical parameters (Juczyński, 2012). In our study, Cronbach's α coefficient ranged between 0.62 and 0.82.

Statistical Analyses

The data analysis in Study 2 consisted of two consecutive steps.

The first series of analysis (presented in **Figure 2**) served to assess the validity of the HBMS. Further analysis aimed to define characteristic classes that differed regarding their profile of regulatory type. This approach is an application of a person-centered perspective, which in contrast to variable-centered approach, takes into account the heterogenity of participants within the studied variables. We extracted two classes that differed regarding their regulatory profile and examined the differences between them in terms of health-related behaviors. Statistical analyses were performed using IBM SPSS Statistics 26 software (IBM Corporation, 2019) and AMOS 26.0 software (Arbuckle, 2019). LPA was carried out in R Statistics software with the use of tidyLPA package.

Results

Structural Validity and Internal Reliability

When constructing the model for analysis, we assumed, based on the Ryan and Connell (1989) and Deci and Ryan (2000) that latent variables representing individual components of the regulatory styles will be correlated with each other (H2). The parameter values were estimated using the maximum likelihood method. Again, to determine the adequacy of the model fit, two criteria were used: *RMSEA* and *CFI*. The measures of *RMSEA* = 0.053 and *CFI* = 0.955 reached values that yield a good fit of the data to the HBMS model. All items constituting HBMS dimensions had significant factor loadings, which confirms the model developed in Study 1.

In the next step, we analyzed the internal consistency of the HBMS scales in this sample. All of them achieved a satisfactory level of reliability measured by Cronbach's α and ω coefficients. We decided to provide ω coefficients as a more adequate measure of reliability, still keeping Cronbach's α as most commonly used index of reliability (Hayes and Coutts, 2020). The results of both analyses are displayed in **Table 4**.

TABLE 4 | Factor loadings in CFA for 30-item health behavior motivation scale (HBMS), Study 2.

HBMS dimensions		*f*	*p*
Intrinsic regulation			
α = 0.95, ω = 0.95	Item 27	0.85	0.001
	Item 40	0.89	0.001
	Item 45	0.87	0.001
	Item 59	0.87	0.001
	Item 54	0.87	0.001
	Item 49	0.89	0.001
Integrated and identified regulation			
α = 0.90, ω = 0.90	Item 15	0.84	0.001
	Item 36	0.75	0.001
	Item 23	0.83	0.001
	Item 8	0.76	0.001
	Item 16	0.69	0.001
	Item 9	0.73	0.001
Introjected regulation			
α = 0.88, ω = 0.88	Item 24	0.69	0.001
	Item 30	0.63	0.001
	Item 10	0.66	0.001
	Item 42	0.85	0.001
	Item 46	0.80	0.001
	Item 37	0.81	0.001
External regulation			
α = 0.93, ω = 0.93	Item 20	0.85	0.001
	Item 61	0.83	0.001
	Item 18	0.79	0.001
	Item 31	0.91	0.001
	Item 25	0.92	0.001
	Item 5	0.67	0.001
Amotivation			
α = 0.93, ω = 0.93	Item 48	0.81	0.001
	Item 58	0.82	0.001
	Item 39	0.85	0.001
	Item 32	0.87	0.001
	Item 19	0.86	0.001
	Item 26	0.82	0.001

Intercorrelations Between HBMS Dimensions

In the next step, the intercorrelations between the HBMS dimensions were assessed. As expected (H2), scales associated with higher degree of perceived autonomy (intrinsic regulation, identified and integrated regulation) correlated positively with each other and negatively with External regulation and Amotivation. The maximum value of Pearson's r correlation coefficient was obtained for the Intrinsic regulation and Identified and integrated regulation. Also scales associated with lower degree of perceived autonomy (external regulation and amotivation and external regulation and introjected regulation) were positively and highly intercorrelated. Positive and moderate value of correlation coefficient was found for external and introjected regulation (both associated with an external locus of causality). External regulation and identified and integrated regulation did not correlate with each other. The obtained results are displayed in **Table 5**. Based on modification index values, with the threshold value of 4, the model included correlations between items: 24 and 10 (constituting the *Introjected regulation* subscale), as well as correlations between items 20 and 25 (constituting the *External regulation* subscale).

Differences in the HBMS Dimensions for Sociodemographic Variables

Next a comparison of the intergroup differences in the HBMS dimensions in terms of sociodemographic variables (including gender, age, education and place of residence) was performed.

TABLE 5 | Intercorrelations of the health behavior motivation scale (HBMS) dimensions, Study 2.

HBMS dimensions and items	HBMS dimensions and items	*r*	*p*
Intrinsic regulation	Integrated and identified regulation	0.86**	0.001
Intrinsic regulation	Introjected regulation	0.42**	0.001
Intrinsic regulation	External regulation	−0.15**	0.001
Intrinsic regulation	Amotivation	−0.27**	0.001
Integrated and identified regulation	Introjected regulation	0.47**	0.001
Integrated and identified regulation	Amotivation	−0.22**	0.001
Introjected regulation	External regulation	0.39**	0.001
Introjected regulation	Amotivation	0.15**	0.001
External regulation	Amotivation	0.68**	0.001
Item no. 24	Item no. 10	0.37**	0.001
Item no. 20	Item no. 25	−0.48**	0.001

*$p < 0.01$, **$p < 0.001$.

According to the Student's *t*-test values for the independent samples, there was a statistical difference between men and women regarding introjected regulation, $t_{(338)} = 2.27$, $p < 0.05$. Within this dimension, women scored significantly higher ($M = 17.96$, $SD = 7.71$) than men ($M = 15.98$, $SD = 8.35$). We also examined the differences in the HBMS dimensions based on age, the education level and the size of the place of residence. Our analysis showed that there is a statistical difference in types of motivational regulation conditioned to the size of the place of residence, $t_{(269,78)} = 2.61$, $p < 0.05$). People who live in small and middle cities have higher level of amotivation ($M = 8.54$, $SD = 8.30$) compared to the big city dwellers ($M = 6.26$, $SD = 7.31$). We did not find any differences in the HBMS dimensions conditioned to age or level of education. The results of our analyzes are included in the (**Supplementary Tables 2A–5A**).

Convergent and Discriminant Validity

In the next step, the construct validity of the HBMS was verified (H3–H6). First, correlations with the AI-23 (Kasser and Ryan, 1993, 1996) and the SSPP (Kolańczyk et al., 2013) were assessed (H3–H4). The obtained results are presented in **Table 6**.

The correlation matrix between the HBMS and the AI-23 subscales showed positive correlations between health (moderate) and intrinsic aspirations (weak and moderate correlations) and intrinsic, identified and integrated regulation (autonomous forms of regulation) (H3). The correlations were stronger for health aspiration index than for the intrinsic aspiration index. Moreover, both health aspiration and intrinsic aspiration indices showed moderate positive correlations with introjected regulation. Intrinsic aspiration index, correlated negatively with external regulation and amotivation, whereas health specific aspiration did not correlate with external regulation, but correlated negatively with amotivation. These results confirm hypothesis H3.

The HBMS scales also correlated with the SSPP subscales (H4). When it comes to general motivation strength and promotion focus scales, they were both positively weakly associated with intrinsic regulation and identified and integrated regulation (autonomous forms of regulation). Moreover, motivation strength showed weak negative correlations with external regulation and amotivation and promotion focus was positively weakly associated with introjected regulation and negatively with amotivation. The prevention focus, on the other hand, showed moderate positive correlations with introjected and external regulations and weak positive correlations with intrinsic, integrated and identified regulations. These results confirm hypothesis H4.

Next the correlations between the HBMS and various dimensions of body image measured by the SATAQ-4 (Schaefer et al., 2015) and the MBRSQ (Cash, 2000) were assessed (H5–H6). The results of this analysis are presented in **Table 7**.

The analysis of correlation matrix between the HBMS and the SATAQ-4 scales (**Table 7**) revealed the existence of weak and moderate, positive correlations between the different types of ideal appearance pressures exerted by family, media and peers and controlled forms of motivational regulation (introjected and external regulation) and amotivation. The strongest correlations of moderate size were obtained for external regulation. The only dimension, which was not significantly associated with introjected regulation was family pressure. In addition, no statistically significant correlations were observed between the SATAQ-4 dimensions and autonomous forms of regulation - intrinsic, identified and integrated regulation. The correlation pattern is as expected and confirms H5.

Moreover, an analysis of the obtained results showed that the positive evaluation of fitness and health and orientation to these aspects of the physical self in the MBRSQ are moderately positively correlated with the autonomous forms of motivational regulation (intrinsic, integrated and identified regulation) and weakly negatively correlated with external regulation and amotivation. Additionally, introjected regulation was weakly, positively correlated with health and fitness orientation. The strongest correlations were obtained for intrinsic regulation and amotivation. No significant relations were found only between the introjected regulation and fitness and health evaluation. The obtained results confirmed H6 (Valentine and Cooper, 2003).

TABLE 6 | Pearson's and Spearman's correlation coefficients between the health behavior motivation scale (HBMS) subscales and different dimensions of AI23 and SSPP, Study 2.

HBMS subscales	AI23 subscales		SSPP subscales		
	Health aspiration	Intrinsic aspiration	Promotion orientation	Prevention orientation	Motivation strength
Intrinsic regulation	0.493**	0.323**	0.336**	0.108*	0.227**
Identified and integrated regulation	0.427**	0.187**	0.325**	0.151**	0.177**
Introjected regulation	0.292**	0.168**	0.134**	0.272**	−0.039
External regulation	−0.048	−0.146**	−0.079	0.214**	−0.175**
Amotivation	−0.174**	−0.245**	−0.218**	0.035	−0.295**

$^{**}p < 0.01$; $^{*}p < 0.05$ (one tailed); intrinsic aspiration coefficients are Rho-Spearman, all the other coefficients are r-Pearson.

TABLE 7 | Pearson's correlation coefficients between the health behavior motivation scale (HBMS) subscales and different dimension of SATAQ-4 and MBRSQ, Study 2.

HBMS subscales	SATAQ-4 subscales		MBRSQ subscale		
	Pressures: family	Pressures: media	Pressures: peers	Fitness and health orientation	Fitness and health evaluation
Intrinsic regulation	−0.087	−0.088	−0.016	0.592**	0.345**
Identified and integrated regulation	−0.009	0.057	0.036	0.598**	0.279**
Introjected regulation	0.059	0.219**	0.117*	0.194**	−0.065
External regulation	0.368**	0.422**	0.416**	−0.166**	−0.289**
Amotivation	0.294**	0.267**	0.323**	−0.314**	−0.343**

$^{**}p < 0.01$; $^{*}p < 0.05$ (one tailed).

Profile Analysis

In the next step, latent profile analysis (LPA) (Rosenberg et al., 2019) was executed in order to estimate distinct HBMS profiles and extract different subgroups of respondents differing in terms of their regulatory style. The HBMS dimensions served as the basis for latent class extraction. In order to determine the adequacy of the model fit, three criteria were used: AIC (*Aikake information criterion*), BIC (*Bayesian information criterion*) (Akaike, 1973; Schwarz, 1978) and the measure of Entropy (Celeux and Soromenho, 1996). In case of AIC and BIC criteria, lower values indicate better model parameters and its higher predictive value (Akaike, 1973; Schwarz, 1978). In case of the measure of Entropy, values >.07 indicate acceptable classification accuracy (Jung and Wickrama, 2008). According to the values of the fit statistics (AIC = 2,944.81; BIC = 3,089.84; entropy = 0.81) the model with two extracted classes, presenting two distinctive profiles: "Extrinisic" and "Intrinsic" was with best fitted to data. Values of fit indices for all models tested are provided in **Table 8**. **Figure 4** presents the mean values of the standardized variables in the extracted classes.

In the first class the extracted "Extrinsic" profile was characterized by a lower level of intrinsic, integrated and identified regulation and a higher level of external regulation and amotivation. Second class, with "Intrinsic" profile, revealed higher level of intrinsic, integrated and identified regulation and lower level of external regulation and amotivation.

Next, the two extracted classes were compared in terms of health-related behaviors (H7). The *t*-test for independent samples was performed. Both classes differed significantly, in terms of: healthy eating habits [$t_{(252)} = -5.45$; $p < 0.01$] preventive health behaviors [$t_{(252)} = -2.53$; $p < 0.01$], health practices [$t_{(252)} = -4.56$; $p < 0.01$] and positive mental attitude [$t_{(252)} = -3.30$; $p < 0.01$]. Mean values of each of the analyzed dimensions were significantly higher in the second class, with "Intrinsic" profile (**Figure 5**). The obtained results confirm H7.

Discussion

The results of the validation procedure performed in Study 2 confirm the HBMS structural, convergent and discriminant validity.

The CFA analysis confirmed the model developed in EFA, proving its structural validity. All HBMS dimensions were characterized by a satisfactory level of reliability measured by Cronbach's α and ω coefficients. The matrix of relations obtained in the present study was similar to the one obtained by Ryan and Connell (1989). Regulatory styles theorized to be closer together along the motivational continuum (Ryan and Deci, 2000, 2017) were more highly correlated than those theorized to be distant. These results confirm H2. The strongest correlation coefficients occurred between the regulatory styles, that are more autonomous and associated with an internal locus of causality (Ryan and Deci, 2000). On the other hand, the high value of *r*-Pearson coefficient between introjected and external regulation may be related to the fact that both regulatory styles are associated with pressure: external (in the case of the external regulation) or internal (in the case of the introjected regulation) (Ryan and Deci, 2000). Because of these similarities, some researchers combine

TABLE 8 | Fit indices and entropy values for models tested in latent profile analysis, Study 2.

Tested models	No of classes	AIC	BIC	Entropy
Equal variances, covariances fixed to zero	2	3,357.84	3,414.44	0.88
	3	3,196.79	3,274.61	0.86
	4	3,155.06	3,254.11	0.83
	5	3,148.90	3,269.17	0.77
	6	3,140.19	3,281.68	0.79
Varying variances, varying covariances	2	2,944.81	3,089.84	0.81
	3	2,917.20	3,136.52	0.83
	6	2,833.28	3,275.44	0.90

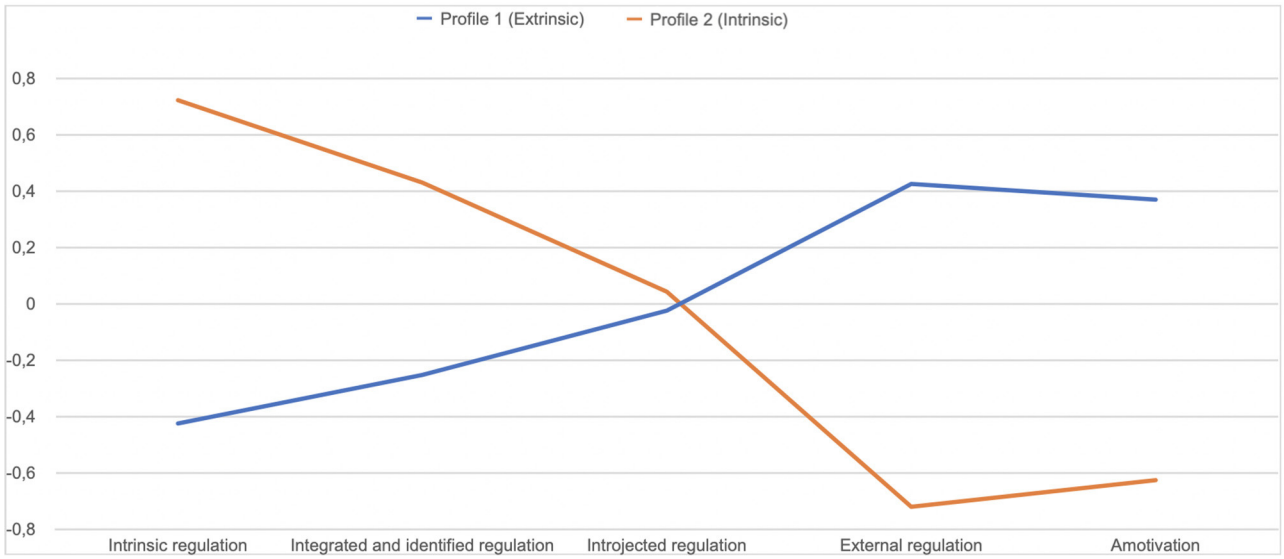

FIGURE 4 | Profiles of regulatory styles (Study 2).

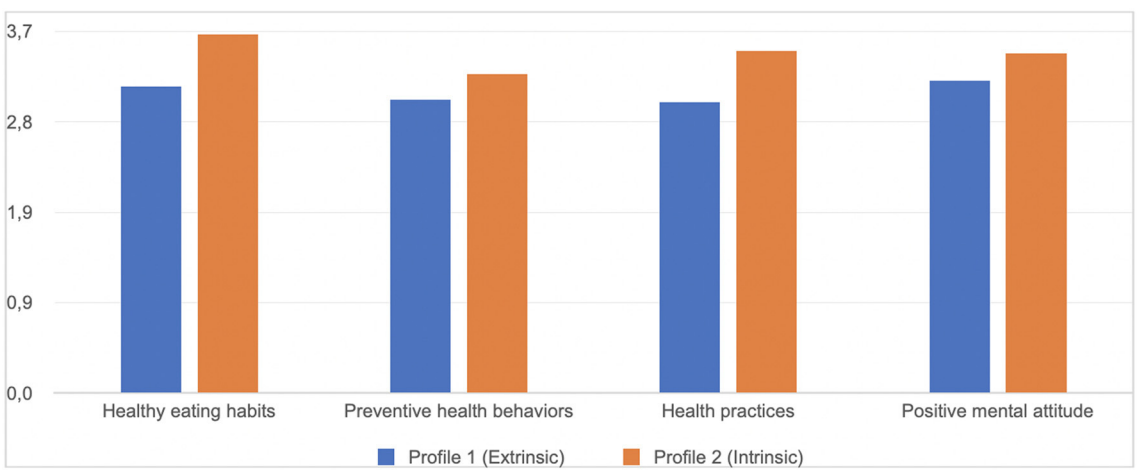

FIGURE 5 | Mean values of health-related behaviors in the two extracted classes (Study 2).

these two types of regulation into a more general controlled motivation composite (Williams et al., 1996).

Most of the expectations which concern the theoretical construct validity have been confirmed. Autonomous regulation of pro-health behavior is associated with setting intrinsic types of goals (especially health related) (Ryan and Deci, 2000) and proved to be stronger than other types of regulations associated with general motivation strength. Controlled regulation of pro-health behavior have generally weaker positive associations with intrinsic types of aspirations (Ryan and Deci, 2000) and with general strength of motivation. Amotivation was negatively related to intrinsic aspirations and promotional orientation and motivation strength, proving to be a good measure of lack of motivation. All the associations, however, were weak or moderate. This implies that the construct of regulation of health behavior is connected, but not interchangeable with both the concepts of aspirations and promotion and prevention self-regulation. These results confirm H3 and H4 (Kolańczyk et al., 2013). The relationships between the HBMS and the SATAQ-4 obtained in our study are also consistent with the assumptions of SDT theory (Deci and Ryan, 2000) and confirm H5 According to researchers (Ryan and Deci, 1985, 2000; Williams et al., 1996; Vallerand, 2000; Ryan et al., 2008) the SDT theory allows for multidimensional insight into the levels and types of motivation on hierarchically ordered different levels of regulatory styles. Thus, aside from the central division into external and internal motivation, it also captures aspects of separation into two general composites of motivation—autonomous and controlled. Within this division, the autonomous forms of regulation usually include intrinsic, identified and integrated regulation, whereas controlled forms of motivation include—introjected and external regulation (Williams et al., 1996). According to the researchers (Williams et al., 1996; Chrupała-Pniak and Grabowski, 2016) the main difference between external and introjected regulation is that in the former case, the pressure is external, whereas in the latter case, it comes from within. The results obtained in our study are not only consistent with SDT assumptions but are also in line with the results of other studies (Raposo et al., 2020) showing the relationships, between the regulatory styles and variables related to perceived pressure. Also, positive correlations between the different types of ideal appearance pressures exerted by family, media and peers with amotivation and introjected and external regulation confirm the theoretical validity of the HBMS.

The correlation coefficients between the HBMS sub-scales and the MBRSQ can also be considered a confirmation of the validity. The analysis of the obtained results allows us to conclude that a higher intensity of autonomous styles of regulation coexists with a more positive assessment of health and fitness and greater commitment to efforts to maintain good health and fitness. The opposite direction of dependence was obtained for external regulation and amotivation. Moreover, introjection was significantly associated with a higher degree of health and fitness orientation. This pattern of results was also obtained in the other studies, which analyzed the correlation between regulation styles and constructs such as positive and health outcomes (Williams et al., 1998; Levesque et al., 2007). An analogy in the results can be observed for all the analyzed dimensions of HBMS.

Finally, in the LPA, we observed two distinct profiles of participants. The first one—"Extrinsic"—was associated with a lower level of autonomous forms of regulation and a higher level of controlled forms of regulation. Second profile—"Intrinsic"—was the mirror image of the first profile and was associated with a higher level of autonomous forms of regulation and a lower level of controlled forms of regulation. The two classes differed in terms of health-related behaviors (H7). Participants with the "Intrinsic" profile were more health-oriented than participants with the "Extrinsic" profile. The results obtained in our study are in line with the results of other researchers (e.g., Hardcastle et al., 2015), applying a *variable-centered approach*, which rely on analyzing relationships between single regulatory styles and variables describing health-related behaviors. For instance, some studies suggest that amotivation toward health-related behaviors is associated with an inability to identify the reasons for acting and poor adherence to health behaviors (Thøgersen-Ntoumani and Ntoumanis, 2006). Low health behavior maintenance is also associated with external regulation (Ryan and Deci, 2000). Intrinsic regulation is in turn significantly and positively associated with positive health outcomes (Levesque et al., 2007). However, both the clinical practice and research show that while implementing change of health behaviors the regulatory style is fluctuating. Individuals implementing health behavior changes (eg. changing their eating habits) report being alternately amotivated and externally regulated with a focus on achieving external goals (Poraj-Weder et al., 2021). According to Ryan and Deci (2000), the boundaries between the regulatory styles are not firmly defined. People present a specific motivational profile, not a specific type of regulation (Teixeira et al., 2012). Thus, applying the *person-centered perspective* to understand how participants presenting various regulatory profiles differ in terms of health-related behaviors is a novelty of the study and its strength.

STUDY 3

The aim of Study 3 was to analyze test-retest reliability of the HBMS. Specifically, we tested if scores on the HBMS are relatively stable over time.

Procedure and Participants

The sample in Study 3 comprised 60 healthy adults (**Table 1**). Similar to Study 1 and Study 2, Study 3 was conducted individually using the paper-and-pencil method, in the presence of a researcher.

Measures

Participants completed the HBMS twice with a 2-week interval in between the test and retest.

Statistical Analyses

The analyzes used in Study 3 are presented in **Figure 2**. Statistical analyses were performed using IBM SPSS Statistics 26 software (IBM Corporation, 2019).

TABLE 9 | Results of the reliability assessments of the health behavior motivation scale (HBMS), Study 3.

HBMS scales	*ICC*
Intrinsic regulation	0.84
Identified and integrated regulation	0.67
Introjected regulation	0.72
External regulation	0.85
Amotivation	0.94

ICC, intraclass correlation coefficient.

Results

The aim of Study 3 was the assessment of the test-retest reliability that lets to verify if scores on the HBMS are relatively stable over time. For estimating test-retest reliability intraclass correlation coefficient (*ICC*) was used. The stability of scores over time was assessed in the study conducted with a 2-week interval in between the test and retest. The results of the reliability assessment of the HBMS is presented in the **Table 9**.

The intraclass correlation coefficients were in the 0.67–0.94 range.

Discussion

The results of the study 3 show that the test-retest reliability of the HBMS (as measured by interclass correlation coefficient) was satisfactory. The obtained values of the interclass correlation coefficients of all subscales of the HBMS did reach the recommended in the literature (Liljequist et al., 2019) threshold of 0.50. The *ICC* values were mostly high or very high and all were satisfying, which proves that the HBMS is a reliable measurement tool. Thus, the HBMS ensures the satisfactory stability of the measurement of various forms of motivational regulation to undertake pro-health behaviors at different time-points.

GENERAL DISCUSSION

The aim of our study was to construct and validate the *Health Behavior Motivation Scale* (HBMS). Basing the HBMS structure on the applicable recommendations regarding the procedure of constructing diagnostic tools (Magnusson, 1991; Zawadzki, 2006; Brzeziński, 2007; Hornowska, 2007) allowed for its careful development in the scope of the adopted construction strategy and conceptual theoretical foundations, as well as for its linguistic validation. In addition, the linguistic and content analysis (Hornowska, 2007), as well as formalized content accuracy analysis (Zawadzki, 2006), along with the procedure of competent judges led to the elimination of incorrectly formulated linguistically and inaccurate items. The linguistic validation was carried out while the tool was being constructed. This enabled the development of its test version, which underwent psychometric properties assessment in the three studies (Study 1–3).

The studies 1–3 allowed for the verification of the HBMS psychometric properties. We posed seven hypotheses, all of which were confirmed. Internal structure of the HBMS was verified by means of confirmatory and exploratory (Study 1), and confirmatory (Study 2) factor analysis. The calculations were performed on various trials which allowed for the development of a stable and theoretically valid, five-factorial measurement model, describing the regulatory styles included in the motivational continuum by Ryan and Deci (2000, 2017). The reliability of the HBMS dimensions was assessed by evaluating its internal consistency by means of Cronbach's α and McDonald's ω coefficients (Study 1-Study 3) and the test-retest reliability (Study 3). The analysis of these results allows to conclude that the HBMS is internally consistent and ensures the satisfactory stability of the measurement. The Study 2 allowed for the verification of the HBMS construct validity (discriminant and convergent).

Limitations of the Study and Recommendations for Future Research

Despite the fact that we confirmed the factorial structure, reliability, and discriminant and convergent validity of the HBMS, and all the psychometric indicators are on, at least, satisfactory level, the study has its limitations.

Firstly, the factorial structure of the HBMS differs from the theoretical Organismic Integration Theory structure of regulatory types. In the structure of the HBMS the identified and integrated regulations were recreated as one factor. Although research confirms that identified and integrated forms of regulations are highly positively correlated and the correlation between these two types of regulation is the highest among all the regulation types (Ryan and Deci, 2017) and some authors operationalize them as one, generalized dimension of external autonomous regulation (Deci and Ryan, 2000, 2008; Levesque et al., 2007), they are still considered theoretically distinct. The use of the HBMS does not enable to differentiate between these two types of regulations. It would be therefore beneficial for future research on health behavior motivation to complement the HBMS with the subscales measuring both types of regulation.

It should be also emphasized that the HBMS is a tool that diagnoses the regulatory styles without taking into account the goal content (Ryan and Deci, 2000; Teixeira et al., 2012). In the light of SDT theory, the distinction between the content of goals and aspirations (like overall well-being, physical fitness physical attractiveness, etc…) and different regulatory reasons (to conform, to maintain self-esteem, to have fun) is important for a comprehensive motivation diagnosis (Ryan and Deci, 2000, 2017; Teixeira et al., 2012).

Another limitation of the presented method is that it focuses solely on pro-health behaviors (serving to maintain or restore health), disregarding anti-health behaviors (causing direct or distant health damage) (Heszen and Sek, 2012). Due to the fact that taking care of health is associated with both, engaging in health-related behaviors as well as avoiding anti-health behaviors, it seems justified to develop a second variant of the HBMS that measures the motivation toward avoiding anti-health behaviors.

Finally, the creation of the HBMS was highly reliant on questionnaires as a method of conducting research. Data based on self-report are affected self-presentation of participants and

can also be influenced simply by a lack of knowledge in the areas that are being explored (McDonald, 2008). When designing further research, it is worth linking HBMS with specific behavioral measures related to healthful behavior.

Conclusions, Theoretical, and Practical Applications of the HBMS

The results of the present study show that the HBMS is a valid and reliable tool and can be successfully used in the population of healthy adults to measure motivation regulation toward health-related behaviors.

This tool has potential many applications in the health psychology area. The HBMS questionnaire can be used for both scientific and practical purposes. It can be a reliable and accurate instrument used in research which combines motivation and health psychology. It can also be used as a practical tool for healthcare professionals (psychologists, doctors, dietitians, diet coaches, and nutrition trainers). A key advantage of the HMBS is that it offers insight into an individual's motivational processes. This makes it possible to explain the mechanisms underlying the successes and failures of changing health-related behavior. Understanding these mechanisms may be used in practical way, by for example, helping to develop effective clinical intervention procedures resulting in profound and lasting changes in patients' health behavior (Halvari and Halvari, 2006). This can significantly contribute to increasing the effectiveness of implementing pro-health measures. The HBMS can find particularly useful in assessing an individual's readiness to engage in health behavioral change and setting motivational goals. Because each person's motivational status for health behavioral change is different, it is crucial to comprehend the types of an individual's motivational regulation styles and deliver an intervention tailored to each individual. The HBMS can serve as useful instrument to guide this process and enhance motivation to health behavioral change.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Ethical Committee of Maria Grzegorzewska University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

The research was conducted by MP-W and AP. MP-W, AP, and MS performed the analysis and wrote the first draft of the manuscript. All authors contributed to manuscript revision, read and approved the submitted version, conception, and design of the study.

FUNDING

This work was supported by the Maria Grzegorzewska University, from the University internal funds and the funds awarded by the Ministry of Science and Higher Education in the form of a subsidy for the maintenance and development of research potential in 2021 (BNS 37/21 - P).

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.706495/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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ORIGINAL RESEARCH
published: 10 September 2021
doi: 10.3389/fpsyg.2021.709935

Temperamental and Personality Traits as Factors Related to Changes in Health Behaviors and Quality of Life in Patients With Metabolic Syndrome in Poland

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Lifestyle changes in diet and physical activity are necessary for managing metabolic syndrome. The aim of this longitudinal study was to examine temperamental and personality traits as moderators of lifestyle changes prompted by motivational intervention. The sample consisted of 50 patients aged 22–65 years ($M = 45.26$; $SD = 9.79$) who fulfilled the diagnostic criteria for metabolic syndrome and were undergoing treatment at the Military Institute of Medicine in Warsaw. There were two measurements: an initial measurement and a second 15 months after motivational counseling. Each patient completed the questionnaires: Formal Characteristics of Behavior – Temperament Inventory, NEO Five Factor Inventory, Inventory of Health Behavior, and Short Form Survey SF-36. Body Mass Index (BMI), Fat Mass, Fat-free Mass, Intracellular Water, and Basal Metabolic Rate (BMR) were also measured. Data were analyzed using dependent samples *t*-tests to detect the changes in consecutive measurements, the hierarchical regression analysis was used to investigate temperamental and personality traits as predictors of change, the cluster analysis was used to extract the subgroups of patients with distinct profiles of temperamental and personality traits, and the analysis of variance was used to analyze extracted profiles as potential moderators of change. Three subgroups were extracted using k-means clustering: patients with higher Neuroticism, Perseveration, and Emotional Reactivity; patients higher Extraversion, Briskness, Sensory Sensitivity, Endurance, Activity, and Conscientiousness; and patients with lower Perseveration. All patients improved significantly in terms of physical quality of life (QoL), health behaviors, BMI, BMR, and Fat-free Mass ($p < 0.05$). Regression analysis found that higher Sensory Sensitivity, lower Perseveration, and higher Agreeableness fostered positive change ($p < 0.05$). Patients with higher Neuroticism, Perseveration, and Emotional Reactivity also improved in terms of their Emotional Quality of Life and Health Practices, reaching parity with other patients, which was verified on the basis of statistically significant interaction ($p < 0.05$). The temperamental and personality trait profiles moderated the changes in health practices and emotional QoL. Motivational counseling was effective for patients diagnosed with metabolic syndrome in general, but patients with higher Neuroticism, Perseveration, and

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Edited by:
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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *14 May 2021*
Accepted: *09 August 2021*
Published: *10 September 2021*

Citation:
Burnos A and Skrobowski A (2021) Temperamental and Personality Traits as Factors Related to Changes in Health Behaviors and Quality of Life in Patients With Metabolic Syndrome in Poland. Front. Psychol. 12:709935. doi: 10.3389/fpsyg.2021.709935

Emotional Reactivity benefited even more, as they were in poorer psychological condition before the motivational intervention.

Keywords: metabolic syndrome, personality traits, temperamental traits, quality of life, motivational intervention

INTRODUCTION

Metabolic syndrome is a pathological state that is characterized by abdominal obesity, insulin resistance, hypertension, and hyperlipidemia (Saklayen, 2018). It increases the risk of chronic diseases like type 2 diabetes and coronary diseases and also increases the probability of stroke and other disabilities. It is estimated that metabolic syndrome affects about 25% of the world population – over a billion people. Metabolic syndrome in Poland is present in about 20% of the adult population – 5.8 million people (Kalinowski and Mianowana, 2016). According to the definition of the World Health Organization (Alberti and Zimmet, 1998), metabolic syndrome is constituted by insulin resistance or glucose >6.1 mmol/L (110 mg/dl), 2 h glucose >7.8 mmol (140 mg/dl), and at least two of the following: HDL cholesterol <0.9 mmol/L (35 mg/dl) in men, < 1.0 mmol/L (40 mg/dl) in women; triglycerides >1.7 mmol/L (150 mg/dl); waist/hip ratio > 0.9 (men) or > 0.85 (women) or Body Mass Index (BMI) >30 kg/m^2; blood pressure > 140/90 mmHg.

The pathophysiological mechanisms of metabolic syndrome have been studied, and the consumption of high calorie/low fiber fast food as well as low levels of physical activity are indicated as the main causes of metabolic syndrome (Barrès and Zierath, 2016; Bird and Hawley, 2017). Genetic predispositions have also been studied; however, they were found to be only a minor factor (Locke et al., 2015). Guidelines for people diagnosed with metabolic syndrome and for people at risk of developing it in terms of physical activity and appropriate diet have been formulated at the individual level (de la Iglesia et al., 2014; Salas-Salvadó et al., 2014; Clark et al., 2019) and in terms of general health policy (Peeters and Backholer, 2017). However, there is also a need for motivational interventions to implement and maintain these guidelines. For decades, the literature has emphasized the necessity of recognizing individual needs, goals, and choices as well as the importance of feedback and reward systems as an important basis for solid motivation (Oldridge and Stoedefalke, 1984). An individual approach to motivational training improves patients' participation and strengthens their ability to make changes to their lifestyle. Self-efficacy is one of the most important factors in predicting failures and successes in maintaining motivation (Dohnke et al., 2010). A systematic review of 14 studies concluded that motivational interventions are effective at fostering long-term behavioral changes and improvement of self-efficacy (McGrane et al., 2015). It was found that self-regulatory strategies indirectly influence physical activity through self-efficacy in patients diagnosed with diabetes or metabolic syndrome (Olson et al., 2017). Self-efficacy in regulating eating habits was one of the predictors of adherence in a prevention program for patients with metabolic syndrome (Susin et al., 2016). A systematic review and meta-analysis (Kuo et al., 2014) point out that the empowerment-based self-management interventions for patients with chronic metabolic diseases, including metabolic syndrome, were effective at increasing self-efficacy.

However, there are still individual differences in patients' adherence to explain. To do so, personality and temperamental traits have been investigated as possible predictors of compliance with health guidelines and as predictors of eating behaviors and physical activity in general (Walther and Hilbert, 2016; Reshadat et al., 2017; Stanyte and Smigelskas, 2018). Personality traits have also been examined as predictors of metabolic syndrome (Sutin et al., 2010). High Neuroticism, low Agreeableness, and low Conscientiousness have been found to be associated with metabolic syndrome. Weak associations have been found between energy expenditure at peak walking pace and Neuroticism, Extraversion, Openness, and Conscientiousness (Terraciano et al., 2013). However, one systematic review points out that there is no clear association between personality and metabolic syndrome – either its occurrence or its development (Mommersteeg and Pouwer, 2012).

Strelau's Regulative Theory of Temperament (RTT; Strelau, 1996) describes formal aspects of behavior, including energetic and temporal characteristics composed of specific traits such as Sensory Sensitivity, Emotional Reactivity, Endurance and Activity (energetic aspect), Briskness and Perseveration (temporal characteristics). Sensory Sensitivity characterizes one's capacity to perceive weak sensory stimuli. Emotional reactivity is the tendency to respond with intensity to stimuli, which induce emotions. Endurance is the ability to withstand long-lasting or exhausting conditions. Activity is the inclination to engage in behaviors that take place under intensely stimulating conditions. Briskness is the ability to react quickly and shift from one behavior to another. Perseveration is the tendency to repeat emotional states in reaction to stimuli, even if the stimuli are no longer present. Many research projects have investigated the functional significance of the temperamental characteristics postulated by the RTT. These temperamental traits may act as the moderators of the impact of life events by increasing or decreasing the associated stimulation (Strelau, 2006). They may also affect coping strategies used in stressful situations. Specifically, they can affect the regulation of emotional states. Temperament is distinguished from character, which is defined as the self-regulatory aspect of personality – the way people shape and adapt responses to changing external and internal conditions (Cloninger et al., 2019). Temperamental traits postulated in the regulative theory of temperament may also be considered as endophenotypes for obesity (Oniszczenko et al., 2015).

The five-factor approach (McCrae and Costa, 1999) is the most popular and influential way of describing human personality. It describes personality in terms of five personality

traits: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. They do not only describe the energetic and temporal aspects of individual differences in human behavior but also include attitudes and reactions to social events. Neuroticism is a tendency to be emotionally unstable and to experience negative emotions due to low tolerance for stress. Extraversion is characterized by engagement in external activities, usually with other people. Openness to Experience is characterized by intellectual curiosity and appreciation of adventure and imagination. Agreeableness is a general concern for getting along with others and being kind, helpful, and trustworthy. Conscientiousness is a trait constituted by self-discipline, reliability, and a preference for planning rather than spontaneity. The use of both temperamental and personality traits allows for a more accurate representation of individual differences in patients' compliance.

The role of personality traits as predictors of eating habits has been examined in the general population and in specific samples. One systematic review has found that neuroticism, impulsivity, and sensitivity to reward are risk factors for obesity (Gerlach et al., 2015), while conscientiousness and self-control have a protective function against possible weight gain. Specific dimensions of personality can interact with each other. Conscientiousness is the basis for the regulation of internal urges and a foundation of self-discipline. It may function as a source of control over compulsive eating behaviors, which may be strengthened by neuroticism. A link between lower conscientiousness and obesity has also been found in children (Sutin and Terracciano, 2018).

Patients with obesity have not only high scores on neuroticism but also have low scores for Agreeableness, Extraversion, Conscientiousness, and Openness to Experience (Garrido et al., 2018). The social attitude characteristic of Extraversion, on the other hand, has been found to foster improvement in multimodal obesity treatment (Lahmann et al., 2011). However, the associations between social activity and anthropometric outcomes were more clear in women than in men (Hosseini et al., 2020).

The positive correlation between bipolar spectrum features and neuroticism, as well as the negative correlation of such features with Agreeableness and Conscientiousness, has been examined in the context of obesity (Dudek et al., 2015). The results suggest that it is the ability to exercise control over constant or situational emotional tension that is crucial for understanding one's eating behaviors. Personality traits, situations, or a combination of both can generate emotional tension, which necessitates a higher level of self-control to protect an individual from engaging in compulsive eating. The primary goal of compulsive eating is to release psychological tension, but an inevitable side effect is serious weight gain. However, a propitious profile of personality traits can also serve as a basis for healthy behaviors. It was found in a large sample of 5,150 adult participants that lower neuroticism and higher Conscientiousness were not only related to lower BMI but also that participants with such a profile of personality traits tend to engage in physical activity and pay attention to their diet in terms of ingredients and regular meal rhythms (Sutin and Terracciano, 2016).

In order to understand health behaviors, a broad approach is needed. The approach of Gochman (1988) takes into consideration convictions, expectations, thought patterns, and emotions. It allows for thinking about behaviors that increase or decrease the probability of developing a disease, behaviors engaged with conscious intention to maintain one's current health status or to reduce the danger caused by disease, and behaviors that follow doctors' recommendations. In this approach, health behaviors lead to a better quality of life (QoL). Based on the definition of The World Health Organization Quality of Life assessment (WHOQOL) (1995), QoL includes one's evaluation of one's physical health, emotional state, independence, and relations with one's social environment. A chronic pathological state – such as metabolic syndrome, excessive weight, or obesity – changes one's functioning in all these areas and one's ability to improve the situation may depend on many factors. Temperamental and personality traits may be such factors.

The purpose of the current study is to analyze the role of temperamental and personality traits as moderators of change in health behaviors, in biological indicators of eating behaviors and in QoL in patients diagnosed with metabolic syndrome. The purpose of our research is to identify the profiles of temperamental and personality traits, which can facilitate positive change in health behaviors and, as a consequence, QoL as well as profiles that can impede such change in the context of metabolic syndrome. Our research question is whether temperamental and personality traits moderate such change and, on this basis, we formulated two hypotheses.

> *H1:* There will be statistically significant changes in health behaviors, biological indicators, and QoL between the two consecutive measurements.
> *H2:* Temperamental and personality traits of patients diagnosed with metabolic syndrome will be related to the magnitude of changes in health behaviors, biological indicators, and QoL between the two consecutive measurements.

From a practical point of view, if we find that person's temperamental and personality traits profile matters, the measurement thereof should be incorporated into daily clinical practice with individual patients diagnosed with metabolic syndrome in order to predict and deal with patients' potential strengths and difficulties when changing their health behaviors.

MATERIALS AND METHODS

This study was conducted at the Military Institute of Medicine in Warsaw, Poland. It is a military hospital; however, it is open to the general population. A total of 80 patients diagnosed with metabolic syndrome were recruited for the study; there were no inclusion criteria other than fulfilling the diagnostic criteria for the diagnosis. All patients that were diagnosed

with metabolic syndrome for 12 consecutive months were asked by the attending doctor to participate. Patients younger than 18 and older than 65 years old were excluded. Other exclusion criteria were chronic ischemic heart disease, diabetes being treated, confirmed chronic heart failure, confirmed chronic renal failure, cardiomyopathy, neoplastic disease, BMI higher than 45, pregnancy and diagnosed mental illness. The research design was longitudinal and consisted of two consecutive measurements. The period between the first and the second measurements was 15 months. It was assumed that the length of this period was enough to detect long-lasting effects. From the initial sample of 80 patients, 50 (62.5%) participated in both measurements and these formed the final sample. All participants gave written consent for their data to be used in the research. The research design was approved by the Local Ethics Committee: the Bioethical Committee of the Military Institute of Medicine, decision no. 63/WIM/2011.

Indicators of metabolic syndrome, such as insulin resistance, HDL cholesterol, triglycerides, and blood pressure, were measured in a diagnostic process prior to participation in the study, before the first measurement. At the first measurement, the patients filled out four psychological questionnaires and were examined to determine five biological indicators: BMI, Fat Mass, Fat-free Mass, Intracellular Water, and Basal Metabolic Rate (BMR). A dietician measured the participants' weight and height. Bioelectrical impedance analysis was used to measure Fat Mass, Fat-free Mass, and Intracellular Water. The psychological questionnaires were used to measure the temperamental and personality traits profiles of each patient as well as their health behaviors and QoL.

Temperament traits were assessed with the Formal Characteristics of behavior – Temperament Inventory (FCB-TI; Strelau and Zawadzki, 1995). This questionnaire measures six temperament traits: Briskness, Perseveration, Sensory Sensitivity, Emotional Reactivity, Endurance, and Activity. It has 120 items, with 20 items per scale (each scale can yield a total score of 0–20). The FCB-TI has good psychometric parameters and proven reliability and validity. Cronbach's α varied from 0.72 to 0.86 depending on the scale.

Personality traits were measured with the use of the NEO Five Factor (NEO-FFI) Inventory, which consists of 60 items and measures Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness – the dimensions of the five-factor approach described in the introduction. The questionnaire was also tested by the authors of its Polish adaptation (Zawadzki et al., 1998) to verify its reliability and validity. Cronbach's α was in the range from 0.68 to 0.82 depending on the scale.

Health behaviors were assessed with the Inventory of Health Behavior (IHB; Juczyński, 2012). This inventory measures Correct Eating Habits, Preventive Behavior, Health Practices, and Positive Mental Attitude. Correct Eating Habits concern the type of food one eats. Preventive Behaviors refer to adherence to doctors' advice and treatment. Health Practices refers to daily habits regarding rhythms of sleep and wakefulness as well as physical activity. Positive Mental Attitude refers to avoiding stressful events and situations evoking strong emotions. The inventory was developed in Poland and is widely used in the field of health psychology. Cronbach's α was reported to be in the range from 0.60 to 0.65 depending on the scale.

Quality of life was measured with the use of the Polish version of the 36-item Short Form Survey (SF-36; Tylka and Piotrowicz, 2009). It consists of 36 questions about health and reactions to disease and measures two main dimensions of QoL. Physical Quality of Life refers to the physical sphere: from physical activity to pain and its negative consequences on daily activities. Emotional Quality of Life covers social activity, emotional consequences of restrictions resulting from a health condition, level of energy, and tiredness. In the Polish version, higher scores mean lower QoL and lower scores mean higher QoL. The inventory has good reliability and is commonly used in health economics to determine the cost-effectiveness of health treatments. Cronbach's α was reported to be in the range from 0.75 to 0.95.

During the first session, in addition to the measurement with the questionnaires (FCB-TI, NEO-FFI, IHB, and SF-36) and the examination (including weight and height measurement and bioelectrical impedance analysis), participants were provided with diet recommendations and underwent motivational training (Miller and Rose, 2009). Information about diet recommendations was prepared and provided by a dietician. Patients were advised to avoid the consumption of saturated fat, trans-fatty acids, and cholesterol and were provided with prepared examples of daily meals. The motivational training was conducted by a health psychologist. During the training, patients were asked about their eating habits: their number of meals per day, eating between meals, number of sweets and snacks eaten, and their tendency to eat at night. The patients were also asked about their physical activity: what kinds of physical activity they undertook per month and per week. In the next stage, psychoeducation about the importance of a healthy diet and physical activity in metabolic syndrome was conducted. The long-term health consequences of metabolic syndrome were underlined. Also, the patients' ambivalence and uncertainty about making major changes to their ways of life were discussed and the discrepancies between the patients' values and goals and their health behaviors were elaborated upon. Possible changes – in the immediate term, in 1 month, and over half a year – in each patient's eating habits and physical activity were determined. All the interventions described above needed to be performed for each patient individually. Each meeting lasted for 50 min.

During the second measurement, patients filled out the IHB and SF-36. Temperamental and personality traits were measured only once, during the first measurement, because psychological traits remain stable even over decades. Although they might change over a lifetime, 15 months is too short to detect any differences. Health behaviors and QoL were measured twice. The same biological indicators were used in both measurements.

Statistical Analysis

Because the distributions of the analyzed variables did not differ from the normal distribution (based on the skewness and kurtosis values), parametric statistical methods were used.

Firstly, descriptive statistics were computed. The next stage was the analysis of differences between the two consecutive measurements. Their statistical significances were investigated with the use of the dependent samples *t*-test. Regression analysis was performed in order to verify the relationships between temperamental and personality traits and the magnitude of changes in health indicators and QoL. We wanted to analyze not only the possible effects of individual psychological traits but also the potential effects of configurations of temperamental and personality traits present in the sample. To this end, we first extracted profiles of patients in terms of temperamental and personality traits with k-means cluster analysis and then assessed the interactions between cluster membership and differences between the two consecutive measurements with mixed-model repeated-measures analysis of variance. Statistically significant interactions were interpreted with the use of 95% confidence intervals. With this sample size, an interaction effect will be statistically significant if Cohen's *f* is equal to or greater than 0.29, allowing us to detect interactions that explain 7.5% of dependent variable variance. The power analysis was performed with the G*Power 3.1.9.2 software. All other calculations were made using IBM SPSS 25.0 software. The statistical significance level was equal to 0.05.

TABLE 1 | Socio-demographic characteristics of the group of patients recruited for the study ($N = 80$) and the group of patients participating in two measurements ($N = 50$).

Variable	Patients recruited *N* = 80 (%)	Two measurements *N* = 50 (%)
Gender		
Female	15 (18.8%)	11 (22.0%)
Male	65 (81.2%)	39 (78.0%)
Age in years (*M* ± *SD*)	46.15 ± 9.84	45.26 ± 9.79
Marital Status		
Married	70 (87.5%)	45 (90.0%)
Single	10 (12.5%)	5 (10.0%)
Education		
Elementary	3 (3.8%)	2 (4.0%)
Secondary	40 (50.0%)	24 (48.0%)
Higher Education	37 (46.2%)	24 (48.0%)
Professional status		
Employed	70 (87.5%)	46 (92.0%)
Retired	6 (7.5%)	3 (6.0%)
Unemployed	4 (5.0%)	1 (2.0%)
Place of residence		
Major city, over 100,000 inhabitants	55 (68.8%)	33 (66.0%)
Minor city, up to 100,000 inhabitants	20 (25.0%)	13 (26.0%)
Village	5 (6.2%)	4 (8.0%)

M, Mean; SD, Standard Deviation.

RESULTS

Socio-Demographic Characteristics

Table 1 presents the socio-demographic characteristics of the initial sample and the studied sample. Most patients were married, had at least secondary education and were employed. The majority were males and lived in major cities with over 100, 000 inhabitants. The socio-demographic structure of the final sample was similar to the structure of the initial sample.

Out of 50 patients, 33 patients (66.0%) had BMI scores in the range between 25 and 30, indicating that they were overweight. A total of 17 patients (34.0%) had BMI scores higher than or equal to 30, which indicates obesity.

Change Between Consecutive Measurements

Table 2 presents descriptive statistics for the analyzed variables acquired at the first and the second measurements. In the case of variables that were measured twice, dependent samples *t*-tests were computed. There were statistically significant changes in Physical Quality of Life ($p < 0.001$), Correct Eating Habits ($p < 0.001$), Preventive Behavior ($p = 0.004$), Health Practices ($p = 0.042$), BMI index ($p = 0.019$), Fat-free Mass ($p = 0.046$), and BMR ($p = 0.019$). The mean value of the Physical Quality of Life was lower at the second measurement. Note, however, that the SF-36 inventory uses reverse scoring, meaning that lower values indicate better QoL. Within 15 months, the patients acquired better Eating Habits, Preventive Behavior, Health Practices, lower BMI, higher Fat-free Mass, and lower BMR. These results reveal significant improvement in lifestyles and Physical Quality of Life. However, there were no statistically significant changes regarding Emotional Quality of Life ($p = 0.294$), Positive Mental Attitude ($p = 0.249$), Fat Mass ($p = 0.058$), or Intracellular Water ($p = 0.451$).

The Role of Temperamental and Personality Traits

The first step in exploring the role of temperamental and personality traits was a set of hierarchical regression analyses. Each indicator of health, health behavior, and QoL that changed significantly from the first to the second measurement was analyzed in a separate model. The values from the second measurement were analyzed as dependent variables. The values of each indicator from the first measurement were included in each model in the first block with the use of the entry method, letting us to interpret the results of the regression analyses in terms of a difference between the first and the second measurements. The second block was concerned with temperamental traits and the third block with personality traits. Both temperamental traits and personality traits were entered stepwise into the model. The use of the stepwise method helped us to identify the temperamental and personality traits that were the best predictors of health, health behaviour, and QoL in the second measurement. The regression coefficients acquired in the final models are presented in **Table 3**.

The values of each indicator from the first measurement correlated positively with the values from the second measurement. There was a positive relationship between Sensory Sensitivity and change in Preventive Behavior. The higher Sensory Sensitivity the greater the increase in Preventive Behavior. There were also negative relationships between Perseveration

TABLE 2 | Descriptive statistics for analyzed variables acquired in the first and second measurements with the values of statistical tests for differences.

Variables	First Measurement				Second Measurement				*t*	Value of *p*
	M	*SD*	*S*	*K*	*M*	*SD*	*S*	*K*		
Briskness	15.44	3.30	−0.79	0.24	–	–	–	–	–	–
Perseveration	11.30	4.20	−0.27	−0.07	–	–	–	–	–	–
Sensory Sensitivity	14.70	3.35	−0.62	−0.22	–	–	–	–	–	–
Emotional Reactivity	10.18	4.89	−0.23	−0.77	–	–	–	–	–	–
Endurance	9.36	4.64	−0.05	−0.37	–	–	–	–	–	–
Activity	8.04	4.55	0.15	−0.89	–	–	–	–	–	–
Neuroticism	86.45	20.24	0.40	−0.81	–	–	–	–	–	–
Extraversion	101.70	19.22	−0.26	0.91	–	–	–	–	–	–
Openness to Experience	101.32	17.85	0.80	0.52	–	–	–	–	–	–
Agreeableness	115.91	13.93	0.04	0.86	–	–	–	–	–	–
Conscientiousness	121.64	13.23	−0.67	0.63	–	–	–	–	–	–
Physical quality of life (QoL)	31.05	13.82	0.57	0.56	22.56	10.53	0.84	0.88	4.60	0.001
Emotional QoL	20.48	10.10	0.80	0.15	19.36	10.29	0.43	0.48	1.06	0.294
Correct Eating Habits	3.11	0.79	−0.26	−0.20	3.70	0.73	−0.85	0.87	−6.47	0.001
Preventive Behavior	3.38	0.65	−0.46	−0.52	3.64	0.61	−0.69	−0.28	−3.00	0.004
Health Practices	3.33	0.52	−0.03	0.51	3.56	0.59	−0.28	0.26	−2.09	0.042
Positive Mental Attitude	3.57	0.57	−0.97	0.38	3.69	0.50	−0.23	−0.80	−1.17	0.249
BMI Index	32.71	4.28	0.20	−0.03	32.25	3.85	0.83	−0.27	2.42	0.019
Fat Mass	31.76	9.53	0.46	0.24	30.34	8.47	0.74	0.66	1.94	0.058
Fat-free Mass	67.76	11.02	−0.36	−0.66	68.77	11.64	−0.50	−0.34	2.05	0.046
Intracellular Water	50.31	8.56	−0.36	−0.69	49.89	7.39	−0.40	−0.06	0.76	0.451
Basal Metabolic Rate	2060.32	349.67	−0.18	−0.67	2020.37	321.93	−0.23	−0.29	2.42	0.019

Temperamental traits and personality traits were measured only once. M, mean value; SD, standard deviation; S, skewness; K, kurtosis; t, dependent samples t test; p, statistical significance.

TABLE 3 | Temperamental and personality traits analyzed as predictors of health indicators in the second measurement.

Dependent variable Second measurement	Predictors First measurement	β	t	ΔR^2	Value of p
Correct Eating Habits	Correct Eating Habits	0.68	6.16	0.457	0.001
Preventive Behavior	Preventive Behavior	0.44	3.49	0.262	0.001
	Sensory Sensitivity	0.27	2.09	0.067	0.042
Health Practices	Health Practices	0.44	3.30	0.206	0.002
Physical QoL	Physical QoL	0.56	4.21	0.312	0.001
BMI Index	BMI Index	0.89	10.78	0.789	0.001
Fat-free Mass	Fat-free Mass	0.95	23.04	0.931	0.001
	Perseveration	–0.08	–2.02	0.008	0.051
	Agreeableness	0.10	2.60	0.010	0.014
BMR	Basal Metabolic Rate	0.95	20.54	0.913	0.001
	Perseveration	–0.09	–2.07	0.010	0.046
	Agreeableness	0.12	2.67	0.014	0.012

β, standardized regression coefficient; t, value of the test for predictors' statistical significance; p, statistical significance; ΔR^2, the change in determination coefficient.

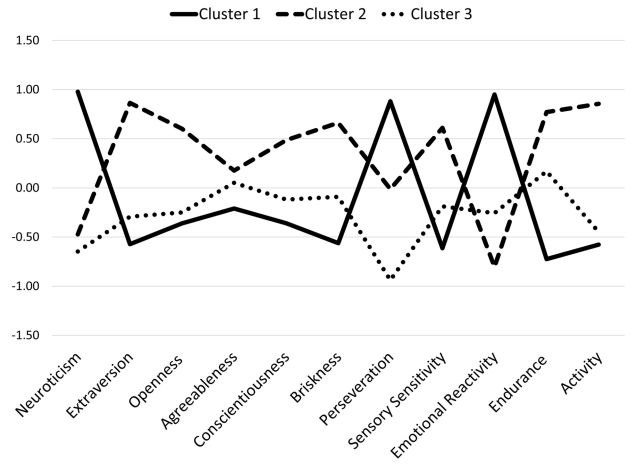

FIGURE 1 | The final cluster centers in the three extracted types of temperamental and personality traits profiles. Cluster 1, higher Neuroticism, Perseveration, and Emotional Reactivity; Cluster 2, higher Extraversion, Briskness, Sensory Sensitivity, Endurance, Activity, and Conscientiousness; Cluster 3, lower Perseveration.

and the change in Fat-free Mass and BMR. Higher Perseveration was linked with smaller increase in Fat-free Mass and less reduction in BMR. Finally, there were positive relationships between Agreeableness and the change in Fat-free Mass and BMR. Higher Agreeableness was linked with greater increase in Fat-free Mass and greater BMR reduction. The temperamental and personality traits explained from 1.0 to 6.7% of the detected changes from the first measurement to the second measurement.

The next step in exploring the role of temperamental and personality traits was k-means cluster analysis. This analysis allows for the identification of subgroups of patients (i.e., clusters). All patients in a given subgroup thus identified have a similar profile of temperamental and personality traits. The profiles of patients from different subgroups have different profiles. This method tries to divide the subgroups such that they differ as much as possible. Three clusters were extracted. The final cluster centers are depicted in **Figure 1**.

There were statistically significant differences between the extracted clusters in terms of Neuroticism, $F\ (2,\ 47) = 27.84$, $p < 0.001$, $\eta^2 = 0.54$, Extraversion, $F\ (2,\ 47) = 15.10$, $p < 0.001$, $\eta^2 = 0.39$, Openness to Experience, $F\ (2,\ 47) = 5.26$, $p < 0.01$, $\eta^2 = 0.18$, Conscientiousness, F $(2,\ 47) = 3.41$, $p < 0.05$, $\eta^2 = 0.13$, Briskness, $F\ (2,\ 47) = 8.05$, $p < 0.01$, $\eta^2 = 0.26$, Perseveration, $F\ (2,\ 47) = 24.83$, $p < 0.001$, $\eta^2 = 0.51$, Sensory Sensitivity, $F\ (2,\ 47) = 8.72$, $p < 0.01$, $\eta^2 = 0.27$, Emotional Reactivity, $F\ (2, 47) = 28.75$, $p < 0.001$, $\eta^2 = 0.55$, Endurance, $F\ (2, 47) = 15.26$, $p < 0.001$ $\eta^2 = 0.39$, and Activity, $F\ (2,\ 47) = 18.42$, $p < 0.001$ $\eta^2 = 0.44$. The three clusters did not differ only in terms of Agreeableness, $F\ (2,\ 47) = 27.84$, $p > 0.05$. The patients from the first cluster ($n = 17$) were characterized by higher Neuroticism, Perseveration, and Emotional Reactivity. The patients from the second cluster ($n = 16$) had higher levels of Extraversion, Briskness, Sensory Sensitivity, Endurance, Activity, and Conscientiousness. The patients from the third cluster ($n = 17$) had lower levels of Perseveration. Based on the results of the previous studies presented in the introduction to this paper (Lahmann et al., 2011; Gerlach et al., 2015; Garrido et al., 2018), it should be expected that the first cluster of traits would hinder adherence to the recommended guidelines, while the second cluster would foster behavioral changes and help to develop self-control. A lower level of Perseveration, which is the tendency to repeat emotional states even in the absence of the stimuli that evoked these states, does not have a clear, well-established impact on adherence to diet and physical activity guidelines.

In the next stage of statistical analysis, cluster membership was analyzed as a moderator of the changes between the two measurements, with the use of mixed-model repeated measure analysis of variance. The interaction effects between the cluster membership and the change from the first to the second measurement were tested in order to investigate moderation. Because it was possible that a change occurred only in a subgroup of participants, the analysis was performed for all of the dependent variables – not only for the variables for which a significant change was detected in the preliminary analysis presented in **Table 2**. **Table 4** presents the values of the interaction effects tests.

TABLE 4 | Statistical tests of interaction effects between cluster membership and the change from the first to the second measurement.

Variables	*F*	η^2	Value of *p*
Correct Eating Habits	1.19	0.05	0.314
Preventive Behavior	1.12	0.05	0.335
Health Practices	4.53	0.17	0.016
Positive Mental Attitude	0.11	0.01	0.896
Physical QoL	0.47	0.02	0.628
Emotional QoL	4.17	0.16	0.022
BMI Index	0.90	0.04	0.414
Fat Mass	3.18	0.13	0.051
Fat-free Mass	2.72	0.11	0.077
Intracellular Water	2.91	0.12	0.065
Basal Metabolic Rate	2.01	0.08	0.146

F, interaction effect test value; p, statistical significance; η^2, partial eta-squared.

Two interactions were statistically significant. The first one concerned Health Practices and the second one concerned Emotional Quality of Life. The level of Health Practices (i.e., daily habits pertaining to physical activity and rhythms of sleep and wakefulness) in the first measurement was significantly lower in the first cluster of patients with higher Neuroticism, Perseveration, and Emotional Reactivity, 95%CI: [3.01, 3.22], than in the second cluster of patients with higher Extraversion, Briskness, Sensory Sensitivity, Endurance, and Activity, 95%CI: [3.23, 3.53], or in the third cluster of patients, with lower Perseveration, 95%CI: [3.49, 3.73] (see **Figure 2**A). However, in the group of the patients from the first cluster, there was statistically significant progress: by the second measurement, they had reached the level of the patients from the second cluster, 95%CI: [3.38, 3.69]. The level of Health Practices in the second cluster, 95%CI: [3.39, 3.69], and in the third cluster, 95%CI: [3.41, 3.74], did not differ between the two consecutive measurements.

Similarly, the patients from the first cluster were characterized by lower Emotional Quality of Life at the first measurement, 95%CI: [22.69, 28.01], but progressed significantly, 95%CI: [17.01, 21.18], and at the second measurement had the same levels as the patients from the second cluster, 95%CI: [16.99, 21.79] and the third cluster, 95%CI: [12.88, 18.02] (in the Polish version of the SF-36, higher scores mean lower QoL while lower scores mean a higher QoL), while the patients from the second cluster, 95%CI: [16.84, 22.83], and the third cluster, 95%CI: [11.17, 16.97], were at the same level at both measurements (see **Figure 2**B).

The level of Health Practices at the second measurement correlated negatively with the indicator of Emotional Quality of Life in the total sample, $r\ (48) = -0.26$, $p < 0.05$. Moreover, only in the group of the patients from the second cluster, with higher Extraversion, Briskness, Sensory Sensitivity, Endurance, and Activity, did the level of Health Practices at the first measurement correlate negatively with the indicator of Emotional Quality of Life at the second measurement, $r\ (15) = -0.44$, $p < 0.05$, and the indicator of Emotional Quality of Life at the first measurement correlate negatively with the level of Health Practices at the second measurement, $r\ (15) = -0.47$, $p < 0.05$.

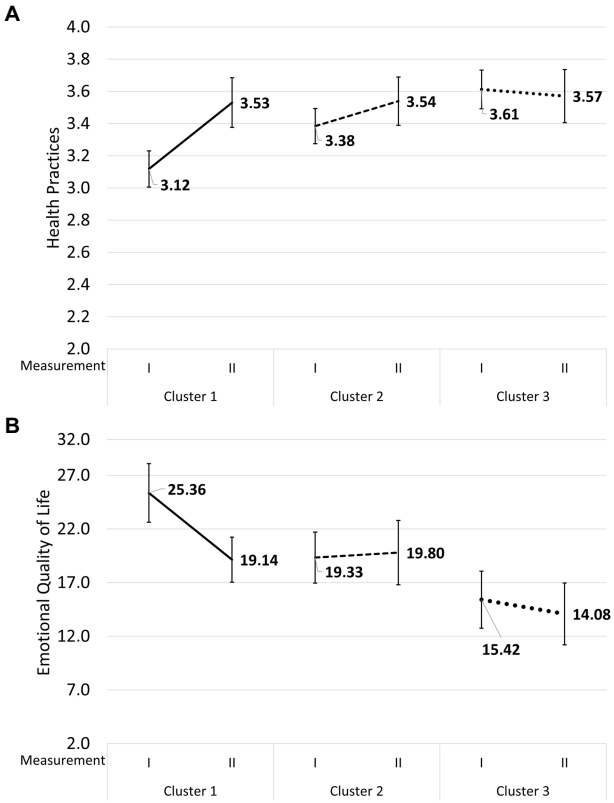

FIGURE 2 | Mean values and 95% confidence intervals for Health Practices **(A)** and Emotional Quality of Life **(B)** at the first and the second measurements in the group of patients with higher Neuroticism, Perseveration, and Emotional Reactivity, in the group of patients with higher Extraversion, Briskness, Sensory Sensitivity, Endurance, and Activity, and in the group of patients with lower Perseveration.

DISCUSSION

All patients improved over the course of the 15 months in terms of Physical Quality of Life, Eating Habits, adherence to doctors' advice and treatment, rhythms of sleep and wakefulness, and physical activity. The improvement could also be seen in the lower BMI values, lower BMR values, and the higher values of Fat-free Mass. Hypothesis 1 was confirmed by the results. Opportunities for improvement in groups of patients diagnosed with metabolic syndrome have also been demonstrated in other studies (Lin et al., 2014; Barnes and Barber, 2017), even when the psychological interventions had a very limited scope – for example, when they were home-based (Blackford et al., 2016) or carried out by phone (Lin et al., 2016). We found that higher Sensory Sensitivity, lower Perseveration, and higher Agreeableness foster positive change. In the group of patients with higher Neuroticism, Perseveration, and Emotional Reactivity, levels of Emotional Quality of Life and Health Practices were significantly lower in comparison with the patients with higher Extraversion, Endurance, and Activity and in comparison with the patients with lower Perseveration. Lower levels of Health Practices were accompanied by lower levels of Emotional Quality

of Life in the whole sample. As expected, patients with higher Neuroticism, Perseveration, and Emotional Reactivity were in worse condition in both of these areas. These three characteristics make engaging in compulsive eating behaviors in order to discharge psychological tension more likely. Neuroticism has been demonstrated to be associated with lower QoL (Bobić, 2012). Perseveration and Emotional Reactivity were also found to be negatively associated with QoL, for example, in patients diagnosed with malignant neoplasm (Burnos and Bargiel-Matusiewicz, 2018). However, the patients with all three adverse factors (i.e., those with higher Neuroticism, Perseveration, and Emotional Reactivity) improved in terms of Emotional Quality of Life and Health Practices, attaining the same level as other patients, while patients with other profiles of temperamental and personality traits did not change, which supports hypothesis 2. Higher levels of Neuroticism, Perseveration, and Emotional Reactivity can lead to an adverse pattern of emotional regulation, characterized by internalizing psychological tension instead of efficient coping, *inter alia*, through physical activity (Robinson et al., 2006; Boyes et al., 2017). The persistent ruminations and worry associated with Neuroticism can also lead to somatic complaints (Denovan et al., 2019). This process can also have an adverse effect on quality of sleep by dysregulating rhythms of sleep and wakefulness. Daily rumination and negative affect have been found to be mediators of the relationship between Neuroticism and impaired sleep (Slavish et al., 2018). Emotional Quality of Life can be affected both directly by ineffective stress management and indirectly through poor sleep quality. Poor Emotional Quality of Life can, in turn, negatively affect coping mechanisms by instigating a sort of vicious circle of maladaptive behaviors. However, the mechanisms and interrelations between Emotional Quality of Life and stress management still need further investigation through longitudinal studies (Gutiérrez Dona, 2003). The results of this study suggest that an individual motivational approach can be effective in this group of patients. They achieved parity in terms of Emotional Quality of Life and Health Practices with other patients and also improved their rhythms of sleep and wakefulness and enhanced their physical activity, which are accompanied by better Emotional Quality of Life. It seems that motivational counseling is effective for patients diagnosed with metabolic syndrome in general, but patients with higher Neuroticism, Perseveration, and Emotional Reactivity can benefit even more, as they are often in poorer psychological condition before the motivational intervention. For them, individual motivational intervention may also be particularly useful, because patients with higher Neuroticism are known to have higher dropout rates from periodic health screenings (Armon and Toker, 2013).

The relationship between Health Practices and Emotional Quality of Life is best seen in the group of patients with higher Extraversion, Briskness, Sensory Sensitivity, Endurance, and Activity, who also display a straightforward link between emotional states and task-oriented coping (Kaiseler et al., 2019). The pattern by which Emotional Quality is related to Health Practices measured after 15 months and Emotional Quality reflects Health Practices 15 months ago suggests a reciprocal relationship.

Personality and temperamental traits explain, to some extent, the functioning of patients with metabolic syndrome in the area of emotional regulation. However, even the patients with the most disadvantageous temperamental personality profile can undergo positive change to at least equal other patients in terms of Health Practices and Emotional Quality of Life. The scores acquired in the second measurement in this group of patients differed from the other patients by less than 5%.

The current study has certain limitations. Firstly, there were only two measurements. The conclusions would be stronger if they were based on a longer period and/or on a greater number of measurements. It would also make plotting the trajectories of changes possible. Secondly, cluster analysis allows many aspects of patients' functioning to be taken into consideration, but it also imposes the existence of clusters. The characteristics of each extracted subgroup are purely empirical. However, the algorithm does not assure their replicability. This means that the identified clusters of patients may differ in subsequent studies.

Furthermore, the conclusions from this study can be generalized only to patients with all properties of the profiles. For example, in this study, we describe a group of patients with higher Neuroticism, Perseveration, and Emotional Reactivity. The conclusions drawn relate to such patients, but not to patients who only have higher Neuroticism without elevated Perseveration and Emotional Reactivity. The current study was limited to only a clinical group, with no control group. A control group without any motivational intervention could strengthen the conclusions drawn. Future research should examine a variety of motivational interventions on a larger sample. This would allow researchers to examine, for example, whether exploring the long-term health consequences of metabolic syndrome or addressing patients' ambivalence and uncertainty are necessary elements of effective motivational interventions.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Bioethical Committee of the Military Institute of Medicine. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AB and AS contributed to conception and design of the study, and wrote sections of the manuscript. AB organized the database, performed the statistical analysis, and wrote the first draft of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

FUNDING

The research was funded by subvention of the Ministry of Education and Science. The publication was supported by the Faculty of Psychology, University of Warsaw, from the funds awarded by the Ministry of Science and Higher Education in the form of a subsidy for the maintenance and development of research potential in 2021 (501-D125-01-1250000 zlec*.5011000229).

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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frontiers in Psychology

ORIGINAL RESEARCH
published: 17 December 2021
doi: 10.3389/fpsyg.2021.702678

Elevating Subjective Well-Being Through Physical Exercises: An Intervention Study

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Background: Physical activity is associated with higher levels of subjective well-being. However, little research has been conducted in naturalistic conditions with a longitudinal design. In the current study, we aimed to examine whether regular activity initiation can impact happiness, life satisfaction, and self-esteem 4 weeks later.

Methods: The sample ($N = 217$, 124 women) was divided into three groups based on level of physical activity (active people, beginners, and inactive people). The participants completed measures of happiness, satisfaction with life, self-esteem, and a survey on physical activity. Ninety-five of participants who completed the same set of measures sent by email after 4 weeks were included in the analyses.

Results: The study showed a strong relationship between subjective well-being and physical activity. Active people showed higher levels of happiness and self-esteem compared to beginners and inactive people and a higher level of life satisfaction than inactive people. Furthermore, after 4 weeks of exercising, beginners revealed greater life satisfaction and happiness compared to the baseline.

Conclusion: These findings confirm that regular physical activity leads to higher levels of well-being. It seems that even a short engagement in physical activity (4 weeks) may contribute to an increase in subjective well-being.

Keywords: physical activity, subjective well-being, happiness, life satisfaction, self-esteem, exercises

OPEN ACCESS

Edited by:
Marja Kaunonen, Tampere University, Finland

Reviewed by:
R. David Hayward, Ascension St. John Hospital, United States
Giorgia Varallo, Istituto Auxologico Italiano (IRCCS), Italy

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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *29 April 2021*
Accepted: *15 November 2021*
Published: *17 December 2021*

Citation:
Iwon K, Skibinska J, Jasielska D and Kalwarczyk S (2021) Elevating Subjective Well-Being Through Physical Exercises: An Intervention Study. Front. Psychol. 12:702678. doi: 10.3389/fpsyg.2021.702678

INTRODUCTION

Sport is considered to be the foundation of a healthy life. More and more studies have shown that physical activity is necessary not only for physical (Blair et al., 2004; Penedo and Dahn, 2005; Warburton and Bredin, 2017) but also for mental health (Paluska and Schwenk, 2000; Biddle and Asare, 2011; White et al., 2017). A healthy lifestyle is becoming more and more popular and desirable worldwide, especially among younger generations (Park and Kang, 2008; Cypryańska and Nezlek, 2019). In general, adults present a decreasingly healthy lifestyle over the years (King et al., 2009). However, existing research findings are not conclusive because a healthy lifestyle also plays a significant role among the elderly. A healthy lifestyle is more common among women, more educated people, those who are less focused on sensation seeking, those who have a tendency to plan ahead, and those who perform fewer social roles (Divine and Lepisto, 2005). Proper education enables the development of appropriate habits

related to physical activity and medical checkups (Park and Kang, 2008).

A global trend has shown that the rate of insufficient physical activity has remained stable over the past 15 years. Furthermore, physical activity is generally less frequent in highly developed countries than in poorer ones (Guthold et al., 2018). However, in several affluent countries (like England), increased physical activity has been reported before COVID-19 pandemic (Active Lives Adult Survey November 2019/20 Report, 2021). In European Union countries, two out of five residents exercise at least once a week and 7% at least five times a week. The largest proportions of physically active people live in Finland, Sweden, and Denmark. The lowest proportions of physically active people were reported in Bulgaria, Greece, and Portugal. A total of 56% of Poles neither exercise nor do sports (Special Eurobarometer 472 Sport and Physical Activity, 2018; Sport England, 2018). Unfortunately, lockdown led to an even more significant decrease in physical activity (Active Lives Adult Survey November 2019/20 Report, 2021).

Physical activity is associated with increases in many aspects of subjective well-being, such as happiness, life satisfaction, and mood regulation (Paskova, 2010; Maher et al., 2014; Pengpid and Peltzer, 2019; Stolarska et al., 2019; An et al., 2020; Van Woudenberg et al., 2020). A question remains as to the extent to which these beneficial effects are causal and evoked by physical activity or whether other mechanisms are lying under the observed phenomenon. Finding these answers seems to be an important undertaking, especially in the current context, the global COVID-19 pandemic badly affecting both physical and emotional well-being, with people actively searching for strategies that can help them to cope with the emotional consequences of lockdown (Bodecka et al., 2021). In this study, we investigate whether commencing physical activity positively affects happiness, life satisfaction, and self-esteem after 4 weeks of exercising. We also compare the differences among groups presenting various levels of physical activity.

People want to be happy, no matter how they perceive it (Myers and Diener, 1995; Diener and Seligman, 2002; McKee, 2017). Concepts of happiness, subjective well-being, and self-worth have been studied and described by many theorists over the years (Campbell, 1976; Shin and Johnson, 1978; Fordyce, 1988; Diener, 2000; Cast and Burke, 2002; Seligman, 2005, 2018). Researchers use happiness and life satisfaction as indicators of subjective well-being. Nevertheless, the two terms capture different aspects of this phenomenon, which has two dimensions: emotional and cognitive (Diener et al., 1999). The former relates to the experience of a positive emotional state and can be reflected by happiness, whereas the latter represents the global evaluation of one's life, denoted by one's satisfaction with life. In the current study, we decided to assess both constructs to obtain a more complex picture of subjective well-being.

There is no consensus regarding the definition of happiness used by philosophers and social researchers. Fordyce (1971) describes happiness as a specific type of emotion, an overall evaluation summarizing all pleasant and unpleasant experiences from the past. According to Diener (2000), happiness indicates how much people like their own lives. In his model of happiness, Seligman (2005) took into account three elements: pleasure, sense of meaning, and commitment. In 2011, Seligman re-examined this model and suggested a new one called PERMA, an acronym for his five measurable well-being components: positive emotion, engagement, relationships, meaning, and accomplishment (Seligman, 2018). Positive emotions include emotions, such as hope, joy, love, compassion, and gratitude, and they can improve level of well-being (Fredrickson, 2001). Engagement is defined as living at the moment and fully focusing on the task (Seligman, 2011). Positive relationships in the model of Seligman (2011) refer to interactions that people have with family, partners, friends, colleagues, and community and to the sense of being valued and loved. Meaning shows individuals that there is something more important than one's self. What is more, life purpose helps to build a sense of value and worth. Accomplishments (also known as achievements) are considered as strive to the success and mastery and can lead to activation of the other components of PERMA (Seligman, 2011). The PERMA constitutes contribute to subjective well-being but also leads to decreased psychological distress (Forgeard et al., 2011). According to Seligman (2011), each domain can be pursued separately, but relationships between them provide wider spectrum of well-being. A number of researches support this broad understanding of well-being including both hedonic and eudemonic aspects (Huppert and So, 2011; Butler and Kern, 2016; Goodman et al., 2017).

Happiness is also considered the highest good, a positive internal experience, and a definitive incentive for all behaviors (Argyle, 2001). Happiness is also considered as multidimensional construct consisted of cognitive and emotional aspects (Hills and Argyle, 2001). According to the approach proposed by Lyubomirsky (2008), happiness is related to the experience of joy, contentment, and positive well-being, combined with the awareness that life has sense and is both good and meaningful. All these definitions focus on slightly different elements of happiness. In line with the concept of Seligman (2018), we assume that a feeling of happiness is a subjective assessment of the possibility of experiencing happiness in life by referring to such spheres as accomplishments, positive relationships with other people and the world, life engagement, finding a purpose, and feeling positive emotions.

Life satisfaction can be considered a cognitive aspect of subjective well-being (Diener et al., 1985; Pavot and Diener, 1993). Shin and Johnson (1978) define it as a general assessment of quality of life, related to personal criteria. Thus, one's evaluation of life satisfaction results from a comparison of one's situation with its established standards. An alternative definition (Gotay et al., 1992) describes life satisfaction as consisting of two elements: ability to cope with daily tasks and one's satisfaction with functioning in all life areas. Anand (2016) claims that life satisfaction is the best measure of how people feel about their lives. Given that the two concepts of happiness and life satisfaction complement each other, we assumed that it would be beneficial to assess both of them in the current study.

Self-esteem is also related to the concept of well-being and is sometimes included as an indicator of it (Ryff and Keyes,

1995; Cypryańska and Nezlek, 2019). Self-esteem is considered an evaluative aspect of self-concept, which refers to the self or specific fields of the self, like physical attractiveness, social standing, career path, or school achievements (Michalos, 2014). According to Leary and Baumeister (2000), it is the inner psychological monitor of social belongingness, representing a general, subjective view of the self as either worthy or unworthy. Self-esteem has been repeatedly regarded as an evaluation or an attitude. Among others, Rosenberg (1965) has stated that self-esteem refers to an overall assessment of one's value, which may be represented by an attitude toward oneself, especially one's own abilities or other socially important features. Depending on one's subjective evaluation and emotional attitude toward one's own characteristics, self-esteem can be either positive or negative. Strelau (2000, p. 573) presents a different definition of this concept. He believes that self-esteem is an evaluation of the self, understood as a generalized, relatively persistent assessment of oneself as a person. Harter (2012) also defines self-esteem as a stable trait that is built during one's life. As components, it includes a rating of physical attractiveness, interpersonal skills, sense of humor, and various other skills. Numerous studies indicate a positive relationship between self-esteem and happiness among children (Dai and Chu, 2018) and adults (Tan et al., 2017).

Although the relationship between physical activity and subjective well-being has been studied more than once, researchers are still finding new fields to explore. Physical activity is defined as muscle work characterized by over-resting energy expenditure (Caspersen et al., 1985). It can affect the life quality of people of all ages (Rottermund et al., 2015; Cihan et al., 2018; Gümüş and Isik, 2018). Comparative studies conducted in clinical groups indicate that sport practiced regularly improves people's moods and prevents depression (Blumenthal et al., 1999). One study has indicated a significantly higher sense of life quality, life satisfaction, and self-esteem among dance class participants (Gałuszka, 2017). Even a small amount of physical activity increases adolescents' subjective well-being and self-satisfaction and contributes to more frequent experiences of positive emotions (Paskova, 2010). Those effects are often explained by the secretion of endorphins, which increase during exercises and improve mood (Starosta, 1995).

A higher level of happiness or life satisfaction is one of the many significant benefits of doing sports. Engaging in physical activity or participating in sports is associated with improvements in life satisfaction and self-assessed health status (Zullig and White, 2011; Orlowski and Wicker, 2017; Schmiedeberg and Schröder, 2017). Sport is also considered a beneficial way to spend free time (Richards et al., 2003; Lorenzo et al., 2018). Researchers have noticed a positive effect between active rest and leisure satisfaction among male students. However, for both sexes, leisure satisfaction is associated with improved well-being, understood as increased life satisfaction and decreased stress (Shin and You, 2013). A sense of happiness is more closely related to membership in a sports organization than other recreational activities (Balish et al., 2016). The beneficial effect of physical activity has been observed for different types of sports. For example, in one study the successful completion of a 45-min aerobic session was found to lead to mood enhancement in female students (Stolarska et al., 2019). In another investigation, people practicing recreational tennis manifested a higher level of happiness than those who spent their free time passively (Majewska, 2011). Moreover, Cypryańska and Nezlek (2019) found that different aspects of well-being such as self-esteem, self-efficacy, life satisfaction, and positive effect increased when participants were running in organized races.

Regular exercises affect various aspects of well-being beyond improving mental health. According to Franks and Howley (1998), physical fitness is strongly associated with health and can lead to optimal life quality. When dosed properly, it affects both the physical and the mental self (Carr, 2009). People engaged in regular physical activity tend to have higher levels of self-esteem, optimism, and happiness than inactive physical adults (Cekin, 2015). Self-esteem also increases regardless of the practitioner's age. Physical activity is associated with increased self-awareness and self-esteem among children and adolescents (Liu et al., 2015). The situation seems to be similar in the case of older people. Indeed, the physical activity of older people brings higher levels of self-esteem and is associated with better social status and relationships (Algarín and Sarasola-Sánchez-Serrano, 2018). Another study has found that physically active women experience more positive feelings and emotions and less sadness, dissatisfaction, senselessness, loneliness, exhaustion, and harm (Demuth and Czerniak, 2011). Sport, combined with a properly balanced diet, is a good premise for improving life quality and increasing self-esteem (Zurita Ortega et al., 2018). Sports and diets are directly related to self-esteem, perceived physical fitness, and body image (Zamani Sani et al., 2016).

Although the beneficial effect of physical activity on well-being seems to be well established, several issues need to be addressed. First of all, given that the majority of research is correlational, there is little evidence of causal relationships between exercises and happiness from longitudinal studies. Does regular activity lead to elevated well-being? Existing data often comprise clinical samples (Blumenthal et al., 1999; Cooney et al., 2013), and their effects cannot be generalized to healthy populations. To address the issues mentioned above, we designed a study to further explore the links between subjective well-being and physical activity in a naturalistic setting. Conducting a study in a naturalistic design supports the practical relevance of the research for designing future interventions that can elevate various aspects of subjective well-being.

In the current study, we compared the levels of happiness, satisfaction with life, and self-esteem among three groups based on their level of physical activity: participants who exercise regularly in a fitness club or a similar facility (Group 1 – active people); people who were just starting to engage in physical activity (Group 2 – beginners); and those who do not exercise (Group 3 – inactive people). Furthermore, to investigate the impact of exercise on well-being, we conducted our measures twice: at the moment of initiation for Group 2 and 4 weeks later. Based on the studies described above that indicate the existence of a relationship between physical activity and a sense

of happiness and life satisfaction (Paskova, 2010; Zullig and White, 2011; Nowak, 2013; Siwy-Hudowska, 2013; Schmiedeberg and Schröder, 2017; Zayed et al., 2018), we expected that people who exercise regularly would show a higher level of happiness (H1) and life satisfaction (H2) than beginners in physical activity and people who do not practice sport. Based on the results of the previous research showing a positive relationship between physical activity and positive self-esteem (Moral-García et al., 2018), we expected that active people would have higher self-esteem than the other two groups (H3). According to the PERMA concept, physical activity should increase well-being because it is connected to all of the components:

- P (positive emotions): Endorphins are released during sport activities (Starosta, 1995),
- E (engagement): Sport may become a passion which gives individuals state of flow (Puig Barata, 1995),
- R (relationships): Regular physical activity at the gym or in the group impacts sense of belonging and helps building relationships with people with similar interests (MacPhail et al., 2004),
- M (meaning): Physical activity helps people to take care of their health, so it can be considered as conscious self-care and chance to self-realization (Khan et al., 2012),
- A (accomplishments): When practicing sports, people can easily observe positive effects such as increase in the level of energy and fitter figure (Chaput et al., 2011).

To assess whether the obtained effect is persistent and exercising leads to changes in well-being, we decided to re-measure all the variables after 4 weeks. We were encouraged by the results of Wicker et al. (2015) demonstrating that life satisfaction increased after participating in four-week fitness programs. In this study, we expected changes not only in the level of life satisfaction but also in happiness and self-esteem in the group of beginners (H4). Therefore, our study represented an extension of the research conducted to date. Investigating these relationships was a noteworthy undertaking as the results could help design future interventions aimed at increasing subjective well-being.

MATERIALS AND METHODS

Procedure and Participants

All participants were volunteers. They were asked in person or indirectly by research assistants to complete self-report questionnaires. Regular exercisers were recruited in facilities belonging to a fitness club chain in Warsaw and the surrounding area. Clients of those facilities were approached at the reception desk and proposed to participate in a study on the relationship between physical activity and well-being. Approximately 30% of participants approached in the gym agreed to participate in the study. Beginners and inactive people were recruited among residents of Warsaw and its surroundings. The respondents were scouted among researchers' friends through social media and in location such as universities and workplaces. The snowball effect was also used in the study. Some beginners were new clients of fitness clubs and gyms.

The study lasted over 2 months, from January 11 to March 19, 2019. Initially, the respondents received a set of paper questionnaires (first survey) with a separate card to write down their email address and date of entering the study. Four weeks after completing the first survey, participants received at the provided email address a link to an online survey (second survey). In addition, two emails were sent with a reminder to complete the questionnaires 2 days apart. Informed consent was obtained from all participants, and all were informed of their responses' anonymity. There were no incentives for participation. All procedures performed in the study were in accordance with the ethical standards of the relevant institutional review board and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

The sample consisted of 295 people, although 78 were later excluded either because: (1) people under the age of 18; (2) people who declared exercising once or twice a week (we decided to exclude this group in order to compare active persons with inactive ones); and (3) people who exercised before the study but did not plan to exercise in the following month at the gym or fitness club because they did not meet our criteria and did not qualify for any of our groups. Further statistics included 217 participants. A total of 57.1% of the respondents were women, 41.9% were men, and 1% were people who did not identify with either of these genders or did not answer the question. Women accounted for 54.1% of the active people, 56.7% of beginners, and 60.5% of inactive people. The respondents' ages ranged from 18 to 64 years ($M = 29.57$, $SD = 9.11$). The average age in the studied groups was as follows – active people ($M = 30.51$, $SD = 9.40$), beginners ($M = 26.97$, $SD = 6.59$), and inactive people ($M = 30.95$, $SD = 10.30$). The majority of respondents (55.3%) declared completing higher education, followed by secondary education (37.8%), vocational education (4.7%), and primary education (1.4%). Two people did not answer the question about education. Most of the people who exercised had higher education 55.4%, followed by secondary education 37.8%. Among beginners, 67.2% had higher education and 31.3% secondary education. Among those who do not exercise 44.7% declared higher education, 43.4% secondary education and 9.2% vocational education. **Table 1** shows the age, gender, and education data divided by groups for both measures. Most of the participants were employed (56.2%). Studying and working respondents accounted for 24.9% of the sample and just studying 14.7%. The least numerous group (4.1%) represented unemployed people who were not studying.

The participants were divided into three groups based on their frequency of physical activity: active people (74 participants), beginners (67 participants), and inactive people (76 participants). Based on the Chi-square test, it can be stated that the groups were equinumerous, so the distribution was not significantly different from the random distribution, $X^2(2, N = 217) = 0.62$, $p = 0.734$. Physical activity was defined as participation in classes organized by fitness clubs or gyms, requiring physical fitness and endurance and/or performing physical exercises outside

TABLE 1 | Demographic data (age, gender, and education level) data divided into groups for first (T1) and second (T2) measurement.

		N	Age	Gender		Level of education	
T1	Active people	74	30.51	Female	54.1%	Primary education	0%
				Male	44.6%	Vocational education	4.1%
				No data	1.4%	Secondary education	37.8%
						Higher education	55.4%
	Beginners	67	26.97	Female	56.7%	Primary education	1.5%
				Male	41.8%	Vocational education	0%
				Other	1.5%	Secondary education	31.3%
						Higher education	67.2%
	Inactive people	76	30.95	Female	60.5%	Primary education	2.6%
				Male	39.5%	Vocational education	9.2%
						Secondary education	43.4%
						Higher education	44.7%
T2	Active people	23	30.57	Female	65.2%	Primary education	0%
				Male	34.8%	Vocational education	8.7%
						Secondary education	43.5%
						Higher education	47.8%
	Beginners	34	28.71	Female	61.8%	Primary education	0%
				Male	35.3%	Vocational education	0%
				Other	2.9%	Secondary education	32.4%
						Higher education	67.6%
	Inactive people	38	29.39	Female	65.8%	Primary education	2.6%
				Male	34.2%	Vocational education	5.3%
						Secondary education	42.1%
						Higher education	50.0%

fitness clubs or gyms, other than work or housekeeping duties. Active people were considered those who had been doing physical activity for at least 3 months, on average, three times a week or more, for a minimum of 30 min in one exercise session. Beginners were people who had not been doing physical activity or had been doing it irregularly in the past 3 months (on average less than once a week) and expressed a willingness to start physical activity in a fitness club or gym at least twice a week for a month.[1] Inactive people had not been engaging in any physical activity or had been doing so less than once a week during the previous 3 months and did not express a desire to begin physical activity within the next month.

Only 140 participants completed the second questionnaire. The analysis included 95 people consisting of adult participants and those who met the conditions for being either active, a beginner or inactive. In order to verify Hypothesis 4, the sample was divided into the previously mentioned groups of active people (23 participants), beginners (34 participants), and inactive people (38 participants), according to the actual physical activity undertaken by the participants in the past 4 weeks. The group of active people consisted of people who were physically active at least three times a week during the 3 months before and during the study. The group of beginners consisted of people who exercised at least twice a week during the research yet had not participated in physical activity or had exercised less than once a week during the 3 months before starting the study. The inactive group consisted of people who had not exercised for the previous 4 months. According to the Chi-square test, these groups were also equinumerous: $X^2(2, N=95)=3.81$, $p=0.149$.

[1]The study was conducted at the beginning of January, taking into consideration that starting to exercise is a popular New Year's resolution.

Measures

Happiness

The Oxford Happiness Questionnaire (OHQ; Hills and Argyle, 2002; Polish adaptation: Poprawa, 2008) is a measure of human happiness potential, meaning the possibility of experiencing happiness in life. It consists of 29 items (such as "I have very warm feelings towards almost everyone") and contains a six-point scale of answers ranging from 1 – "I strongly disagree," to 6 – "I strongly agree." The reliability of the scale was good: $\alpha=0.921$ for the first measurement and $\alpha=0.943$ for the second.

Life Satisfaction

We used the Satisfaction With Life Scale (SWLS; Diener et al., 1985; Polish translation: Jankowski, 2015), which assesses a person's general sense of satisfaction with their quality of life. It contains five statements (such as "I am satisfied with my life"). Participants answer using a seven-point Likert scale (from 1 – "Definitely disagree," to 7 – "Definitely agree"). The reliability of the scale was good: $\alpha=0.830$ for the first measurement and $\alpha=0.894$ for the second.

Self-Esteem

We used the Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965; Polish adaptation: Łaguna et al., 2007), which evaluates a person's level of general self-esteem, defined as a relatively constant disposition denoting a conscious attitude toward the self, which affects the individual's emotions, thoughts, and behaviors. It consists of 10 statements (such as "I feel that I have a number of good qualities"). Participants answer using a four-point scale of answers (from 1 – "Strongly agree,"

FIGURE 1 | Average level of happiness in groups of active people, beginners, and inactive people.

to 4 – "Strongly disagree"). The reliability of the scale was good: $\alpha = 0.889$ for the first measurement and $\alpha = 0.913$ for the second.

Survey Regarding Physical Activity

The respondents also completed a survey on physical activity, in which they answered the following closed-ended questions: "How often in the past 3 months have you practiced sports or taken up physical activity?," "Do you intend to undertake or continue engaging in physical activity at a gym or fitness club in the next month, at least twice a week?," and "How do you evaluate the level of your activity?" A further question was open-ended: "How long does your average training last? Please enter the approximate time in minutes." The participants also filled in demographic data, such as age, gender, education, place of residence, and professional situation.

RESULTS

Main Results

The analysis began by determining the Spearman's correlation of dependent variables, taking into account the sample of people over 18 years of age from divided into three groups according to their frequency of physical exercise ($N = 217$). In the first measurement (T1), happiness was found to strongly correlate with life satisfaction ($r = 0.71$, $p < 0.001$) and self-esteem ($r = 0.74$, $p < 0.001$). Life satisfaction was associated with self-esteem ($r = 0.59$, $p < 0.001$). The second measurement (T2) on a sample of 95 people showed stronger relationships between the studied variables. Happiness was found to correlate with life satisfaction ($r = 0.76$, $p < 0.001$) and self-esteem ($r = 0.78$, $p < 0.001$). Greater happiness was associated with higher life satisfaction and self-esteem. Satisfaction with life also correlated with self-esteem ($r = 0.74$, $p < 0.001$). An increase in self-esteem accompanied the increase in life satisfaction.

In order to compare the level of happiness, a one-way ANOVA was performed. The analysis showed that in the first measurement the groups significantly differed in their levels of happiness: $F(2, 214) = 15.59$, $p < 0.001$, $eta = 0.127$. The data are presented in **Figure 1**. Bonferroni's *post hoc* tests indicated that active people presented a significantly higher happiness level than beginners and inactive people ($p < 0.001$). Hypothesis 1 was thus confirmed.

Consistent with the expectations of Hypothesis 2, the groups at the first measurement also differed in their levels of life satisfaction: $F(2, 214) = 3.52$, $p = 0.031$, $eta = 0.032$. Active people presented a significantly higher level of life satisfaction than inactive people (Bonferroni's *post hoc* test, $p < 0.05$). The data are presented in **Figure 2**.

Differences were also observed for the level of self-esteem: $F(2, 214) = 7.36$, $p = 0.001$, $eta = 0.064$. Active people presented a significantly higher level of self-esteem at the first measurement than beginners and inactive people (Bonferroni's *post hoc* test, $p < 0.05$). The data are presented in **Figure 3**. Thus, Hypothesis 3 was confirmed.

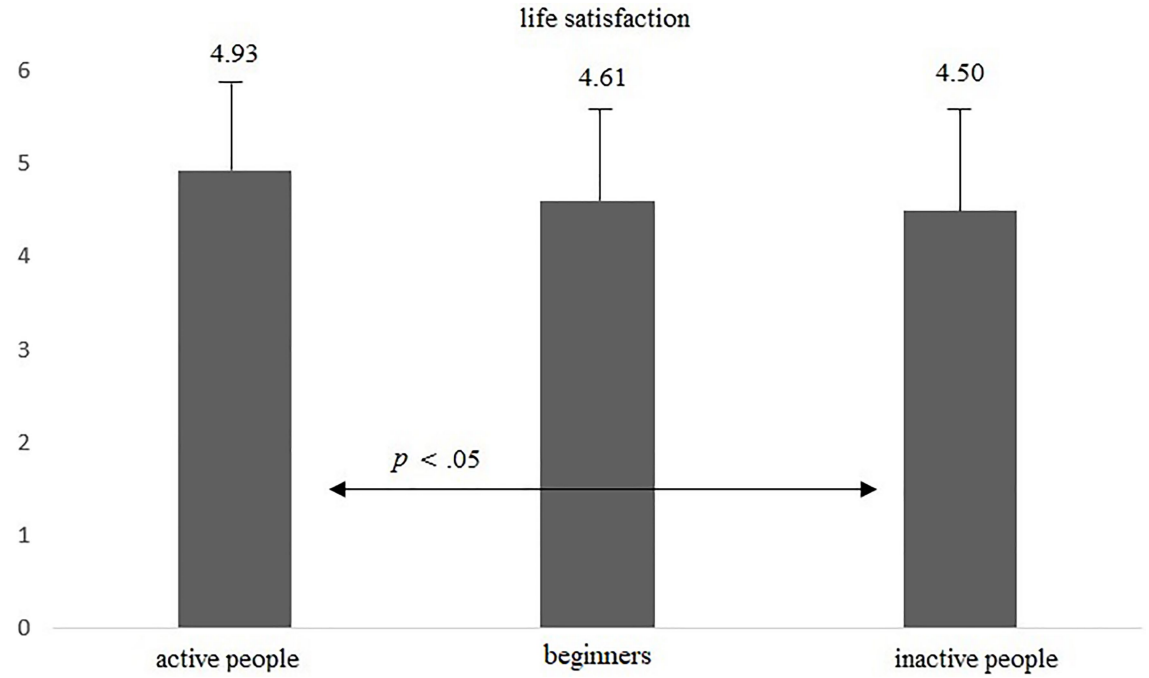

FIGURE 2 | Average level of life satisfaction in groups of active people, beginners, and inactive people.

FIGURE 3 | Average level of self-esteem in groups of active people, beginners, and inactive people.

A Student's *t* test for dependent samples was used to verify whether commencing exercise leads to a higher level of happiness (H4). As **Table 2** shows, after 4 weeks of physical activity, the beginners' average levels of life satisfaction and sense of happiness increased above the baseline ($p < 0.05$). The results for self-esteem were not statistically significant. The levels of the above variables were also compared in groups of active and inactive people, but after 4 weeks, no significant changes were observed in life satisfaction, sense of happiness, or self-esteem. This was consistent with our expectations, as there was no change in physical activity in these groups.

TABLE 2 | Comparison of life satisfaction, happiness, and self-esteem in the group of beginners before and after 4 weeks of physical activity.

	M	*SD*	*t*	*p*	*d*
Life satisfaction T1	4.80	0.91	2.19	0.036	0.38
Life satisfaction T2	5.12	0.94			
Happiness T1	4.32	0.65	2.60	0.014	0.45
Happiness T2	4.54	0.67			
Self-esteem T1	2.95	0.60	1.51	0.141	-
Self-esteem T2	3.10	0.44			

Single-factor repeated-measures ANOVA was also performed. The simple effect of time (T1, T2) on the level of life satisfaction turned out to be statistically significant $F(1, 92) = 7.29$, $p = 0.008$. The effect of the interaction of the group (active people/beginners/inactive people) and time on the level of life satisfaction was statistically insignificant $F(2, 92) = 0.77$, $p = 0.465$. The simple effect of time (T1, T2) on the sense of happiness turned out to be statistically insignificant $F(1, 92) = 0.97$, $p = 0.327$. The effect of the interaction of the group (active people/beginners/inactive people) and time on the level of happiness is statistically significant $F(2, 92) = 5.64$, $p = 0.005$. To determine the essence of this effect, a Bonferroni's *post hoc* test was carried out, which showed that the change in the level of happiness in beginners, $M_1 = 4.32$, $SD_1 = 0.65$, $M_2 = 4.54$, $SD_2 = 0.67$, is greater than in the case of inactive people, $M_1 = 3.90$, $SD_1 = 0.72$, $M_2 = 3.90$, $SD_2 = 0.82$. The simple effect of time (T1, T2) on the level of self-esteem was statistically insignificant $F(1, 92) = 1.71$, $p = 0.194$. The effect of the interaction of the group (active people/beginners/inactive people) and time on the level of self-esteem turned out to be statistically insignificant $F(2, 92) = 0.81$, $p = 0.447$.

Additionally, it was checked whether the participants who completed the second measurement (separate active people, beginners, and inactive people) vary in the level of the studied variables at the first measurement. Differences between the groups were noted. **Table 3** shows the data.

Bonferroni's *post hoc* tests indicated that inactive people presented a significantly lower happiness level, $M = 3.90$ than active people, $M = 4.73$, $p < 0.001$, and beginners $M = 4.32$, $p < 0.05$. Active people presented a significantly higher level of life satisfaction, $M = 5.08$ than inactive people $M = 4.26$, $p < 0.05$. Active people presented a significantly higher level of self-esteem, $M = 3.26$ than inactive people $M = 2.84$, $p < 0.05$.

Additional Results

Age and sex were not related to the levels of self-esteem, happiness, and life satisfaction in all of the studied groups. There were some small correlations when the education level of participants was considered. The level of education correlated with happiness in the group of the beginners ($r_s = 0.31$, $p = 0.011$). The higher the level of education of beginners, the higher the level of happiness. A positive correlation was also found between self-esteem and level of education ($r_s = 0.34$, $p = 0.004$) in the group of active people. The higher their level of education, the higher the level of self-esteem.

The relationships between the psychological variables and self-reported activity were also investigated (T1). As **Table 4** shows, positive relationships were noticed between the subjective assessment of activity (from 1 – "I choose to avoid activity," to 4 – "I am a very active person") and life satisfaction, happiness, and self-esteem. People who regarded themselves as more physically active were found to be happier, more satisfied with their lives and enjoying higher self-esteem, but the relationships between the variables were weak. Moreover, the frequency of physical activity (from 1 – "Less than once a week or not at all," to 5 – "Four times a week or more") was positively associated with life satisfaction, sense of happiness, and self-esteem. The higher the frequency of exercise, the higher the rates of the studied variables. A positive correlation was also noticed between average training duration and sense of happiness and self-esteem. More extended average training was found to be accompanied by an increase in declared levels of happiness and self-esteem.

Gender comparative analyses were also carried out (T1). A Student's *t* test for independent samples showed that women and men significantly differed in self-esteem: $t(213) = 2.66$, $p = 0.008$, $d = 0.37$. Men showed higher self-esteem ($M = 3.18$, $SD = 0.51$) than women ($M = 2.97$, $SD = 0.63$). The ANOVA with group and gender factors showed the main effect of gender in explaining self-esteem: $F(1, 209) = 6.52$, $p = 0.011$. Gender explained 3% of the variability in self-esteem. There were no significant differences between the genders in terms of happiness and life satisfaction.

DISCUSSION

The relationship between physical exercise and happiness has received considerable attention from researchers. However, research on certain forms of exercise (such as fitness) as well as on the impacts of exercising on well-being is quite limited (Stolarska et al., 2019). In our study, we sought to fill this gap. Therefore, our research was more than a comparative analysis of active and inactive people (Gałuszka, 2017). It was also a longitudinal assessment of the results of exercising for people starting physical activity. To our knowledge, there has been no previous longitudinal research on this matter in Poland. The participants were divided into three groups to ensure a broad spectrum. The study compared various indicators of well-being, such as sense of happiness, life satisfaction, and self-esteem, both among and within participants. It is worth studying psychological constructs under different conditions, in different populations, and at different times, because it allows to state to what extent the observed relationships are culturally universal.

Based on the obtained results, the assumed hypotheses were mostly confirmed. Regular physical activity was found to be associated with higher levels of happiness, self-esteem, and satisfaction with life. Hypothesis 1 assumed that active people would declare a higher level of happiness than beginners and inactive people. The executed analysis confirmed this hypothesis. This result is consistent with previously conducted research (Demuth and Czerniak, 2011; Majewska, 2011; Moljord et al., 2011; Richards et al., 2015; Lathia et al., 2017). Higher happiness

TABLE 3 | Comparison of life satisfaction, happiness, and self-esteem in the participants who completed second measurement separately for the group of active, beginners, and inactive people.

	N	*F*	*df1*	*df2*	*p*	*eta*
Life satisfaction	95	4.65	2	92	0.012	0.09
Happiness	95	11.50	2	92	<0.001	0.20
Self-esteem	95	3.20	2	92	0.045	0.07

TABLE 4 | Correlations between the happiness, life satisfaction, self-esteem, and physical activity variables.

	Happiness	Life satisfaction	Self-esteem
The frequency of physical activity	0.33**	0.15*	0.26**
Duration of average training	0.26**	0.08	0.16*
Subjective assessment of activity	0.39**	0.22**	0.28**

$^{**}p < 0.001$; $^{*}p < 0.05$.

in people who exercise regularly may result from their greater level of endorphins, triggering positive emotions, which are components of happiness (Starosta, 1995; Dsouza et al., 2020). People's change in mood may be affected by biological factors. The appetitive system is associated with reward-seeking behavior, a desire to satisfy bodily needs and sensory pleasure. This brain system is dependent on the dopamine system connected with pleasure. This relationship has been confirmed in studies conducted on rats, which have shown that treadmill running increases dopaminergic activity (Hattori et al., 1993, 1994).

Hypothesis 2 regarding life satisfaction in the examined groups was partially confirmed. Active people showed a higher level of life satisfaction than those who did not exercise. The obtained effects were similar to previous studies, which have clearly shown that people who engage in regular physical activity experience better moods and are more satisfied with their lives than people who do not participate in physical activity regardless of age (Elavsky et al., 2005; Zullig and White, 2011; Martin-Albo et al., 2012; Brodáni et al., 2015; Zayed et al., 2018). However, the difference was not significant between active people and beginners. The beginning of physical activity is associated with reaching a goal, which reduces the divergence between an individual's current situation and internalized standards (Diener et al., 1985). This may cause the higher evaluation of life satisfaction among beginners. Furthermore, people who are commencing physical activity may have a positive life balance considering their past lifestyle and new active beginning. The lack of difference in levels of life satisfaction between active people and beginners can also be associated with their internal motivation, especially in men (Walczak and Tomczak, 2011; Dodge et al., 2021). People who start regular physical activity may have a positive attitude toward their goals and thus may be as satisfied with life as people who exercise regularly.

The study results also confirmed Hypothesis 3, assuming that self-esteem is associated with the undertaking of physical activity. As expected, the people who regularly exercised showed higher self-esteem than beginners and inactive people. Previous studies have also confirmed this relationship (Elavsky et al., 2005; Cekin, 2015; Gałuszka, 2017; Moral-García et al., 2018). These studies suggest that people who exercise regularly show greater self-esteem and are more optimistic and positive about life than inactive people. It is widely acknowledged that regular physical activity helps with body shaping. Furthermore, self-esteem is related to body perception: People who are dissatisfied with their body tend to declare a lower level of self-esteem (Brytek-Matera, 2010; Asimakopoulou et al., 2020; Watt and Konnert, 2020). Therefore, active people may have a more positive image of their body and thus better self-esteem.

A novel aspect of this research is that it was a longitudinal study comparing subjective well-being before and after 4 weeks of physical activity. To the best of our knowledge, no similar studies have been performed in Poland to date. Hypothesis 4, assuming increased levels of happiness, life satisfaction, and self-esteem in people starting physical activity within 4 weeks, was mostly confirmed. The average intensity of life satisfaction and sense of happiness after 4 weeks of exercise became higher than the baseline. The study of Wicker et al. (2015) showed a similar effect on life satisfaction after a 4-week fitness program. Our study also revealed an increase in self-esteem after 4 weeks in the beginners' group, but the result was not statistically significant. This may have been due to the brief period of exercising. Four weeks is a relatively short amount of time to notice significant effects of physical activity, including improved appearance, which is directly related to self-perception and self-esteem (Brytek-Matera, 2010; Pop, 2016). After such a period, people may not be able to assess positive changes in their physical attractiveness. Beginners may also not notice improvements in their sports skills and capabilities, which are components of self-esteem according to Harter (2012).

This study also revealed other interesting correlates of physical activity. Even though these dependencies were not initially included in the hypotheses or research questions, the results may be considered an additional source of knowledge and enhancement of this research.

A comparative analysis of gender showed that women and men differed in their levels of self-esteem. Men showed higher levels of self-esteem than women. There were no significant differences between the sexes in their senses of happiness and life satisfaction. Other studies have additionally confirmed that there are no gender differences in these variables. Men have only slightly higher overall self-esteem compared to women. However, there are differences in specific kinds of self-esteem. Higher sport self-esteem characterizes men. Men also tend to be more satisfied with their bodies and physical attractiveness,

which may not be consistent with external observers' opinions (Wojciszke, 2012; Magee and Upenieks, 2019).

The study also revealed positive correlations between frequency of physical activity and senses of happiness, life satisfaction, and self-esteem. In addition, the duration of average training was found to be related to happiness and self-esteem: The longer the training duration, the higher the intensity of the studied variables. These results strengthen the above-mentioned findings of the links between physical activity and subjective well-being. A positive relationship was also demonstrated between the subjective assessment of activity and the measured variables. This may suggest that not only activity understood as physical exercise but also everyday living activity may affect subjective well-being.

This study also had certain limitations. One of the main difficulties of the research was the inability to control the participants' physical activity. It was not possible to verify whether the respondents' declarations were true or false. Due to their strong need for social approval, the participants could have declared more frequent physical activity than was actually the case. Due to the naturalistic settings, another challenge was related to the lack of possibility of ensuring equal conditions for all participants. The measures for two groups were carried out in gyms, where people often hurry to fixed classes. Individuals may also choose different kinds of activities. The sample consisted of volunteers, so it is possible that they had different levels of well-being than random sample (Rosenthal and Rosnow, 1975). In future studies, it is advisable to control the activity type to ensure that there are no differences between the specific exercises. Moreover, a group of active people was recruited in gyms. In sports facilities, people are exposed to more frequent interactions with people with similar interests and hobbies, so they have a greater chance of developing interpersonal relationships. Social capital is essential for an individual to achieve happiness (Oshio, 2017). Therefore, it is important to have a sense of belonging to a specific group and to establish positive and satisfying relationships with others (Ciupińska, 2005; Fang et al., 2017). Accordingly, it is worth considering that variables such as other people's presence and satisfying the need for belonging may have represented mediators in this study. What is more depression symptoms may be a barrier to enhance physical activity, so it is worth to check whether low scores on well-being are connected to symptoms of depression (Achttien et al., 2019). Studies indicate that physical activity and exercise can contribute to better well-being and be a beneficial in the treatment of depression (Ströhle, 2008), but influences may be bidirectional and low subjective well-being may contribute to small activity or even inactivity.

Future research on this subject can benefit from this study and take into account the above limitations. Actual control of physical activity may be hard to implement. Therefore, it would be worth conducting a 4-week intervention involving participants of organized groups exercising at least twice a week. Furthermore, future research could also include additional variables, such as a sense of effectiveness or the main kind of motivation to begin exercises. Four weeks may be insufficient to notice positive changes in appearance and thus enhanced self-esteem, so further studies should consider an extended period of physical activity, like 3 months.

Future research could also look into the role of physical activity in clinical populations because it plays such an important role in promoting subjective well-being (Nunan et al., 2013). Specific clinical populations, such as those with obesity (Kim et al., 2017) or chronic pain (Dysvik et al., 2010; Geneen et al., 2017; Law and Sluka, 2017), may benefit from regular physical activity. This line of research is intriguing because it appears that people with specific health conditions have movement beliefs (Varallo et al., 2020, 2021a,b) that may limit their willingness to engage in physical activity. We recommend to verify whether exposing people with these conditions to a physical activity intervention can change their beliefs about movement and improve their subjective well-being.

Our study has broadened previous findings of the links between subjective well-being and physical activity by presenting data from a naturalistic setting in a longitudinal study on the impacts of physical activity. The results seem to be relevant in the modern world, especially in the face of the COVID-19 pandemic and the closure of gyms and other sports facilities by many governments worldwide. Most of our hypotheses were confirmed, indicating that exercising is an essential factor contributing to various aspects of well-being. Given that a healthy lifestyle and physical activity have become increasingly popular subjects in contemporary society, these data may promote an active lifestyle and frequent physical exercise. These results seem to be particularly relevant in the context of the challenges posed by the coronavirus pandemic, where evidence-based practices aimed at improving well-being are able to provide real support that psychologists can offer to enable people to stay happy and satisfied.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Maria Grzegorzewska University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

KI and JS developed the study concept, performed data analysis, and described the results. KI and DJ drafted and revised the manuscript. DJ supervised the research project and provided critical comments. KI, JS, and SK gathered data for the study. All authors contributed to the article and approved the submitted version.

FUNDING

The authors acknowledge support from The Maria Grzegorzewska University.

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frontiers in Psychology

ORIGINAL RESEARCH
published: 23 December 2021
doi: 10.3389/fpsyg.2021.710870

Involvement in Health Behavior After Heart Transplantation: The Role of Personal Resources and Health Status. Single-Center Observational Study

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OPEN ACCESS

Edited by:
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Reviewed by:
Ekamol Tantisattamo, School of Medicine, University of California, Irvine, United States
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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *17 May 2021*
Accepted: *01 December 2021*
Published: *23 December 2021*

Citation:
Mierzyńska A, Kokoszka A, Jerzak-Wodzyńska G, Sobieszczańska-Małek M, Zieliński T and Piotrowicz R (2021) Involvement in Health Behavior After Heart Transplantation: The Role of Personal Resources and Health Status. Single-Center Observational Study. Front. Psychol. 12:710870. doi: 10.3389/fpsyg.2021.710870

Introduction: Heart transplantation affects all spheres of the patients' functioning - their physical well-being and coping with everyday situations, as well as their identity and social functioning. Its long-term effects depend on the effective cooperation with the transplant team. Post-transplant patients are expected to be committed to adherence to recommendations. Patients' subjective characteristics could increase the risk of difficulties during treatment or might have a protective effect. The major aim of the study was to evaluate the level of engagement in health behavior in heart transplant recipients in relation to their personal resources, such as personality traits, and their health status.

Material and Method: The observational *ex post* facto model was proposed. Participants completed a set of psychological questionnaires. In the study, there were used questionnaires regarding health behavior (HBI), personality traits (NEO-FFI), health locus of control (MHLC), self-efficacy (GSES) and health status (GHQ-28). The group included in the analyses consisted of 107 heart transplant patients. They ranged in age from 19 to 75 years; 10.3% of them were women.

Results: According to norms, 71% patients reported high level of engagement in health behavior. There were significant differences in the level of dietary habits and other types of health behaviors. The best predictors of overall health behavior were conscientiousness ($\beta = 0.20$, $p < 0.05$) and health locus of control (Powerful Others) ($\beta = 0.25$, $p < 0.05$). The prophylaxis behavior was related significantly to the level of conscientiousness ($p < 0.05$) and health locus of control (Internal and Powerful Others) ($p < 0.05$; $p < 0.01$). The level of positive mental attitude was related significantly to agreeableness ($p < 0.05$), health locus of control (Powerful Others) ($p < 0.01$), and self-efficacy ($p < 0.01$). Everyday healthy practices were related significantly to openness to experience ($p < 0.01$) and health locus of control (all categories: Internal, Powerful Others and Chance) ($p < 0.05$; $p < 0.01$; $p < 0.05$, respectively).

Conclusion: Majority of heart transplant patients is engaged in high level of health behavior. Among the various forms of health-relevant habits, heart transplant patients adhere significantly less frequently to a healthy diet. Among examined resources, the best predictors of caring about health are generalized self-efficacy and age at the time of HTx.

Keywords: heart transplantation, adherence, health behavior, health practices, personal resources, personality, conscientiousness, health locus of control

INTRODUCTION

Heart transplantation is an established method of treating end-stage heart failure, allowing it to extend the lives of people for whom other treatments have failed. It is a turning point event during heart failure treatment, and it affects all spheres of the patients' functioning - their physical well-being and coping with everyday situations, as well as their emotional state, identity, and social functioning (Christopherson, 1987; Grady et al., 1999; Steinbüchel et al., 2000; Stolf and Sadala, 2006; Kugler et al., 2009; Ratajska, 2011; Mauthner et al., 2012, 2014; Pietruszewski and Siwy-Hudowska, 2013; Abedi et al., 2015). In recent years, about 80-100 procedures have been performed annually in Poland, and their number has remained constant for about 8 years (Malanowski, 2018). Despite the recent introduction of innovative technologies to support the left ventricle at home (LVAD), heart transplantation remains the most frequently chosen method of treating advanced heart failure (Cadeiras et al., 2007). Heart transplantation is a treatment method whose long-term effects depend on the effective cooperation of patients with the treatment team. The care regimen after heart transplantation includes frequent outpatient control visits and invasive medical tests, such as biopsies or coronarography, especially in the first years after surgery, and patients are required to conscientiously take medications and follow medical recommendations relating to various spheres of everyday functioning (Zieliński and Sobieszczańska-Małek, 2015). Treatment after heart transplantation places new demands on the patient and his or her immediate environment. The most important tasks of the patient, analogously to the situation of treatment of other somatic diseases, include coping with the psychological consequences of their condition and treatment, adapting to the requirements of treatment (especially immunosuppressive) and the specific environment, which is the health service, and building and maintaining a positive relationship with the treatment team (Kubacka-Jasiecka and Ziarko, 2016). Post-transplant patients are expected to be committed to adherence to recommendations (understood primarily as scrupulously taking prescribed medications) and to adapt their lifestyles to the principles of treatment, i.e., taking care of their general health, avoiding risks in the form of infections (Barańska-Kosakowska et al., 2013; Dębska-Ślizień et al., 2015). This is to enable patients to prolong their lives and to minimize the risk of complications such as vasculopathy or new organ rejection (Sobieszczańska-Małek, 2015).

The literature indicates the influence of several groups of factors on the potential for cooperation after organ transplantation affecting patients' ability to follow recommendations and adhere to treatment. Those factors stem from the characteristics of the treatment and illness itself, organization of health-care system and patients' personal and interpersonal resources. One of known major factors contributing to involvement in self-care is personality. Certain subjective characteristics of patients increase the risk of difficulties in coping with the demands of treatment. At the same time, personality traits are also known to have a protective effect. They influence patients to undertake behaviors consistent with health recommendations, which can be a valuable resource in the process of adaptation to treatment after heart transplantation. Findings from numerous studies suggest significant effects of individual personality traits on both overall health and lifestyle, as well as behaviors in the patient role, such as seeking medical help, coping with symptoms, and adherence to medical recommendations (Courneya and Hellsten, 1998; Widiger, 2005; Czarnecka and Tylka, 2010; Cheng et al., 2015; Čukić et al., 2016; Kohli, 2017; Abbeya et al., 2018; Gray and Pinchot, 2018; Santangelo et al., 2018). Each of the personality traits exerts an individual influence on the individual, modifying the actions taken by him in different situational contexts, and the impact of the links of personality traits is synergistic in nature. Current studies regarding psychological factors influencing health behavior and compliance rarely refer to posttransplant patients. Considering that the role of good adjustment and adherence could be crucial to patients' health status, quality of life, and survival, this knowledge could be beneficial in terms of patients care. Understanding the relationship between the psychological dispositions of heart transplant patients and their lifestyle and engagement in health-relevant behaviors may allow us to profile psychological factors important for cooperation related to their subjective characteristics. Therefore, the main research question in this study was whether stable psychological factors (such as personality traits) were important for sustaining healthy habits after heart transplantation. The major aim of the study was to evaluate the level of engagement in health behavior in heart transplant recipients in relation to their personal resources, such as personality traits, and their health status regarding somatic and psychological symptoms.

MATERIALS AND METHODS

In the study, the observational *ex post* facto model of the exploratory variety (implemented in the correlational mode) was proposed. Recruitment for the study took place at the

Department of Heart Failure and Transplantation, Institute of Cardiology, Warsaw, Poland. The study was conducted within the framework of the statutory project no. 2.55/VII/12, the data collection for the cross-sectional part of the study was gathered from 2012 to 2014. The study received a positive opinion of the Bioethics Committee of the Institute of Cardiology (No. 1315).

Study participants were asked to complete a set of self-descriptive tools (psychological questionnaires) during hospitalization for medical follow-up examinations (e.g., cardiac tests and biopsy or other screening tests required by their current health status). The hospitalization period was chosen due to time-consuming self-evaluation using questionnaires and the need to give patients feedback. The self-assessment was conducted by the patients themselves with the presence of psychologist in case of any questions regarding items in questionnaires. Every patient was evaluated once during the study. At the conclusion of the study, participants received feedback regarding the level of their reported health behaviors in relation to norms, as well as assessments of psychological well-being and individual resources. Those who reported difficulties in functioning or adherence during the study received support according to the standards adopted by the transplant center.

In the study, there were used questionnaires regarding health behavior (HBI, Health Behavior Inventory by Z. Juczyński), personality traits (NEO-FFI, Five Factor Inventory by Costa and McCrae), health locus of control (MHLC, Multidimensional Health Locus of Control scale by Walston and Walston), self-efficacy (GSES, Generalized Self-Efficacy Scale by R. Schwarzer) and health status (GHQ-28, General Health Questionnaire by Goldberg) (Zawadzki et al., 1998; Goldberg et al., 2001; Juczyński, 2010). The HBI scale consists of 28 items regarding various forms of health behavior, and it allows to describe subject's health behavior pattern related to 4 areas: healthy dietary habits (HDH), prophylaxis behavior (PB), positive mental attitude (PMA) and everyday healthy practices (EHP), as well as the general health behavior index (HBI). The higher result of the HBI and its subscales indicates the higher level of particular behavior. The score range for HBI is 24–120 points, and for every area – from 1 to 5 points based on the calculator proposed by the Authors. The general score could be transformed to sten scale according to norms for gender (Juczyński, 2010). The NEO-FFI refers to the OCEAN personality model (Neuroticism, Extraversion, Openness, Agreeableness, Consciousness) and the score range for every scale is between 12 and 60 points (Zawadzki et al., 1998). The MHLC questionnaire evaluates the health locus of control in 3 dimensions (Internal, External – Powerful Others, and External – Chance) with a score range of 6–36 points for every scale (Juczyński, 2010). The GSES scale refers to the generalized self-efficacy concept and its score ranges from to 10 to 40 points. The GHQ-28 scale results were calculated with the method assuming 0–3 points for every item, according to the method recommended by the Authors. The score for every subscale (somatic symptoms, anxiety with insomnia, social dysfunction, and depression) ranges from 0 to 21 points, with the general score (overall distress) in the range of 0–48 points. The overall GHQ-28 score could be transformed to sten scale according to norms for gender (Goldberg et al., 2001).

Study Group

The study was conducted according to analytical observational design and the research model assumed the use of a non-randomized study sample. Data collection used a purposive sampling method, according to the focus of the study and the population characteristics sought (Beins and McCarthy, 2018). The inclusion criteria for the study were being adult, more than 1 year after heart transplantation, and treatment at the transplant center of the Institute of Cardiology in Warsaw, and exclusion criteria consisted of having severe cognitive impairment or health status disabling the use of self-assessment, or withdrawal of consent during the study. At the time of participating in the study patients had stable health status, with a satisfactory level of functioning. The reason of not recruiting patients who were less than 1 year post-transplant was that it is a time of early adjustment to a new situation and medical regimen, with a higher risk of early post-surgery complications. The study aimed at the group of assumed stable health behavior patterns in post-transplant care regarding patients' individual resources.

After collecting quantitative data from 118 subjects, data from 107 subjects were used for further analyses. The reason for exclusion from the analysis was improper completion of the self-report questionnaires (numerous missing answers or selection of several answers to a given question), which prevented reliable analysis of the full set of questionnaires.

The group included in the analyses consisted of 107 heart transplant patients. They ranged in age from 19 to 75 years; 10.3% of them were women. The time since transplantation of the subjects was 1 year to 24 years at the time of inclusion in the study. Majority of the subjects had a high school education. A detailed summary of the demographic characteristics of the study subjects is shown in **Table 1**.

Patients most often reported some form of cardiomyopathy as the main reason for qualifying for heart transplantation (59 people, 23 of whom did not specify the type). Among the study participants who were able to name the type of cardiomyopathy, 22 named dilated cardiomyopathy and 5

TABLE 1 | Characteristics of the subjects participating in the study.

	Number of participants (*N* = 107)
Gender	11 females (10.3% of the group)
	96 males (89.7% of the group)
Age	*M* = 53.11; SD = 14.39 Min = 19/Max = 75
Age at time of heart transplantation	*M* = 46.36; SD = 13.37 Min = 14/Max = 66
Time since heart transplantation	*M* = 6.75; SD = 4.76 Min = 1/Max = 24
Education	
Primary education	8 patients (7.5% of the group)
Occupational education	31 patients (37% of the group)
Secondary education	50 patients (46.7% of the group)
Higher education	15 patients (14% of the group)
No data	3 patients (2.8% of the group)

named hypertrophic cardiomyopathy. The next most common reason for qualification for transplantation was myocardial infarction and its consequences (33 people, 30.84% of the group). The remaining patients reported other reasons, such as postinfectious complications, valvular defects, or arrhythmogenic cardiomyopathy.

Statistical Analysis

The results of the study were compiled using the statistical analysis program SPSS.20 (OS: Win 10). Descriptive results for nominal variables are in the form of absolute numbers and percentages for the entire study group. The results for continuous variables are presented as means and standard deviations. The distribution of variables was assessed using Shapiro-Wilk method. The differences in distinct types of health behaviors were examined using Wilcoxon rank test. To verify hypotheses on the influence of single factors on the examined variables, Spearman's rank correlation method (for variables of non-normal distribution) or Pearson's linear correlation (for variables of normal distribution) were used. The difference in health behavior in groups with lower and higher levels of education was analyzed using the U Mann-Whitney test (the first group consisted of patients with primary and occupational education, which means less than 12 years of education, and the second group consisted of participants with secondary and higher education – 12 and more years of education). The next step of the analyzes was to determine the interaction of predictors on the dependent variables by running a multiple regression model including the stepwise method of introducing the predictors one at a time. A significance level of $p < 0.05$ was assumed for reporting statistically significant results.

RESULTS

Based on the collected data, the level of engagement in health behaviors in the group of heart transplant recipients was determined. Descriptive statistics of health behaviors (overall index and individual types of health behaviors) and psychological variables are presented in **Tables 2**, **3**. According to Polish norms 71% patients reported a high level of engagement in health behavior, whereas 24.3% declared average and 4.7% – low level of health behavior (Juczyński, 2010). There were significant differences in the level of dietary habits and other types of health behavior, with patients being less engaged in dietary behaviors in comparison to prophylaxis, positive mental attitude, and daily healthy practices (**Table 4**).

Among the examined relationships, the correlation between the level of conscientiousness and the level of overall health behaviors (HBI) reached the required level of statistical significance ($r = 0.23$; $p < 0.01$). Furthermore, the level of statistical significance was obtained by the relationships concerning self-efficacy ($r = 0.17$, $p < 0.05$) and health locus of control (all categories: Internal, Powerful Others and Chance) ($r = 0.23$, $p < 0.01$; $r = 0.27$, $p < 0.01$; $r = 0.17$, $p < 0.05$, respectively). Since all correlation coefficients are at a level below 0.3, the strength of the relationship between these variables should be described as weak. The remaining correlations with HBI did not reach the required level of statistical significance. There was also relationship between personality factors and three of four types of health behavior observed. The prophylaxis behavior was related significantly to the level of conscientiousness ($r = 0.22$, $p < 0.05$) and health locus of control (Internal and Powerful Others) ($r = 0.21$, $p < 0.05$; $r = 0.29$, $p < 0.01$). The level of positive mental attitude was related significantly to agreeableness ($r = 0.21$, $p < 0.05$), health locus of control (Powerful Others) ($r = 0.28$, $p < 0.01$) and self-efficacy ($r = 0.28$, $p < 0.01$). Everyday healthy practices were related significantly to openness to experience ($r = -0.23$, $p < 0.01$) and health locus of control (all categories: Internal, Powerful Others and Chance) ($r = 0.17$, $p < 0.05$; $r = 0.28$, $p < 0.01$; $r = 0.21$, $p < 0.05$, respectively). The remaining correlations were non-significant (**Table 5**).

Based on the above results, it can be concluded that among heart transplant patients, the intensity of health behaviors is related to the belief about the ability to successfully cope with difficulties along with the health locus of control, that is, the belief in both one's own influence on health or the influence of others (e.g., medical personnel) or random factors. Almost all the above-mentioned relationships are positive, meaning that as the level of a trait increases, so does the level of overall health care among heart transplant patients. The one exception regards the relationship between everyday healthy practices and openness to experience, which suggests that in our study group the lower level of openness, the higher level of health practices related to a healthy proportion of physical effort and sleep or rest.

Age, Education, Distress, and Health Behaviors

We have analyzed the level of overall distress in the study group, as well as the level of reported types of difficulties regarding somatic symptoms, anxiety with insomnia, social dysfunctions, and depression. Comparing those results with norms for adults, proposed by the authors of GHQ-28, we have found that in transplant recipients 41 patients (38.3% of the group) reported low levels of overall distress. 40 participants (37.4% of the group) declared average, and 26 participants (24.3% of the study group) – high level of overall distress (Goldberg et al., 2001). The results of the correlation analyses suggest that among the subjects, the level of anxiety with insomnia is significantly associated with the intensity of daily healthy practices ($r = -0.19$, $p < 0.05$). This correlation has weak power (less than 0.3) and is negative, i.e., among heart transplant patients, high levels of anxiety cooccur with lower intensity of practices regarding adequate sleep and rest (**Table 5**).

Moreover, the analyses indicate positive relationships (with weak power) between age at the time of heart transplantation and overall health behavior index, dietary habits, and preventive behaviors ($r = 0.22$, $p < 0.05$; $r = 0.21$, $p < 0.05$; $r = 19$, $p < 0.05$, respectively). There was also a significant difference between the intensity of positive mental attitude in the groups with lower and higher levels of education ($U = 914.50$; $p < 0.05$) (**Table 6**).

TABLE 2 | Descriptive statistics of individual types of health behaviors.

Descriptive statistics (*N* = 107)	Mean(M)	Standard deviation (SD)	Minimum (Min)	Maximum (Max)
HBI	92.92	11.90	56	118
HDH	3.56	0.73	1.50	5.00
PB	4.01	0.66	1.67	5.00
PMA	3.98	0.54	2.67	5.00
EHP	3.94	0.61	2.17	5.00

HBI – heath behavior index; HDH – healthy dietary habits; PB – prophylaxis behavior; PMA – positive mental attitude; EHP – everyday healthy practices.

TABLE 3 | Descriptive statistics of psychological variables.

Descriptive statistics (*N* = 107)	Mean(M)	Standard deviation (SD)	Minimum (Min)	Maximum (Max)
NEU	18.45	5.82	6	34
EXT	26.47	4.58	17	42
OPN	24.69	5.10	13	40
AGR	30.10	4.97	14	39
CON	32.64	5.39	15	45
HLoC-In	24.70	5.43	12	36
HLoC-PO	28.05	4.59	17	36
HLoC-Ch	21.07	6.27	8	36
GSE	31.30	3.85	20	40
GHQ-28 Som	6.70	3.98	1	17
GHQ-28 Anx	5.58	3.70	0	16
GHQ-28 Soc	7.41	3.28	0	19
GHQ-28 Depr	1.88	2.29	0	10
GHQ-28 Diss	21.57	10.16	4	50

HTx – heart transplantation; HBI – heath behavior index; HDH – healthy dietary habits; PB – prophylaxis behavior; PMA – positive mental attitude; EHP – everyday healthy practices; NEU – Neuroticism; EXT – Extraversion; OPN – Openness to experience; AGR – Agreeableness. CON – Conscientiousness. HLoC-In – Health Locus of Control – Internal; HLoC-PO – Health Locus of Control – Powerful Others; HLoC-Ch – Health Locus of Control – Chance; GSE – Generalized Self-Efficacy; GHQ-28 Som – Somatic Symptoms; GHQ-28 Anx – Anxiety with Insomnia; GHQ-28 Soc – Social Disfunction; GHQ-28 Dep – Depression; GHQ-28 Diss – Overall Distress.

TABLE 4 | Differences between types of health behaviors.

	PB – HDH	PMA – HDH	EHP – HDH	PMA – PB	EHP –PB	EHP – PMA
Z	–5.91	–5.54	–4.66	–1.00	–1.00	–0.,60
Significance (two-tailed)	0.00*	0.00*	0.00*	0.32	0.32	0.55

*$p < 0.001$.
HBI – heath behavior index; HDH – healthy dietary habits; PB – prophylaxis behavior; PMA – positive mental attitude; EHP – everyday healthy practices.

The results suggest that older heart transplant recipients are more likely to engage in health behaviors (in general) and are characterized by greater commitment to dietary compliance and preventive behaviors. At the same time, those with lower levels of education show higher levels of mental health concern compared to those with higher levels of education.

Personality Traits as Predictors of Health Behavior

Integration of the analysis was obtained by examining regression models for predicting health behaviors using significant personality coefficients of the overall HBI only, since it had, as only dependent variable, normal distribution of data. The psychological variables: Conscientiousness, Internal Locus of Control, External Locus of Control (Powerful Others), External Locus of Control (Chance) and Generalized Self-Efficacy were introduced to the regression model in above-mentioned order. Among tested models, the best prediction has the one with 3 factors: conscientiousness and health locus of control (Internal and Powerful Others) (**Table 7**). The regression model has shown goodness-of-fit at the acceptable level [$F(3;103) = 5,747$; $p < 0,001$] and predicts 14.3% of HBI variation in the studied group ($R^2 = 0,143$). According to this model the strongest predictor of the engagement in health behavior is the level of external locus of control (Powerful Others) ($\beta = 0,251$; $p < 0,05$).

DISCUSSION

Insufficient engagement in health behaviors and unsatisfactory level of medication adherence are significant problems after vascular organ transplantation. Since the transplantation is a form of treatment in which outcomes are closely related to compliance, adaptation to the patient role has been the focus of many studies. They attempt to seek answers to questions about

TABLE 5 | Correlation between health behaviors, personality factors, health status and demographical factors.

		HBI	HDH	PB	PMA	EHP
NEU	r	–0.070	0.002	–0.083	–0.141	–0.036
	p	0.236	0.491	0.198	0.074	0.358
EXT	r	–0.086	–0.155	0.028	0.057	–0.138
	p	0.189	0.056	0.387	0.280	0.079
OPN	r	–0.068	0.067	–0.021	–0.030	–0.226**
	p	0.243	0.247	0.413	0.378	0.010
AGR	r	0.130	0.064	0.109	0.207*	0.114
	p	0.091	0.255	0.132	0.016	0.121
CON	r	0.228**	0.121	0.220*	0.150	0.127
	p	0.009	0.102	0.011	0.062	0.096
HLoC-In	r	0.226**	0.050	0.211*	0.168	0.171*
	p	0.010	0.303	0.015	0.041	0.039
HLoC-PO	r	0.272**	0.044	0.295**	0.285**	0.276**
	p	0.002	0.326	0.001	0.001	0.002
HLoC-Ch	r	0.172*	0.010	0.109	0.138	0.215*
	p	0.038	0.459	0.133	0.079	0.013
GSE	r	0.170*	0.078	0.129	0.280**	0.124
	p	0.038	0.214	0.094	0.002	0.102
GHQ-28 Som	r	0.104	0.139	0.066	0.058	0.021
	p	0.287	0.154	0.499	0.551	0.829
GHQ-28 Anx	r	0.009	0.076	0.082	0.038	–0.194*
	p	0.926	0.434	0.400	0.701	0.046
GHQ-28 Soc	r	0.022	0.130	–0.111	0.045	0.005
	p	0.825	0.183	0.257	0.649	0.957
GHQ-28 Dep	r	–0.026	–0.051	–0.088	0.006	0.061
	p	0.787	0.603	0.368	0.955	0.532
GHQ-28 Diss	r	0.041	0.106	0.013	0.044	–0.053
	p	0.678	0.277	0.897	0.649	0.585
Age	r	0.185	0.170	0.155	0.114	0.115
	p	0.056	0.080	0.110	0.214	0.237
Age at the timeof HTx	r	0.217*	0.206*	0.195*	0.148	0.128
	p	0.025	0.034	0.045	0.129	0.188
Number of yearsafter HTx	r	–0.158	–0.120	–0.127	–0.158	–0.125
	p	0.103	0.218	0.192	0.105	0.199

*$p < 0.05$; **$p < 0.01$.
HTx – heart transplantation; HBI – heath behavior index; HDH – healthy dietary habits; PB – prophylaxis behavior; PMA – positive mental attitude; EHP – everyday healthy practices; NEU – Neuroticism; EXT – Extraversion; OPN – Openness to experience; AGR – Agreeableness. CON – Conscientiousness. HLoC-In – Health Locus of Control – Internal; HLoC-PO – Health Locus of Control – Powerful Others; HLoC-Ch – Health Locus of Control – Chance; GSE – Generalized Self-Efficacy; GHQ-28 Som – Somatic Symptoms; GHQ-28 Anx – Anxiety with Insomnia; GHQ-28 Soc – Social Disfunction; GHQ-28 Dep – Depression; GHQ-28 Diss – Overall Distress.

TABLE 6 | The difference in health behavior between patients with lower (primary/occupational) and higher (secondary/higher) levels of education.

	HBI	HDH	PB	PMA	EHP
Mann-Wilcoxon U	1082.50	1267.00	1135.50	914.50	1016.00
Significance (two-tailed)	0.21	0.99	0.38	0.02*	0.09

*$p < 0.05$.
HBI – heath behavior index; HDH – healthy dietary habits; PB – prophylaxis behavior; PMA – positive mental attitude; EHP – everyday healthy practices.

the extent of cooperation of organ transplant recipients and examine factors influencing treatment adaptation and effective interventions regarding motivation in this group of patients. The main objectives of this study were to verify the importance of subjective characteristics of heart transplant patients on their health behavior.

The results of the analyses indicate that vast majority (71%) of the study participants report a high level of engagement in various forms of health behaviors. Because daily health habits are an adequate indicator of adherence, the data from the present study suggest that approximately 30% of individuals in the study population exhibit difficulties in cooperating with the treatment process after transplantation (Siwińska et al., 2011). These findings are consistent with previous reports that 20-50% of transplant patients reveal problems with adherence to various categories of medical recommendations (Grady and Jalowiec, 1995; Laederach-Hofmann and Bunzel, 2000; Dew et al., 2007). The study group placed significantly less importance on adherence to dietary recommendations than on other types of health-relevant behaviors. No significant empirical rationale was found for determining whether preventive behaviors (such as participation in checkups or outpatient visits) were significantly higher compared to other types of health behaviors. These findings correspond with studies of other transplant patient groups, in which the highest rates of cooperation are being observed in relation to medication adherence (especially to the immunosuppressive treatment) and the lowest – to dietary recommendations (Hreńczuk et al., 2018).

The analyses allowed us to identify variables that may increase the likelihood of engaging in health-enhancing behaviors. Of the possible correlates of health behaviors examined, both demographic and psychological factors proved to be important for adaptation to treatment in the study group. According to the results, older age at the time of surgery favors the adoption of favorable behaviors in the subsequent course of treatment, including attention to proper eating habits and proper contact with health care. These relationships are also reflected in other studies in the field of transplantation (Kotarska et al., 2015). Young age at the time of transplantation may be an important risk factor – Aujnarain et al. (2017) pointed out that younger people reveal significantly more difficulties in compliance after organ transplantation (Aujnarain et al., 2017). Hence, the necessity for exceptional care given to younger individuals, especially those who underwent transplantation in childhood and those who are in transition to an adult center. Only adult patients participated in the current study, but a similar direction of relationship as in studies of child and adolescent populations suggests that those who experienced transplantation at a younger age are less likely to care for their own health and should receive adequate care from the transplant team.

The level of education was also found to be a significant factor in the study group; however, the direction of this relation was different from the cited research results and our assumptions. Among the study participants, those with lower education were the group taking more care of positive psychological attitude (by avoiding experiencing strong emotions and using strategies to reduce stress levels). The literature suggests that a lower level of

TABLE 7 | The linear multinomial regression model for predicting overall health behavior index (HBI) using personality coefficients.

Model		Unstandardized coefficients		Standardized coefficients	*t*	*p*
		B	Std. Error	Beta		
1	(Constant)	76.489	6.946		11.012	0.000
	CON	0.503	0.210	0.228	2.397	0.018
2	(Constant)	68.253	7.937		8.599	0.000
	CON	0.434	0.210	0.196	2.067	0.041
	HLoC-In	0.426	0.208	0.194	2.048	0.043
3	(Constant)	64.413	7.876		8.179	0.000
	CON	0.441	0.204	0.200	2.159	0.033
	HLoC-In	0.227	0.217	0.104	1.047	0.297
	HLoC-PO	6.061	2.362	0.251	2.567	0.012

CON – Conscientiousness. HLoC-In – Health Locus of Control – Internal; HLoC-PO – Health Locus of Control – Powerful Others.

general knowledge and, as a result, a low level of health literacy, is a risk factor for incomplete adherence, poorer quality of life, and adverse events during treatment (White and Gallagher, 2010; Cajita et al., 2017). The results of these studies were not confirmed by the results of the current analyses. However, these specific correlations in the study group seem to reflect theoretical relationships described, for example, in Susan Miller's concept of coping with stress. According to this theory, it is possible that with a higher level of health knowledge, the level of anxiety related to the possible consequences of the current situation may increase. While greater knowledge may positively influence medication adherence and other preventive behaviors, it has an adverse effect on psychological well-being by increasing levels of health anxiety. At the same time, findings from other populations indicate a tendency for individuals with lower levels of education to have avoidance-focused rather than task-focused coping. According to these hypotheses, in individuals with lower levels of education, we are more likely to expect behaviors that bring about a reduction in the level of psychological discomfort than behaviors aimed at changing the stressful situation (here, adherence). This hypothesis was only partially verified in the process of analyzing the results and may be an interesting development of the research problem presented in this paper.

The results of the current study also did not confirm the relationship described in other studies, in which one of the factors that potentially influenced adherence to recommendations was time since surgery. In a study by Germani et al. (2011), those with longer survival time since surgery revealed greater severity of behaviors indicative of insufficient cooperation, whereas in the current study this relationship did not reach the level of statistical significance (Germani et al., 2011).

Another area explored in the present study was the relationship of reported psychological difficulties to health behaviors. Among the study participants, 24.3% revealed high level of distress, which confirms findings from other studies (Kugler et al., 2014). Despite numerous reports on the relationship between the presence of psychopathological symptoms and health care, the results obtained in the present study do not support these assumptions. In the study group, the level of reported psychological difficulties was not significantly related to the engagement in health behaviors. The exception was the relationship between levels of anxiety and insomnia and daily healthy practices. This form of health behavior is related specifically to adherence to the proper balance between exercise/activity and rest and sleep hygiene. Hence, the association between reported insufficient rest in individuals complaining of sleep disorders seems reasonable. At the same time, this highlights a critical area of functioning in post-transplant patients that has not yet been explored in the literature. Sleep as a basic physiological activity ensuring sympathetic-parasympathetic balance is a major area of quality of life and proper functioning. Sleep hygiene difficulties reported by study participants and their relationship to levels of psychopathological symptoms may warrant further exploration.

The Influence of Subjective Characteristics on the Level of Health Behaviors

The main purpose of the research conducted in this study was to determine the relationship between health habits and personality characteristics, and the results provided interesting conclusions. Among the analyzed subjective characteristics, only generalized self-efficacy was proven to be significant predictor of health-enhancing behaviors. The results suggest that individuals with an elevated level of belief in his or her capacity to execute behaviors necessary to produce specific performance attainments will be significantly more engaged in various forms of health behaviors. These results confirm the importance attributed to these traits in cooperation after transplantation and in other clinical contexts. In Życińska's (2017) study, the sense of self-efficacy and internal locus of health control were also significant factors influencing adaptation, but in her study population (patients with diabetes and acute coronary syndrome) they were predictors of emotional adaptation and well-being of patients rather than variables influencing health behaviors (Życińska, 2017). The belief that one can influence one's own health, the attaching of importance to the guidance and actions of physicians along with a stable tendency to act in an orderly manner are, as hypothesized, important resources in the process of adaptation to treatment after heart transplantation. These findings support previous analyses on the protective effects of personality factors in the health behavior domain (Dobbels et al., 2004; Telles-Correia et al., 2009; Kronish and Ye, 2013; Silva et al., 2016;

Kohli, 2017). These results interpreted in pathogenetic terms, suggest that a propensity for impulsive and chaotic behavior and a belief in negligible or insignificant self-influence (or the actions of health care providers) on health may be risk factors for difficulties in adherence. The higher risk of unhealthy behaviors can also occur in individuals with the belief about not being able to succeed in specific situations or accomplish a task, such as following medical recommendations. For the above reasons, these results can be described as an indication to deepen the psychological assessment of transplant patients in the area of attributional beliefs and personality characteristics. Regarding the meta-resources, it can be stated that the results obtained support, in part, the concept of mental toughness, indicating the importance of its pillars, namely, self-efficacy, internal locus of control and conscientiousness (described as "confidence," "control," and "commitment" in this theory). Since there are few studies on this construct, verifying the importance of mental toughness in the process of adaptation to treatment after organ transplantation could be an interesting development of the current research problem.

Limitations of the Study

The current research project was conducted with methodological and substantive assumptions that were intended to structure the argument and methodology of this study. At the same time, however, they may represent some limitations of this study. The first limitation was the lack of a comparison group in the implemented research model. Due to the assumption of the exploratory nature of the study, a group that could serve as an interpretative background for the population under study was dropped. The analysis of studied variables in other populations, such as patients after different organ transplants, could be an interesting development of the described research problem and allow the generalization of the study results to other clinical groups. Another limitation was the focus on subjective psychological resources. As the literature suggests, correlates of health behaviors may also be interpersonal or organizational in nature, resulting in these areas being explored in other adherence research. Another limitation of the study derives from the possible source of response bias related to patients' need to show themselves as cooperative and behaving according to medical recommendations. We have tried to address that concern providing patients with support during completing questionnaires and acceptance of their difficulties with adherence in the clinical setting. Even though the questionnaire set was covering a broad range of variables and consisted of multiple items, majority of the patients manifested engagement in the study and appreciated the need of understanding the psychological factors which could enhance their compliance. The sheer number of participants in the study is also a certain limitation. As suggested in recent years, in scientific projects in the field of health psychology, the aim should be to increase the size of the study population to achieve statistically and clinically significant results and thus, interpretable in broader contexts (Jewett et al., 2010). At the same time, however, the current study was able to obtain data from over 33% of the current group of transplant patients under the care of the Institute of Cardiology in Warsaw, which can be considered a representative sample for this center. Additionally, results corresponding with reports from other centers indicate the existence of similar relationships in groups of transplant patients after transplantation of other organs and from other medical centers.

CONCLUSION

Considering the obtained results, it seems reasonable to conclude that most heart transplant patients are characterized by high levels of health behaviors. Among the various forms of health-relevant behaviors, heart transplant patients engage significantly less frequently in behaviors related to a healthy diet than in preventive behaviors, attention to a positive mental attitude, or daily health practices. Among all subjective resources examined, the best predictors of caring about health are health locus of control, and level of conscientiousness. The results of the analyzes also indicate other relationships with respect to specific forms of health behaviors.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Bioethics Committee of the Institute of Cardiology. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AM, AK, MS-M, TZ, and RP contributed to conception and design of the study. AM and GJ-W organized the database. AM and AK performed the statistical analysis and wrote the first draft of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 04 January 2022
doi: 10.3389/fpsyg.2021.687388

Can Self-Esteem Help Teens Resist Unhealthy Influence of Materialistic Goals Promoted By Role Models?

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The aim of the study was to examine the role of self-esteem in resisting the influence of materialistic goals of four social role models (mother, father, peers, and media) in adolescents (aged 13–16). Previous studies showed a negative correlation between the psychological health of teens and striving for materialistic goals, one of the main sources is the social modeling of materialism. Two studies were carried out. The first, correlational study, was conducted on target teens and their mothers, fathers, and peers of their choice. It examined if self-esteem is a moderator of the relationship between the materialism of social role models (mothers, fathers, peers, and media) and the materialism of teens. The second, experimental study, was conducted on target teens only. It examined how boosting the self-esteem of teens and activating materialism of social role models (mothers, fathers, peers, and media) may affect the materialism of teens. Study 1 showed a significant interaction effect of self-esteem and the materialism of peers on the materialism of teens. The interaction effects of self-esteem and other role models (parents and media) were not significant. Study 2 showed that elevated self-esteem lowered the influence of the materialism of peers on the materialism of teens. The results were not significant when other role models (parents and media) were analyzed. The results obtained in the presented studies indicate that the self-esteem of teens may have an important role in resisting the influence of materialism role models of peers. Practical implications of the studies for the psychological health of teens are also discussed.

Keywords: materialism, self-esteem, role models, parents, peers, media

OPEN ACCESS

Edited by:
Lidia Zabłocka-Żytka, The Maria Grzegorzewska University, Poland

Reviewed by:
Oscar F. Garcia, University of Valencia, Spain
Daria Biechowska, Institute of Psychiatry and Neurology (IPiN), Poland

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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *29 March 2021*
Accepted: *15 November 2021*
Published: *04 January 2022*

Citation:
Zawadzka AM, Borchet J, Iwanowska M and Lewandowska-Walter A (2022) Can Self-Esteem Help Teens Resist Unhealthy Influence of Materialistic Goals Promoted By Role Models? Front. Psychol. 12:687388. doi: 10.3389/fpsyg.2021.687388

INTRODUCTION

Self-determination theory holds that the importance attached to the pursuit of intrinsic and extrinsic goals is related to the wellbeing of an individual (Ryan and Deci, 2000). Intrinsic goals, i.e., self-acceptance, affiliation, and community feeling, satisfy basic psychological needs, and striving for these is in itself rewarding. Extrinsic goals, i.e., financial success, popularity, and image (physical appearance), also known as materialistic goals, refer to focusing on external rewards, opinions of other people, and making an impression on others. Self-determination theory (SDT) assumes that

the pursuit of extrinsic goals is problematic only when they are considered more important than intrinsic goals. In line with this approach, in this paper, materialism is understood as an orientation toward materialistic goals, i.e., financial success, popularity, and physical appearance, at the cost of neglecting non-materialistic goals, i.e., self-acceptance, affiliation, and community feeling; (Relative Extrinsic Versus Intrinsic Value Orientation, REIVO) (Kasser, 2002; also see Kasser et al., 2014).

Psychological research confirms that successive generations of teens are becoming more materialistic (Twenge and Kasser, 2013). And yet, existing literature demonstrates that attaching excessive significance to materialistic goals and attaching greater significance to materialistic goals than intrinsic goals may cause negative consequences for physical health, psychological condition, and social wellbeing of adolescents (Kasser and Ryan, 1993; Cohen and Cohen, 1996; Williams et al., 2000; Vansteenkiste et al., 2007; Dittmar et al., 2008; Twenge et al., 2010; Kasser et al., 2014; Tsang et al., 2014; Moldes and Ku, 2020).

One of the main sources of the materialism of teens is social modeling, and there are various role models (parents, peers, and media) that can shape the materialism of teens (Kasser et al., 1995; Flouri, 1999; Goldberg et al., 2003; Chaplin and John, 2010; Zawadzka and Dykalska-Bieck, 2013; Zawadzka et al., 2017, 2021; Chaplin et al., 2019). As a result of materialism social modeling, the individual becomes oriented toward pursuing materialistic goals (Kasser, 2002).

In view of the negative health consequences of materialism for adolescents, it is important to identify ways in which the impact of materialism role models can be lessened. One of the possible resources associated with resistance to the influence of materialism role models is high self-esteem. Self-esteem is a positive attitude toward oneself. It is an effective resource, which brings a sense of social support (Battistich et al., 1993; Keefe and Berndt, 1996; Glendinning and Inglis, 1999; Leary and Baumeister, 2000) and works as a mechanism that can deal with the problem of being excluded from a group (cf. Achenreiner, 1997; Banerjee and Dittmar, 2008; Jiang et al., 2015). Furthermore, lower self-esteem is associated with pursuing materialistic goals (Chaplin and John, 2007; Park and John, 2011; Kasser et al., 2014; Liang et al., 2016; Zawadzka and Iwanowska, 2016). Thus, individuals with elevated self-esteem seem likely to be more resistant to the social modeling of materialism. The presented study is an attempt to answer the question of whether the self-esteem of teens may be a resource that is associated with resistance to materialism influences.

In this study, we worked toward three goals. First, we analyzed whether elevated teens' self-esteem can be a moderator of the relationship between the materialism of role models (mothers, fathers, peers, and media) and the materialism of teens. Second, we checked whether boosting self-esteem can lessen the influence of materialism role models (mothers, fathers, peers, and media). Third, we examined whether higher self-esteem may help teens to resist the influence of any of the materialism role models in question. Below, we present the theoretical basis of the study and discuss questions posed in our two studies, correlational and experimental.

Self-Esteem and Materialism of Teens

Self-esteem can be analyzed as a one-dimensional global self-evaluation (Rosenberg, 1965) and as a multi-dimensional self-evaluation in various domains (Chen et al., 2020). Self-esteem is understood in this paper as positive global self-evaluation and a feeling of general happiness and satisfaction (Harter, 1999). According to self-determination theory, self-esteem occurs as the effect of satisfying basic psychological needs (i.e., affiliation, autonomy, and competence) and pursuing intrinsic, non-materialistic, goals (i.e., self-acceptance, affiliation, and community feeling; Ryan and Deci, 2000; Kasser, 2002). Materialistic goals are in opposition to intrinsic, non-materialistic, goals – the pursuit of the former occurs with neglect of the latter. Studies on teens indicate that materialism can be a compensatory strategy for violation of self-esteem (Chaplin and John, 2007; Park and John, 2011; Shrum et al., 2013; Kasser et al., 2014; Zawadzka and Iwanowska, 2016). This compensatory strategy occurs more frequently in teens from families with low social-economic status (SES) than in those from families with high SES (Nairn and Opree, 2021).

Studies on teens to date mainly deal with the relationship between self-esteem and materialism. They show that lowered self-esteem is linked to increased materialism (Chaplin and John, 2007). Other studies also say that the negative relationship between self-esteem and materialism is stronger for implicit than explicit self-esteem (Park and John, 2011). However, in one study, the negative relationship between self-esteem and materialism was confirmed by an indirect measure and was not confirmed by a direct one (Zawadzka and Iwanowska, 2016). Other studies indicate that the negative relationship between self-esteem and materialism depends on how the teens define themselves (Gil et al., 2016; Zhang and Hawk, 2019; Zhang et al., 2020) and how stable the self-esteem is (Baoyan et al., 2021). Self-esteem also directly affects body image and body satisfaction, which are related to materialism (Guðnadóttir and Garðarsdóttir, 2014; Sun, 2018). Some studies show a causal direction between materialism and self-esteem, e.g., they found that activating positive self-beliefs reduces materialism (Chaplin and John, 2007; Liang et al., 2016). In a longitudinal study by Kasser et al. (2014), decreasing materialism resulted in increasing self-esteem, especially in those participants who had had a high level of materialism.

Thus, most previous studies show that materialism of teens is negatively linked to high/elevated self-esteem and that materialism may be a compensatory strategy for the decline of self-esteem.

Parents, Peers, and Media as Materialism Role Models

Theories of social modeling postulate that certain behaviors and attitudes arise through observation and imitation of role models – mothers, fathers, peers, and those displayed by media (Bandura, 1997). Many studies to date demonstrate that adolescent materialism is linked to the materialism of role models. Moreover, experimental studies indicate that activation

of various materialism role models may increase the importance of materialistic aspirations of teens (Zawadzka et al., 2021).

Cross-sectional studies indicate that the materialism of teens is positively linked to the materialism of mothers (Flouri, 1999; Goldberg et al., 2003; Chaplin and John, 2010; Zawadzka and Dykalska-Bieck, 2013). As far as the link between the materialism of fathers and materialism of teens are concerned, the results are inconsistent; some show significant positive relationships (Goldberg et al., 2003; Chaplin and John, 2010), while others do not show any significant relationships (Flouri, 2004; Wojtowicz, 2013; Zawadzka and Dykalska-Bieck, 2013).

As regards peers, studies show that teens learn materialism from peers and friends (Churchill and Moschis, 1979; Santini et al., 2017), teens who have materialistic peers display higher levels of materialism (Sheldon et al., 2000; Chaplin and John, 2010), peer influence relates to the materialism of teens (Vinayak and Arora, 2018) and more intense involvement in consumption (cf. Bachmann et al., 1993; Gentina and Bonsu, 2013), and materialism of teens is positively linked to susceptibility to peer influence (Achenreiner, 1997).

Research into media and materialism of teens shows that media play a role in increasing the materialism of children and teens (Goldberg and Gorn, 1978; Churchill and Moschis, 1979; Moschis and Moore, 1982; Buijzen and Valkenburg, 2003; Schor, 2004; Chia, 2010; Sharif and Khanekharab, 2017; Wang et al., 2020). Media messages and advertisements exposure may foster the conviction that money, fame, and attractive image are the source of happiness in life and, in this way, are important life goals. However, correlations between media exposure and adolescent materialism are relatively low.

As described above, the research literature indicates that parents, peers, and media affect the materialism of teens. However, the impact of these role models can be different (cf. Parke, 2004). In adolescence, a period of maturation, teens increasingly crave relations with their peers, who experience similar problems (cf. Steinberg and Morris, 2001). Consequently, peer pressure becomes stronger, and the importance of conforming to group norms increases while parental influence decreases (Schaffer, 1996). Adolescence is also a period when teens are more prone to risky behaviors (Garcia et al., 2020). Peers can have both a positive impact on the teen, e.g., contribute to the development of social competencies (Gallarin and Alonso-Arbiol, 2012) and a negative one, e.g., encourage to undertake unhealthy and risky behaviors (Ridao et al., 2021). Although parental influence decreases during adolescence decreases, it is still important for the optimal functioning of the teen. Teens who have caring and committed parents tend to have higher self-esteem and adapt better to school and are less likely to engage in unhealthy and risky behaviors than those whose parents are cold and neglectful (Yeung, 2021). The materialism of teens is increased by both the normative influence of peers (Achenreiner, 1997; Chan and Prendergast, 2007, 2008) and social comparisons with peers (Chan and Prendergast, 2007, 2008). Peers have an influence on how teenagers receive and evaluate media information (Steinberg and Monahan, 2007). They use the media and get inspiration for shopping, for example, from there (Ward and Wackman, 1971; Shrum, 1996).

Thus, previous studies show that although there are links between the materialism of teens and materialism of all role models (i.e., mothers, fathers, peers, and media), peers may play a special role in modeling the materialistic goals and attitudes of teens.

Self-Esteem and Social Modeling of Materialism

Self-esteem is also shaped in the context of social relationships. Parental warmth and commitment, unconditional love, and a sense of security offered by parents lay the foundations for positive self-esteem (Coopersmith, 1967; Harter, 1983; Martinez et al., 2020; Queiroz et al., 2020). It is well documented that parental support is vital for self-esteem (Gecas and Schwalbe, 1986; Parker and Benson, 2004; Chaplin and John, 2010) and that positive parent-child interactions can delay the decline of self-esteem in adolescence (Yang and Schaninger, 2010). Teens fulfill the need for intimacy and closeness in friendly relationships with their peers to a greater extent than younger children do (Berndt, 1989; Berndt and Perry, 1990). Having friendly relationships with peers results in elevated self-esteem, while feelings of rejection by peers lead to a drop in self-esteem (Damon et al., 2006). According to current approaches to the function of self-esteem, high self-esteem may serve as an effective resource, which gives a sense of social support (Leary and Baumeister, 2000). Sociometer Theory (Leary and Baumeister, 2000) holds that self-esteem functions as a barometer relational value of a person – high self-esteem is linked to a sense of being accepted and high relational value while low self-esteem is linked to a sense of exclusion and low relational value. Individuals with high self-esteem can feel a sense of social support (Battistich et al., 1993; Keefe and Berndt, 1996; Glendinning and Inglis, 1999; Leary and Baumeister, 2000) and high self-esteem helps them cope with rejection (Brown, 2004). Studies on teens showed that high self-esteem is associated with perceiving oneself as popular among peers, while low self-esteem is associated with perceiving oneself as socially isolated (cf. Glendinning and Inglis, 1999). In addition, individuals with high self-esteem have a stronger influence on interaction partners and see themselves as having more influence than people with low self-esteem (Cohen, 1959). What is more, the experience of being excluded from a peer group is associated with feeling greater pressure from the group and fosters materialism (Achenreiner, 1997; Banerjee and Dittmar, 2008), and, vice versa, materialism resulting from the experience of peer rejection may decrease when (implicit) self-esteem is elevated (Jiang et al., 2015).

Few previous studies analyzed the relations of having or not having social support with materialism and self-esteem as a mediator of such relations. They showed that self-esteem of teens can be a mediator of the relation between perceived acceptance and support of peers or parents and adolescent materialism – acceptance and support elevate self-esteem and, consequently, lower materialism (Chaplin and John, 2010; Fu et al., 2015; Gentina et al., 2018).

In conclusion, both parental and peer support can elevate self-esteem and lower materialism. However, the importance of parental support and acceptance for positive self-esteem is

crucial, while the importance of peer support and acceptance for positive self-esteem may be susceptible to change. High/elevated self-esteem may give a sense of social support and help deal with being rejected or excluded from the peer group.

The Current Study

The aim of the present studies is to fill in the gaps that exist in the literature on teenage materialism (REIVO) and self-esteem. Until now, the role that self-esteem may play in moderating materialistic social influences on adolescents has not been clearly explained in the literature. Based on various findings, we assumed that self-esteem might play a crucial role in resisting the materialistic influence of peers. First, high self-esteem is an emotional resource, which evokes a sense of social support (cf. Battistich et al., 1993; Keefe and Berndt, 1996; Glendinning and Inglis, 1999; Leary and Baumeister, 2000) and elevates the relational value of a person (cf. Leary and Baumeister, 2000; see also Chaplin and John, 2010; Gentina et al., 2018). Second, self-esteem may play a mediating role in the relationship between social support and materialism (Chaplin and John, 2010; Gentina et al., 2018). Third, individuals with higher self-esteem tend to have a stronger influence on their interaction partners than individuals with lower self-esteem (Cohen, 1959). Fourth, the risk of exclusion from a peer group is an important correlate of materialism, and elevating self-esteem lowers materialism resulting from peer group exclusion (Jiang et al., 2015). Thus, we formulated the first hypothesis H1: Self-esteem will moderate the relation between the materialism of peers and the materialism of teens.

Furthermore, previous studies have not examined the role that self-esteem may play in reducing materialistic influences on adolescents. Taking into account, once again, theories about the function of self-esteem as a sense of being accepted (cf. Leary and Baumeister, 2000), and findings suggesting that elevating self-esteem may lower materialism (cf. Chaplin and John, 2007), and considering that materialism of teens resulting from peer rejection may be lowered when self-esteem is elevated (Jiang et al., 2015), we proposed hypothesis H2: Elevating self-esteem will reduce the influence of materialism of peers on the materialism of teens.

To test the hypotheses, we carried out two studies, a cross-sectional one and an experimental one. We analyzed all materialism role models discussed above (i.e., mothers', fathers', peers', and media), to check the assumed effects in both studies.

STUDY 1[1]

Method

The first, cross-sectional, study tests Hypothesis H1 about self-esteem as a moderator of the relationship between the materialism of peers and materialism of teens. In the study, we checked the moderation effect of self-esteem on the relation between the materialism of teens and materialism of each of the role models examined, i.e., mothers', fathers', peers', and media.

Participants

We have surveyed 796 subjects. The sample of target teens consisted of 199 middle school students, aged 13–16 (M_{age} = 14.36, SD = 1.07), of whom 53.3% were girls and 46.7% were boys. We also obtained data from 199 of their mothers (M_{age} = 41.71, SD = 4.06), 178 of their fathers (M_{age} = 43.67, SD = 5.32), and 199 of their peers (of whom 57.3% were girls and 42.7% were boys; M_{age} = 14.44, SD = 1.57). None of the mothers and fathers had primary school education, 10.1% of the mothers and 19.6% of the fathers had vocational education, 25.1% of the mothers and 24.1% of the fathers had secondary education, 11.6% of the mothers and 6.5% of the fathers had a Bachelor's degree, and 52.3% of the mothers and 48.7% of the fathers had a Master's degree or above. All respondents came from the Pomeranian region of Poland. The families maintained an average standard of living (M Family SES = 6.20; SD = 1.37) measured by MacArthur's Scale of Subjective Social Status (Goodman et al., 2001).

In both studies, we surveyed 13–16-year olds. Teens after the period of early adolescence, in which the self-esteem lowers, may show an increase in materialism (cf. Chaplin and John, 2007). The sample consisted of a similar number of girls and boys; studies indicate that the level of the materialism of teenage boys is generally higher than that of teenage girls (cf. Churchill and Moschis, 1979; Achenreiner, 1997). The teens came from families with (similar) family SES; previous research shows that family SES is related to the self-esteem of teens (cf. Nairn and Opree, 2021). The above selection criteria were applied to standardize the sample and minimize a possible impact on the study of the dependencies between age, gender, and family SES.

Procedure and Materials

Prior to the study, consent had been obtained from both the research ethics committee at the University [blinded] and from principals of the schools whose students we surveyed. Each parent had been informed about the study and its goals and had allowed the child to participate in the study. The survey was anonymous. The same procedure was followed in both studies presented in this paper. All questionnaires were administered in the Polish language.

The research was conducted at the schools that target teens attended. The teens, their mothers, fathers, and peers filled out questionnaires in groups of 5–15 people. The peers we surveyed were those indicated by target teens as their best friends. The questionnaires consisted of questions about demographics and measures of materialism (refer below). The sets for target teens also included a self-esteem scale and measures of exposure to media and the Internet. The scales and measures were arranged in a random sequence.

The Measure of Target Materialism of Teens

We used an adaptation of the Aspiration Index (AI) for teens (AI; Kasser et al., 2014, Study 4). It includes 36 goals grouped in 12 aspiration domains (Affiliation, Self-acceptance, Community, Financial Success, Popularity, Physical Appearance, Hedonism,

[1]This study is a part of bigger research on Social determinants of materialism in teenagers.

Safety, Conformity, Spirituality, Health, and Savings). A standard back-Polish-translation of the English version of AI was used (Brislin, 1970). Respondents used a 9-point scale (1 = *not at all important* and 9 = *extremely important*) to rate "How important was each goal to you in the past month." We wanted to find here how important the three primary extrinsic (materialistic) domains were for the teens, that is a financial success (e.g., *I will have many expensive possessions*), popularity (e.g., *I will be admired by many people*), and physical appearance (e.g., *My image will be one that others find appealing*), relative to the three primary intrinsic (non-materialistic) domains, that is, self-acceptance (e.g., *I will choose what I do, instead of being pushed along by life*), affiliation (e.g., *People will show affection to me, and I will to them*), and community feeling (e.g., *I will assist people who need it, asking nothing in return*). We calculated the level of materialism assuming, in line with the conclusions of Grouzet et al. (2005), that materialistic goals and intrinsic goals are two ends of the same dimension. We summed scores on the three intrinsic domains (nine items) and subtracted them from the sum of scores on the three extrinsic domains (nine items) (cf. Sheldon and Kasser, 1998, Kasser, 2001). In this way, we generated a REIVO score, which reflects the relative importance an individual puts on extrinsic/materialistic vs. intrinsic aspirations (refer to also Kasser et al., 2014). The higher the result, the higher the level of materialism is. The reliability of the REIVO was Cronbach's $\alpha = 0.78$ and McDonald's $\Omega = 0.80$ (refer to Deng and Chan, 2017).

The Measure of Target Self-Esteem of Teens

We assessed self-esteem with the Rosenberg Self-Esteem Scale (Rosenberg, 1965; a Polish adaptation by Łaguna et al., 2007) consisting of ten statements relating to feelings about one's worth. Respondents rated the statements on a 4-point scale (1 = *strongly agree* and 4 = *strongly disagree*). The reliability of the scale was high, Cronbach's $\alpha = 0.86$, McDonalds'$\Omega = 0.87$.

The Measure of the Materialism of Mothers and Fathers

We used an adaptation of the AI for adults (Kasser and Ryan, 1993; a Polish adaptation by Zawadzka et al., 2015) to assess the materialism of mothers and fathers. It included 35 goals assessing three extrinsic (materialistic) aspirations: financial success, popularity, physical appearance, and three intrinsic (non-materialistic) aspirations: personal growth, affiliation, and community feeling; five items also assessed health aspirations (e.g., to be fit and healthy) but we did not focus on them here. Respondents rated the question of "How important each goal is to you?" using a 7-point scale (1 = *not at all important* and 7 = *very important*) for each item. We created a REIVO score (cf. Kasser et al., 2014). The reliability of the REIVO for mothers was Cronbach's $\alpha = 0.78$ and McDonalds'$\Omega = 0.81$ and for fathers was Cronbach's $\alpha = 0.81$ and McDonalds'$\Omega = 0.80$.

The Measure of the Materialism of Peers

We used the AI for teens described above to assess the materialism of peers. We created a REIVO score (cf. Kasser et al., 2014). The reliability of the REIVO for peers was $\alpha = 0.63$ and McDonald's $\Omega = 0.70$.

The Measures of Media and Advertising Exposure

We used a method inspired by Schor (2004) by asking target teens to answer questions related to the frequency of their viewing TV and using the Internet. Using a 5-point scale (1 = *never* and 5 = *always*), first respondents indicated how often they watch television and use the Internet on weekdays at five specific times of day (i.e., before school, after school, during dinner, after dinner, and in bed before sleep). Next, using the same 5-point scale, they rated how often they engaged in the same two activities on the weekend at six specific times of day (i.e., in the morning, during lunch, in the afternoon, during dinner, after dinner, and in bed before sleep). We summed the ratings of exposure to television, and the Internet, during the weekdays and weekends.

Results

Preliminary Analysis

Table 1 displays correlations between all studied variables. Target self-esteem of teens was significantly negatively correlated with the materialism of mothers and materialism of peers but was not significantly related to the materialism of teens, the materialism of fathers, and media exposure. Correlations between self-esteem and sex ($r = -0.08$) and age ($r = -0.13$) were not significant. The materialism of all role models was positively related to the materialism of teens.

Self-Esteem as a Moderator of the Relationship Between the Materialism of Teens and Materialism Role Models

We examined whether the relationships between the materialism of teens and that of the four role models (e.g., mothers, fathers, peers, and media) were moderated by the self-esteem of teens. Moderation effects were tested with regression analysis using the PROCESS bootstrapping macro procedure (Hayes, 2013).

Of the four potential moderation effects of self-esteem, one was significant – self-esteem moderates the relationship between materialism of peers and materialism of teens ($\Delta R^2 = 0.04$, $\Delta F_{(1,195)} = 9.69$, $b = -0.14$, SE = 0.04, $t = -3.11$, $p = 0.002$, lower 95% CI [LLCI] = −0.222, upper 95% CI [ULCI] = −0.049). As can be seen in **Figure 1**, the materialism of teens rises with the increase of materialism of their peers, but the effect is weaker when the self-esteem of teens is high.

TABLE 1 | Correlations of variables (Study 1).

Variables	1	2	3	4	5
1. Teenager's self-esteem					
2. Teenager's materialism	–0.08				
3. Mother's materialism	–0.20**	0.32***			
4. Father's materialism	–0.05	0.31***	0.32***		
5. Peer's materialism	–0.28**	0.32***	0.32***	0.26***	
6. Media exposure	–0.01	0.14*	0.14*	–0.098	0.07

*Level of significance: * = 0.05, ** = 0.01, *** = 0.001.*

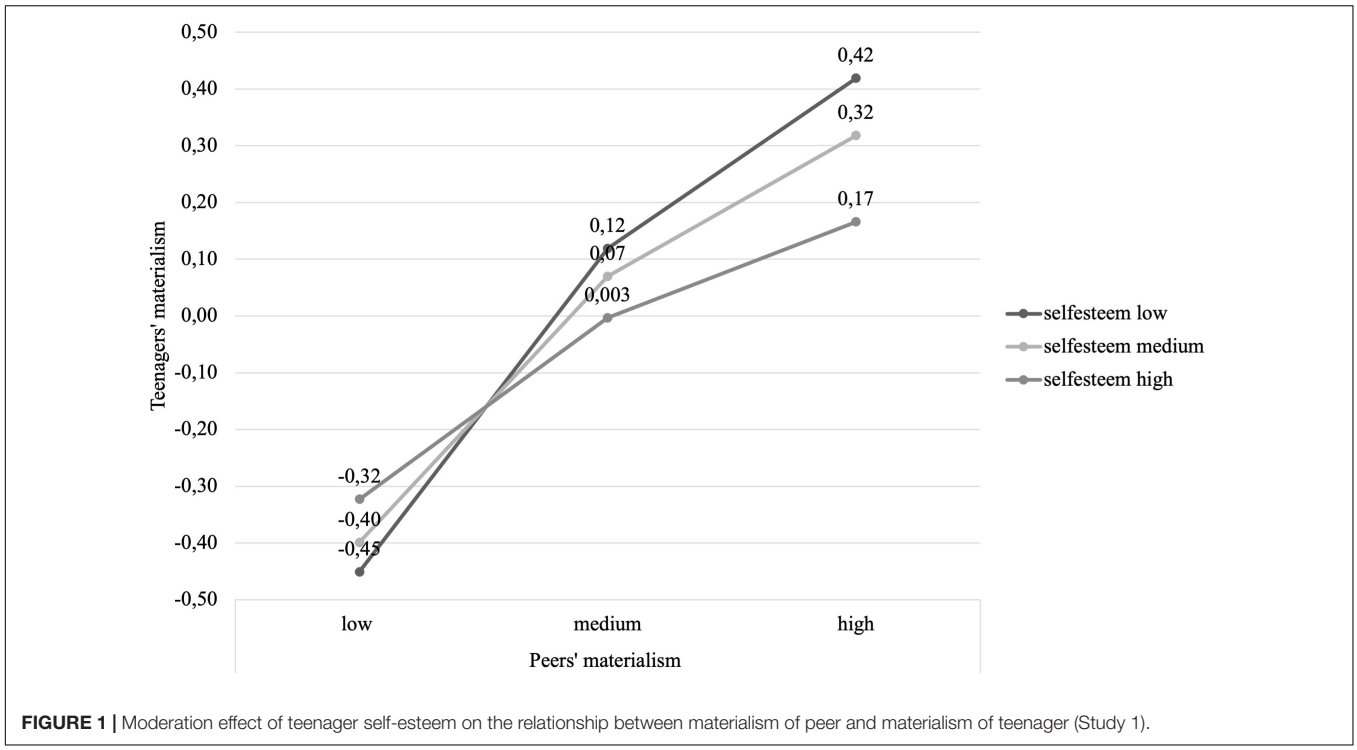

FIGURE 1 | Moderation effect of teenager self-esteem on the relationship between materialism of peer and materialism of teenager (Study 1).

The results do not show that self-esteem is a moderator in the case of the other three social materialism role models studied, i.e., mother ($\Delta R^2 = 0.006$, $\Delta F_{(1,195)} = 1.19$, $b = 0.08$, $t = 1.09$, $p = 0.276$, LLCI = − 0.061, ULCI = 0.213), father ($\Delta R^2 = 0.006$, $\Delta F_{(1,195)} = 1.32$, $b = -0.08$, SE = 0.07, $t = -0.1.15$, $p = 0.251$, LLCI = − 0.225, ULCI = 0.059), and media ($\Delta R^2 = 0.004$, $\Delta F_{(1,195)} = 0.735$, $b = -0.06$, SE = 0.07, $t = -0.857$, $p = 0.392$, LLCI = − 0.201, ULCI = 0.079).

Therefore, the results of Study 1 support hypothesis H1, predicting that the self-esteem is a moderator of the materialism of peers on the materialism of teens.

STUDY 2

Method

The second, experimental study tests Hypothesis H2 relating to the effect of elevating self-esteem on the impact of the materialism of peers on the materialism of teens. In this study, we activated either both self-esteem and materialism of the four role models (mother, father, peer, or media) together or the materialism of the four role models only. Then we tested if elevating the self-esteem of teens can lessen the impact of the materialism of the role models on the materialism of teens as compared to the neutral group (i.e., neither self-esteem was elevated nor materialism role model was activated) as a reference group. In our experimental study, we used semantic priming and goal priming to activate both materialisms of social role models and self-esteem. Exposure to specific stimuli, concepts, or clues concerning certain knowledge or goals makes the knowledge and goals more accessible (cf. Forster et al., 2009). The dependent variable was the materialism of teens measured with AI (i.e., REIVO score) as the relative importance individuals place on extrinsic (materialistic) vs. intrinsic aspirations.

Participants

The sample consisted of 164 middle school students aged 13–16 (M = 14.47, SD = 0.09), of whom 56.7% were girls and 43.3% were boys. The respondents came from families in which 9.1% of mothers and 4.7% of fathers had only primary school education, 13.6% of mothers and 16.8% of fathers had vocational education, 19.5% of mothers and 22.8% of fathers had secondary education, 10.4% of mothers and 15.4% of fathers had a Bachelor's degree, and 47.4% of mothers and 40.3% of fathers had a Master's degree or above. Teenagers came from the Pomeranian region of Poland. Their families maintained an average standard of living (M Family SES = 6.57; SD = 1.30) as measured by MacArthur's Scale of Subjective Social Status (Goodman et al., 2001). All measures were administered in the Polish language.

Procedure and Materials

The study was conducted at the schools the teens' attended. They were seated in classrooms separately so that they could not communicate with each other and were randomly assigned to one of the eight conditions in two (elevated vs. non-elevated self-esteem) × four (activated single materialism role model – mother, father, peer, or media) experimental design.

Elevation of Self-Esteem

The procedure of elevating self-esteem was inspired by a method previously used by Chaplin and John (2007). Teens had to do a word search puzzle and find 10 adjectives (only positive

characteristics of people). After that, they had to form 10 sentences about themselves with all of the adjectives they had found (e.g., *I am. . . creative*; *I am. . . ambitious*; *I am. . . friendly*). In the non-elevated condition, teens had to solve a word search puzzle, i.e., 10 nouns referring to everyday life and surroundings, e.g., a cloud, a mountain, a couch. After finding the words, participants had to write them down in a column.

To check the effect of manipulation, the teens in the experimental group were asked to pick one characteristic and describe a situation within the previous 3 months in which they displayed that characteristic and, thus, were satisfied with themselves ("Choose one of the characteristics from the word search puzzle. Recall a situation within the last 3 months when you displayed the characteristic and were satisfied with yourself. Describe the situation"). After the survey, competent judges (psychology experts) ($n = 4$) assessed the content of descriptions of teens in the group with self-esteem manipulation ("Indicate to what extent the content presented in the description indicates that the teenager was proud and satisfied on a scale from 1 – *absolutely not* to 5 – *absolutely yes*"). In assessing the effectiveness of self-esteem manipulation, we took into account the mean and SD of the judges' ratings and the concordance of the ratings.

Activation of the Materialism Role Model

The procedure of activation of materialism role models (i.e., mothers, fathers, peers, and media) was inspired by a method successfully employed in previous studies by Ashikali and Dittmar (2011); Bauer et al. (2012), and Zawadzka et al. (2021). It involved the use of ads, images, and videos with materialistic themes. The activation procedure was divided into two parts. First, in mother, father, and peer conditions, teens answered three identical questions referring to a relevant materialism role model (i.e., "Which of these things would your mother/father/peer choose to make himself/herself happy?") choosing one out of three answers for each question from separate sets for each condition; the answers were customized to suit the relevant materialism role model, e.g., *their child having a well-paid job in the future* for father/mother or *winning a nationwide inter-school competition* for peers. In the media condition, respondents answered three questions (i.e., "Which of these things do media present as those that bring people happiness?"). The provided answers in all four conditions included materialistic goals only, e.g., *fame, celebritydom, and very high salary, studying at a world-famous/prestigious university*.

Next, respondents in all four conditions were shown visual materials of 36 material goods (e.g., cosmetics, sports shoes, cars, jewelry, backpacks or purses, computers, and luxury vacations) with high price tags and logos of prestigious brands. A preliminary study had confirmed that teens were familiar with the goods/brands used in the visual materials and considered them luxurious. In mother, father, and peer conditions, teens were asked to "indicate at least three things that their mother/father/peer would choose to make herself/himself happy"; the products were customized depending on who the questions referred to. In the media condition, teens indicated "at least three things that would bring the biggest happiness to everybody according to media advertisements and commercials".

In the neutral condition, teens answered three neutral questions about preferences for colors and places, choosing one out of three suggested neutral responses, e.g., "Which of the following things would you choose to make yourself happy with your job in the future, when you grow up: (a) *working in a room with paintings on the walls*; (b) *working in a room with flowers*; and (c) *working in a room with colorful walls*"; "Which of the following things would you choose to make yourself happy, when you grow up: (a) *more green places in the place where I live*; (b) *more cycle lanes in the place where I live*; and (c) *more playgrounds in the place where I live*." Next, teens were asked to choose at least three most preferred figures out of 36 colorful figures: i.e., (a) squares, (b) rectangles, (c) ellipses, and (d) triangles (e) polygons.

The Measure of the Materialism of Teens

To assess the materialism of teens, we used the AI adapted for teens (AI; Kasser et al., 2014, Study 4). The AI is described in the methodology section of Study 1 above. For this study, the reliability of the REIVO (after recoding items for intrinsic goals) was Cronbach's $\alpha = 0.75$ and McDonald's $\alpha = 0.68$.

Results

Self-Esteem Manipulation Check

The mean of competent judges' ratings was $M = 4{,}21$, SD = 0.53 (Max = 5). Kendall's W of concordance analysis of competent judges was W = 0.68. Thus, the judges agreed that the descriptions of teens in the experimental group do express pride and self-satisfaction, which means that the manipulation of self-esteem – self-esteem elevation was successful.

Self-Esteem, Materialism Role Models, and Materialism of Teens

To check hypothesis 2, regression analyses with categorical variables were performed for each of the tested materialistic models (i.e., mother, father, peer, and media). In accordance with the analysis requirements, the nominal variables (i.e., study conditions) were counted into instrumental variables by binary coding (zero-one) before entering the model. The first variable represented the group primed with both elevated self-esteem and materialism role model (i.e., mother or father or peer or media). The second variable represented the group primed with materialism role model only. The control group was a reference group. The dependent variable was the materialism of teens (REIVO score).

The results showed that only the materialism role model of peers proved significant [$R = 0.39$, $R^2 = 0.15$, $F(2,53) = 4.83$, $p = 0.012$]. Regression analysis coefficients indicated that the peer condition differed significantly from the control condition on the level of materialism of teens ($\beta = 0.46$, $t = 3.10$, $p = 0.006$; LLCI = 0.36, ULCI = 1.56) whereas the self-esteem and peer condition did not differ significantly from the control group ($\beta = 0.21$, $t = 1.43$, $p = 0.11$, LLCI = 0.36, ULCI = 1.56). Regression analyses of the tested models for the other conditions were not significant (see **Table 2**).

Therefore, hypothesis H2 was confirmed. In other words, Study 2 indicated that elevating self-esteem results in reducing the influence of materialism of peers on the materialism of teens.

TABLE 2 | Summary of linear regression analysis predicting materialism of adolescent from activation of self-esteem and/or materialism role model (Study 2).

Model	Conditions	B	s.e.	β	t	p	Ba LLCI	Ba ULCI
Peer	SES and MAT	0.46	0.32	0.21	1.43	0.16	–0.07	1.05
	MAT	0.02	0.30	0.46	3.10	0.003	0.358	1.56
				$R = 0.39$, $R^2 = 0.15$, $F(2,53) = 4.83$, $p = 0.012$				
Mother	SES and MAT	–0.10	0.01	0.05	–0.30	0.76	–0.647	0.595
	MAT	0.42	0.02	0.20	1.26	0.21	–0.290	1.10
				$R = 0.10$, $R^2 = 0.01$, $F(2,53) = 1.47$, $p = 0.24$				
Father	SES and MAT	–0.14	0.31	–0.08	–0.47	0.64	–0.672	0.366
	MAT	0.09	0.31	0.05	0.29	0.77	–535	0.828
				$R = 0.11$, $R^2 = 0.01$, $F(2,51) = 0.294$, $p = 0.75$				
Media	SES and MAT	–0.04	0.36	–0.02	–0.12	0.91	–0.664	0.640
	MAT	0.41	0.35	0.19	1.18	0.24	–0.215	1.149
				$R = 0.20$, $R = 0.04$, $F(2,46) = 0.983$, $p = 0.38$				

Linear regression analysis was conducted on the transformed variables; the control group is a reference group. SES and MAT = conditions with both self-esteem and materialism role model activation, MA = conditions with materialism role model activation only; BCa LLCI = bias-corrected accelerated lower 95% CI; BCa ULCI = bias-corrected accelerated upper 95% CI.

However, this is not true for the other social role models tested (i.e., mother, father, or media).

DISCUSSION

The aim of the study was to check whether the self-esteem of teens can help resist the social modeling of materialism. The research conducted so far has focused on the relationship between materialism and self-esteem (Chaplin and John, 2007; Park and John, 2011; Zawadzka and Iwanowska, 2016), on self-esteem as a mediator of the relationship between materialism and parental and peer support (Chaplin and John, 2010), and on self-esteem as a moderator of the relationship between materialism and peer rejection (Jiang et al., 2015). However, the role of self-esteem in resisting materialistic social influences (i.e., mother, father, peer, and media) has not been studied before. Thus, the presented study expands the knowledge on the nature of the relationship between self-esteem and materialism of teens. It is important to note that we conducted both cross-sectional and experimental studies, the latter of which employed various ways of activating self-esteem and materialism role models. The cross-sectional study (1) showed that high self-esteem can help teens resist the influence of materialism on peers, which is not the case for the other materialistic influences tested (i.e., mother, father, and media). The experimental study (2) indicated that elevated self-esteem can decrease peers' materialism influence on the materialism of teens.

The findings of the first study, that confirm a moderation effect of high self-esteem for peer influence on materialism of teens, may be explained by the fact that this superior strength of this specific influence results from the need to be accepted and the fear of ostracism (Mujiyati and Adiputra, 2018) since peers are particularly important references for the group identity of teens (Erikson, 1968). According to previous studies, low self-esteem is linked to increased susceptibility to peer pressure (Bukowski et al., 2008), while high self-esteem is positively linked to resistance to peer pressure (Chen et al., 2016). In addition, high self-esteem is linked to clear self-beliefs, and teens who have clear self-beliefs are more resistant to social consumption motivation (i.e., imitating peers; Gil et al., 2012).

The absence of a moderation effect for parental models may result from differences between the developmentally based nature of parental influence and that of the peers. In teens, parental influence is diminished in favor of peer influence (Maccoby, 1992; Schonpflug, 2001). Parental influence refers to intergenerational transmission based on the emotional bond (Tucker and Updegraff, 2009), while peer influence relates to a relationship in which teens can choose the people they will form close ties with (Furman and Buhrmester, 1992). The influence of parents, who are the first agents of socialization, affects the hierarchy of teens' values, and peer influence affects preferences concerning everyday behaviors (e.g., what music to listen to, what to wear, where to hang out; Maccoby, 1992; Schonpflug, 2001; Richins, 2017). Thus, self-esteem may not moderate the relationship between the influence of materialism of parents and materialism of teens.

The absence of a moderation effect in the case of media may be due to the fact that the relationship between the media and advertisement exposure and teens' materialism is weaker than the relationship between other materialistic influences and teens' materialism. Previous studies also show that the relationship between materialistic media and teens' materialism does occur but is rather weak (cf. Buijzen and Valkenburg, 2003; Opree et al., 2014). Adopting previously used measures, we examined the frequency of teen exposure to media (Schor, 2004). However, a growing number of studies on adults indicate that there are other variables that should be analyzed when measuring the influence of media, such as active processing during viewing (Shrum et al., 2005), commercial portrayals of characters (Richins, 1987), the purpose of using media (Richins, 2017), or active participation in social media and social networks (Noar and Harrington, 2012).

It is worth mentioning in this study that Study 1 did not confirm the conclusions from the research of predecessors on American teens that indicate a significant negative

relationship between self-esteem and materialism of teens (Chaplin and John, 2007, 2010; Park and John, 2011). As stated in the text, there are studies showing that the relationship between self-esteem and materialism depends on how teens define themselves (Zhang and Hawk, 2019) and that the relationship between self-esteem and materialism may also depend on one's origin or culture (see Zawadzka et al., 2020). Thus, it can be assumed that the negative relationship between self-esteem and materialism may be related to the culture in which the teen respondents have been growing up.

Our experimental study also confirmed that elevating the self-esteem of teens reduces the impact of the materialism of peers but not that of the other materialistic models. In this respect, the experimental study results echo the results of the cross-sectional one. Based on these results, it can be assumed that peers' materialistic influence is less stable than that of parents and can be changed by boosting the teen's self-esteem. Boosting self-esteem is not related to lessening the materialistic influence of parents because parental influence is more stable since parents are the first social models and self-esteem is largely determined by the relationship with parents and the upbringing of the child in the period prior to adolescence (cf. Coopersmith, 1967; Harter, 1983).

Limitations

The presented research also has its limitations. First, following our predecessors the measurement of media materialism used in the cross-sectional study (1) focuses on media use frequency. Considering the conclusions from studies on adults, it would be a good idea to extend the next study to include additional variables such as active processing during viewing or materialistic purposes of using media (cf. Richins, 1987; Shrum et al., 2005), which may be of importance for materialistic aspirations. Second, the studies focus on self-esteem that is defined as a positive attitude and a good opinion of oneself. However, as known from previous research, the relationship between materialism and self-esteem may be related to how people define themselves (cf. Zhang and Hawk, 2019) and in which areas of the self they build their self-worth contingencies (cf. Nagpaul and Pang, 2017; Chen et al., 2020). Taking account of the fact that activating intrinsic contingencies of self-worth and extrinsic contingencies of self-worth are linked to materialism in different ways (cf. Nagpaul and Pang, 2017), further studies should extend the analysis of self-esteem as a mediator of materialistic influences, such as the topic of self-worth contingencies. Third, the teens came from families with average family SES. Previous research suggests that the level of family SES (low and high) may be related to the self-esteem of teens and their materialism (cf. Nairn and Opree, 2021). Thus, subsequent research should be expanded to include the analysis of family SES as a mediator of self-esteem moderation in the relation between the materialism of teens and that of their peers.

Despite the limitations indicated above, the research presented here clearly demonstrated that self-esteem may allow predicting the effect of materialistic peer influences on materialism if teens and that elevating self-esteem can work as a resource helping teens, i.e., 13–16-year olds from families with average SES resist the materialistic influence of peers.

Practical Implications

Conclusions from the research on the role and function of self-esteem in healthy functioning carried out so far are not obvious. In the present study, it was shown that good self-esteem can be an effective way to be less prone to being influenced by peers, for example, overpaying attention to materialistic goals that have negative consequences for health (cf. Kasser and Ryan, 1993; Cohen and Cohen, 1996; Williams et al., 2000; Twenge et al., 2010; Manolis and Roberts, 2012; Kasser et al., 2014; Tsang et al., 2014; Moldes and Ku, 2020). Some researchers uphold the claim that self-esteem is essential for the functioning and allows predicting the effects of actions and even life success (Donnellan et al., 2005; Schimel et al., 2008), while others point to its limited value or even the burden that high self-esteem may put on individuals (Baumeister et al., 1996, 2003; Heatherton and Vohs, 2000). The presented studies also have practical implications. They suggest that a way to make teens resistant to the omnipresent materialistic social influences is to undertake activities aimed at strengthening their self-esteem, especially in the context of peer connections.

Thus, the obtained results may contribute to the development of intervention programs promoting boosting self-esteem on both cognitive (perception of self-worth) and social (perception of oneself in relationships with others) levels (Harter, 1999) to make teens more resistant to the influence of peer role models on materialism. The conducted experiment shows that effective strengthening of self-esteem on the cognitive level may include exercises such as "best possible self," a classic of positive psychology (King, 2001; Sheldon and Lyubomirsky, 2006) or "strengths exploration" (Seligman et al., 2005). The results of the correlational study show that intervention programs, such as measures to strengthen the self-esteem of teens and a sense of support in the peer group, may be beneficial for the health of teens (cf. Harter, 1999; Morris, 2009).

Contrary to previous studies on self-esteem interventions that did not indicate that self-esteem interventions can enhance the wellbeing of the individual (Guindon, 2010), the results obtained in the current studies do indicate that self-esteem may be a resource reducing the impact of peer materialism, which carries negative effects on the wellbeing of teens.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee Department of Psychology, University of Gdańsk. Written informed consent to

participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

AZ: project administration, supervision, conceptualization, methodology, formal analysis, and writing the original draft. JB: methodology, investgation, and writing the original draft and data curation. MI and AL-W: methodology, investigation, and writing the original draft. All authors read and approved the manuscript.

FUNDING

The research project was sponsored by the National Science Centre (Narodowe Centrum Nauki NCN (PL)) with grant number 2015/17/B/HS6/04187.

ACKNOWLEDGMENTS

We would like to thank Tim Kasser for his perceptive comments on the first draft of the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 12 January 2022
doi: 10.3389/fpsyg.2021.734350

Differences and Similarities in Motives to Decrease Drinking, and to Drink in General Between Former and Current Heavy Drinkers—Implications for Changing Own Drinking Behaviour

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OPEN ACCESS

Edited by:
Aneta Pasternak, Warsaw Management University, Poland

Reviewed by:
Hannah R. Hamilton, UCONN Health, United States
Lidia Cierpiałkowska, Adam Mickiewicz University, Poland

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Specialty section:
This article was submitted to Health Psychology, a section of the journal Frontiers in Psychology

Received: *01 July 2021*
Accepted: *16 November 2021*
Published: *12 January 2022*

Citation:
Rowicka M (2022) Differences and Similarities in Motives to Decrease Drinking, and to Drink in General Between Former and Current Heavy Drinkers—Implications for Changing Own Drinking Behaviour. Front. Psychol. 12:734350. doi: 10.3389/fpsyg.2021.734350

The evidence on why people initiate or cease drinking is vast; however, little is known regarding why people change their frequency and amount of drinking from intense (heavy or dependent drinking) to recreational (with little risk). Therefore, the purpose of this study was to investigate how drinking motives and motives to decrease drinking differ between former heavy drinkers (problematic and dependent), current dependent, and current recreational drinkers. Data were obtained from four groups of individuals (n = 263) using alcohol with different severity. The participants were Polish young adults aged between 18 and 35 years. About 53% of the sample were women. The Alcohol Use Disorder Identification Test (AUDIT) was used to assess the level of drinking; the Drinking Motive Questionnaire-Revised Short Form (DMQ-R SF) was used to assess drinking motives (social, coping, enhancement, and conformity). The reasons for abstaining and limiting drinking (RALD) instrument was used to assess the RALD. Additionally, a set of questions regarding motives to decrease drinking were analysed. The results show that differences were observed between the investigated groups: the current dependent group scored significantly higher on all the dimensions of drinking motives than the current low-risk group and significantly higher on coping, social, and enhancement motives than former heavy drinkers (both groups). The two groups of former heavy drinkers did not differ from each other on drinking motives. The investigated groups differed on the motives to reduce drinking—low-risk users scored the lowest on all the motives, whereas current dependent—the highest. The differences in motives to decrease drinking between current-depended and former heavy drinkers indicate which motives can be associated with the prevention strategies, programmes, and therapeutic approaches.

Keywords: drinking motives, alcohol dependence, heavy drinking, low risk drinking, motives to decrease drinking

INTRODUCTION

Alcohol use initiation usually takes place in adolescence (Johnston et al., 2003) and is followed by excessive drinking episodes more often in late adolescence and early adulthood (at ages 15–24 years) than at any other developmental stage (Gmel et al., 2003; RARHA, 2016). An early initiation can increase the risks for alcohol problems later in life (McCambridge et al., 2011; Kuntsche et al., 2017). The evidence on why people initiate alcohol consumption and engage in drinking, in general, is vast and mainly related to drinking motives. Research demonstrates that drinking motives predict alcohol use better than alcohol expectancies (Cronin, 1997) and contribute significantly in explaining the alcohol use variance together with situational factors or local norms (Kairouz et al., 2002). It is, therefore, crucial to understand what motivates people to drink and how those motivations differ between recreational and heavy alcohol users. Such knowledge could be further applied in various prevention and harm reduction interventions (Labrie et al., 2011).

Drinking motives can be characterised as psychological reasons for drinking and are based on the assumption that drinking satisfies different needs and serves different functions (Cox and Klinger, 1988; Cooper, 1994). The most common and influential model (Cooper, 1994) proposes that drinking motives can be described on two dimensions: the former one is related to reinforcement sought from alcohol use (positive or negative), and the latter one is related to the expected consequences of alcohol consumption (internal or external). The model proposes four drinking motives: coping with negative affect (negative and internal, e.g., "to forget your worries"), conformity with others (negative, external, e.g., "not to be left out"), enhancement of positive affect (positive and internal, e.g., "because it's fun"), and social experience (positive and external, e.g., "to celebrate a special occasion with a friend").

Studies show that different intensity of drinking is related to different motives; for example, heavy drinking is related to stress and need for coping (coping motive), as well as socialising in case of heavy peer drinking (social or conformity motive) (Abbey et al., 1993; Carpenter and Hasin, 1998). The coping motive has been repeatedly associated with negative consequences and heavy drinking (Kuntsche et al., 2005; Merrill et al., 2014). Therefore, it is expected that heavy alcohol users, such as dependent users, will score significantly higher on coping motives. Less is known regarding social and enhancement motives. A prior research was inconclusive—on the one hand, positive reinforcement motives (enhancement and social) are related to patterns of alcohol use but might be unrelated to drinking problems; on the other, they are related to both (predicting problems related to drinking) (Cooper, 1994; Cooper et al., 1995; Kuntsche et al., 2005; Littlefield et al., 2010; Hauck-Filho et al., 2012). It is important to note that the two motives—coping and enhancement—are related to affect (the former one—negative, and the latter—positive) and regulation *via* drinking, especially among young adults (Read et al., 2003). Some studies showed that enhancement motives are related to heavy drinking, whereas coping motives were related to adverse consequences (both related and unrelated to heavy drinking) (Kuntsche et al., 2005, 2014; Kuntsche and Kuntsche, 2009; Merrill and Read, 2010). Finally, conformity motives were associated with lower and not higher alcohol use (Kuntsche et al., 2014).

The evidence on why people initiate alcohol consumption or drink in general is vast; however, little is known why people change their frequency and amount of drinking from intense (heavy or dependent drinking) to recreational (with little risk). Therefore, it is essential to understand why people reduce their drinking—is it due to negative outcome expectancies (beliefs about the negative consequences of drinking) or due to abstention or drinking-reduction motives. Empirical evidence on the relationship between negative alcohol expectancies and consumption is mixed (Adams and McNeil, 1991; Jones et al., 2001), and little is known about the abstention motives and motives to decrease or limit drinking. The concept of motives or reasons for abstaining and limiting drinking (RALD) is under-research; however, numerous instruments measure RALD dating back to the 1970s (Epler et al., 2009). As a result, no standard RALD measure or instrument is accepted in the field, and researchers employ different approaches. Factorial structure of RALD is not a standard, as well—researchers conducted studies using one or two RALD factors (Nagoshi et al., 1994) and three and more (Collins et al., 2000; Epler et al., 2009). The full factorial structure of RALD comprises religious/moral considerations, a desire to maintain personal control, upbringing, concerns regarding expense, and desire to avoid adverse consequences (Epler et al., 2009). The research shows that the first three factors are negatively associated with drinking and the latter—positively (Collins et al., 2000). On the other hand, it was shown that health-related RALD (such as, health concerns) are associated with limiting own drinking (Wisk et al., 2020).

Though scarce, evidence showing the relationship between drinking motives, drinking severity, RALD and drinking behaviour is available. Similarly, the empirical evidence suggesting how drinking motives differ between dependent and low-risk alcohol users are rare. There is very little known about the difference between various alcohol users and their RALD.

Therefore, the purpose of this study was to investigate how drinking motives and motives to decrease drinking differ between former heavy drinkers (problematic and dependent), current dependent, and current low-risk drinkers.

Based on the literature, it is hypothesised that (1) current dependent users will score significantly higher on coping and enhancement motives than current low-risk users; (2) there will be no or slight difference between current dependent and current low-risk users with regard to social motives.

Furthermore, it is hypothesised that (3) the three heavy user groups will score higher on coping motives than current low-risk users. Further, it is hypothesised that (4) there will be differences in conformity and enhancement motives between the investigated groups, but the direction is undetermined. Since enhancement motivation is related to hedonistic motives and the introduction of positive mood states, it could be higher among low-risk users; on the other hand, when viewed as a compensation mechanism, it could be coupled with coping mechanism acting as positive expectancies and therefore,

scoring higher among heavy alcohol users. Additionally, it is hypothesised that (5) coping, conformity, and enhancement motive will predict problem related to drinking [in terms of the Alcohol Use Disorder Identification Test (AUDIT) score], and social motives will either predict problem of drinking slightly or insignificantly. Finally, it is hypothesised that (6) motives related to religious/moral considerations, maintaining personal control, and upbringing will be associated negatively with drinking, whereas motives related to avoiding adverse consequences—positively. It is expected that (7) current dependent users will score higher on all motives than current low-risk users. There is insufficient evidence to expect whether former heavy users will score similarly to the current dependent users or current low-risk users. On the one hand, the former heavy user groups shared heavy drinking experiences with current dependent users; on the other hand, the two former heavy users decreased their drinking (some due to therapy) and currently keep on drinking but with low risk.

MATERIALS AND METHODS

Participants

The participants were Polish young adults aged 18 and 35 years (M = 29.31; SD = 4.28) consuming alcohol with various intensities and severity. There were three inclusion criteria: (1) being young adult (between 18 and 35 years old); (2) drinking alcohol within the last 12 months prior to the study; and (3) being classified into one of the four groups: (1) current low risk: drinking alcohol currently but with low risk [as indicated in the AUDIT (Saunders et al., 1993; Babor et al., 2001)] and with no history of alcohol abuse ($n1$ = 78); (2) current dependent: being alcohol dependent—drinking alcohol in the last 12 months, receiving the diagnosis of alcohol dependence, and not being in treatment for a period longer than 3 months prior to the participation in the study; additionally, individuals who were classified into this group scored above 20 points in the AUDIT (Saunders et al., 1993; Babor et al., 2001) ($n2$ = 82); (3) former heavy users current low risk: drinking currently (within the last 12 month) with low risk [up to 8 points in the AUDIT (Saunders et al., 1993; Babor et al., 2001)] but with a history of alcohol abuse in the past ($n3$ = 46) (but no diagnosis); and (4) former dependent current low risk: drinking currently (within the last 12 month) with low risk [up to 8 points in the AUDIT (Saunders et al., 1993; Babor et al., 2001)] but being diagnosed with dependence in the past ($n4$ = 56).

The exclusion criteria included dependence treatment (different than alcohol), abuse of other substances, as well as and prescribed opioid use more than 10 times in a lifetime (for more details, see Rosenkranz et al., 2019).

Within 262 participants, 49% were male, and 51% were female. Sex distribution between the four investigated groups was equal [$chi^2(3) = 4.61$; $p = 0.20$]. The majority of the participants had at least high school education (90.5%), only 2% had primary education, 8% had vocational education, 38% had high school education, and 53% had higher education. There were minor differences in education structure between the four investigated groups [$chi^2(9) = 19.68$; $p = 0.020$] related to a slightly lower level of education in the two dependent groups (currently and in the past). The places of residence of participants were varied, but their distribution did not differ between the four investigated groups [$chi^2(21) = 24.77$; $p = 0.257$]. About 37% of the participants were single, and a further 40% were married. Approximately 19% of the participants were in informal relationships, and 4% were disordered. The four investigated groups differed significantly with respect to marital status [$chi^2(9) = 40.34$; $p < 0.001$]—in Group 1 (currently low-risk drinking with no history of alcohol abuse), there was significantly more participants in informal relationships than in any other group and significantly fewer married participants than in Group 2 (currently dependent) and Group 3 (problematic in the past). The descriptive statistics are presented in **Table 1**.

Materials

Participants were classified into one of the investigated groups based on a set of questions regarding their alcohol dependence (in the last 12 months and lifetime), participation in treatment (in the last 12 months and lifetime), and current drinking (in the last 12 months). To confirm current dependence and current low-risk drinking, the AUDIT (Saunders et al., 1993; Babor et al., 2001) was administered. To classify the participants into Group 3 (former heavy users and current low risk), a set of questions derived from the AUDIT was used but regarding a year in the past (not last 12 months) with the most intensive drinking pattern. The participants classified into Group 3 scored above 16 points (mainly due to questions 1–4 and 7–8, drank above 40/60 ml of alcohol per day, and have never been diagnosed with alcohol dependence).

Additionally, the demographic questions regarding age and sex were asked, as well as regarding receiving a diagnosis recently or in the past, and any alcohol treatment experience.

The Drinking Motive Questionnaire-Revised Short Form (DMQ-R SF) (Cooper, 1994) was used to assess drinking motives (social, coping, enhancement, and conformity).

Drinking Motive Questionnaire

The factorial structure of the DMQ-R SF was investigated. The assumed four-factor structure yielded satisfactory results based on the criteria for global fit indexes (Browne and Cudeck, 1993; Jöreskog and Sörbom, 1993; Hu and Bentler, 1999; Kline, 2005). Further, internal consistency reliabilities (Cronbach alpha) were calculated for each of the factors. The internal consistency reliabilities of three factors were satisfactory (Cronbach's alpha: 0.77 for coping, 0.814 for conformity, and 0.758 for social) and less satisfactory for one factor (Cronbach's alpha 0.56 for enhancement). To investigate the low alpha in one of the original factors of the DMQ-R SF, an exploratory factor analysis (EFA) was conducted. The EFA resulted in a three-dimensional structure (explaining 62% of variance). The three-factor structure yield satisfactory results based on the criteria for global fit indexes (Browne and Cudeck, 1993; Jöreskog and Sörbom, 1993; Hu and Bentler, 1999; Kline, 2005), as well as convergent and discriminant validity indicators (Hu and Bentler, 1999;

TABLE 1 | Sociodemographic variables in the total sample and the four investigated groups.

Sociodemographic variables	Current low risk (Group 1)		Current dependent (Group 2)		Former heavy user current low risk (Group 3)		Former dependent current low risk (Group 4)		Total group	
	N	%	n	%	n	%	n	%	n	%
Sex										
Males	34	43.6	48	58.5	20	43.5	26	46.4	128	48.9
Females	44	56.4	34	41.5	26	56.5	30	53.6	134	51.1
Education										
Primary	1	1.3	2	2.4	0	0.0	2	3.6	5	1.9
Vocational	3	3.8	7	8.5	4	8.7	6	10.7	20	7.6
High school	20	25.6	39	47.6	14	30.4	26	46.4	99	37.8
Higher	54	69.2	34	41.5	28	60.9	22	39.3	138	52.7
Place of residence										
Village	10	12.8	15	18.3	6	13.0	6	10.7	37	14.1
City up to 19,000 residents	7	9.0	7	8.5	6	13.0	8	14.3	28	10.7
City 20,000–49,999 residents	7	9.0	12	14.6	2	4.3	4	7.1	25	9.5
City 50,000–99,999 residents	7	9.0	12	14.6	8	17.4	6	10.7	33	12.6
City 100,000–199,999 residents	9	11.5	9	11.0	4	8.7	10	17.9	32	12.2
City 200,000–499,999 residents	9	11.5	11	13.4	8	17.4	14	25.0	42	16.0
City above 500,000 residents	23	29.5	11	13.4	8	17.4	6	10.7	48	18.3
Warsaw	6	7.7	5	6.1	4	8.7	2	3.6	17	6.5
Marital status										
Single	26	33.3	28	34.1	16	34.8	26	46.4	96	36.6
Married	22	28.2	41	50.0	26	56.5	16	28.6	105	40.1
Divorced	1	1.3	4	4.9	0	0.0	6	10.7	11	4.2
Non-formal relationship	29	37.2	9	11.0	4	8.7	8	14.3	50	19.1
Employment status										
Employed	63	81	70	85	38	83	44	79	215	82
Retired	0	0	1	1	0	0	2	4	3	1
Unemployed	2	3	8	10	2	4	6	11	18	7
Student	10	13	0	0	2	4	4	7	16	6
Not working (other reason than unemployed)	3	4	3	4	4	9	0	0	10	4

Supplementary Tables 1, **2**). However, for clarity purposes, only the original four-factor model was presented in the article.

Motives to Decrease Drinking

Motives to decrease drinking derived from the qualitative arm of the study. An exploratory and confirmatory analysis structured them into: negative consequences (e.g., to avoid adverse psychological consequences because of regret of having done something under the influence of alcohol), social (e.g., familial disapproval), neglect of other duties (e.g., school and work), and loss of control (**Supplementary Table 3**).

Reasons for Abstaining and Limiting Drinking

The RALD were employed (Epler et al., 2009) and were tested with EFA to establish their factorial structure. The EFA showed that three factors explain 78.5% of the variance. The factors were named: (1) loss of control and negative consequences, (2) outgrowing, and (3) avoidance of negative physical and psychological consequences. The exact working and factorial loadings of the statement are presented in **Supplementary Table 4**.

Procedure

The reported results derive from a mixed-method study conducted in the years 2019 and 2020. First, qualitative semi-structured interviews were conducted to identify motivational and individual aspects that might change the drinking trajectory. The results informed the quantitative arm of the study that the substantial focus was on investigating the motives to drink and reduce drinking. The quantitative part was conducted partially in person and partially *via* phone/skype and Internet platform [due to coronavirus disease 2019 (COVID-19) restrictions]. Participants in the two arms of the study were not redundant. Participants were awarded a voucher for an approximate value of 6 euros.

RESULTS

Before the hypotheses were tested, the descriptive statistics were analysed (**Tables 2**, **3**). Analysis of Skewness and Kurtosis for the total sample (**Table 2**) and subsamples (**Table 3**) showed that normal distribution could be assumed for three motives (with an exception for conformity) (Ghasemi and Zahediasl, 2012). To

deal with deviation from the normal distribution, bootstrapping was employed, and multivariate ANOVA (MANOVA) and Pearson's correlations were conducted. Finally, the regression analysis was conducted with the prior investigation of assumptions. The distribution of residuals in the regression analysis was not deviating from normal, and additionally, Mahalanobis distance analysis did not reveal any outliers (Tabachnick and Fidell, 2007).

Drinking Motives

To test hypotheses 1–4, two sets of multivariate analyses of variance with bootstrapping were conducted. Hypothesis 1 assumed that current dependent users will score significantly higher on coping and enhancement motives than current low-risk users; hypothesis assumed no differences between the current dependent and current low-risk users with regard to social motives; hypothesis 3 assumed that the three heavy user groups will score higher on coping motives than current low-risk users; and hypothesis 4 assumed there will be differences in conformity and enhancement motives between the investigated groups.

The analysis conducted for the drinking motives (four-factor model) showed differences in all four motives, Wilk's Lambda = 0.63; $F(4,12) = 674.96$; $p < 0.001$; and partial eta-squared = 0.143. Current dependent users (Group 2) scored significantly higher on coping and conformity motives compared with all other groups (current low risk and both former heavy/current low risk); the effect size was stronger for conformity (partial eta-squared = 0.262) than for coping (partial eta-squared = 0.109). This supports hypothesis 1 and goes beyond since only differences between current dependent users (Group 2) and current low-risk users (Group 1) were assumed, together with only two motives). Current dependent users (Group 2) scored higher on enhancement motive than formers users (Groups 3 and 4) (no distinction was found between the two former groups) and current low-risk users (Group 1), as hypothesized (H1, H3 and H4). Additionally, both the former user groups (Groups 3 and 4) scored higher than the current low-risk group (Group 1). Finally, Current dependent users (Group 2) scored significantly higher on social motive than current low-risk users (Group 1) (contrary to what was hypothesized – lack of differences between these two groups, H2) (**Table 4**).

To test hypothesis 5 (assuming that only coping, conformity, and enhancement motives will not predict the score in AUDIT), a regression model was used. In the model, the score in AUDIT was the explained variable, and the four motives were predictors (**Table 5**). A correlation analysis showed that all the motives are associated with drinking severity (**Table 6**).

A regression analysis showed that three out of four motives predict severity of drinking significantly—coping, conformity, and enhancement (as predicted in the hypothesis 5). Social motive did not predict the severity of drinking. Moreover, all three motives positively predict the severity of drinking—the higher the motive, the higher the serenity of drinking. Additionally, conformity and enhancement predicted the severity of drinking moderately (beta: 0.317 and 0.347), whereas coping—in a relatively small manner (beta = 0.107) (**Table 5**).

Motives to Decrease Drinking

To test hypotheses 6 and 7, a set of multivariate analyses of variance was conducted. Hypothesis 6 assumed that motives related to religious/moral considerations, maintaining personal control, and upbringing will be associated negatively with drinking, whereas motives related to avoiding adverse consequences—positively. Hypothesis 7 assumed that current dependent users will score higher on all motives than current low-risk users.

The MANOVA showed the differences in all three motives to decrease drinking, Wilk's Lambda = 0.623; $F(9,623) = 14.86$; $p < 0.001$; and partial eta-squared = 0.146. Current low-risk users (Group 1) scored significantly lower on all three motives than other groups (current dependent and former heavy users). Additionally, differences were observed in the "loss and negative consequences" motive—the two former heavy user groups (Groups 3 and 4) scored significantly higher than the current low-risk group (Group 1) but significantly lower than the current dependent group (Group 2). The current low-risk group (Group 1) scored significantly lower than others in the two remaining motives (**Table 7**).

Reasons for Abstaining and Limiting Drinking

The MANOVA showed the differences in two out of three motives to decrease drinking (RALD): control [$F(1,101) = 4.08$; $p = 0.046$; and partial eta-squared = 0.039] and convictions [$F(1,101) = 4.05$; $p = 0.047$; and partial eta-squared = 0.039]. In both cases, formerly dependent users (Group 4) scored higher than formerly heavy users (Group 3).

Finally, the regression analysis was conducted to test hypothesis 7. The results showed that two out of three motives/reasons to limit drinking predicted severity of drinking: convictions ($B = 2.260$, $t = -4.330$, beta = 0.411; and $p < 0.001$) and adverse consequences ($B = -1.37$; $t = -3.038$; beta = −0.298; and $p < 0.001$). The model explained 18.4% of the variance of the severity of drinking.

DISCUSSION

The primary purpose of this study was to investigate the similarities and differences in drinking motives, as well as motives to decrease/reasons to limit drinking between four specific types of alcohol users—current low risk (with no prior history of alcohol abuse), current depended (in therapy not longer than for 3 months or not at all), formerly depended but currently, low risk, and formerly heavily drinking but currently drinking with low risk. Much attention was paid to differentiate between the current low-risk users with and without prior history of heavy alcohol use. In general, the results show that such a differentiation is important and, when lacking, may lead to unreliable results (lack of differences between different motives to drink between current low risk and current dependent users).

The main purpose of this study was not to adapt DMQ-R SF or RALD measure or to create a new one; however, to test the hypothesis, a set of exploratory and confirmatory analyses was

TABLE 2 | Descriptive statistics for motives, Alcohol Use Disorder Identification Test (AUDIT), and age in the total sample.

	N	Min	Max	Mean	SD	Skewness	Skewness' SE	Kurtosis	Kurtosis' SE
Coping	263	1.00	3.00	2.00	0.54	0.019	0.150	−0.471	0.299
Conformity	263	1.00	3.00	1.64	0.60	0.751	0.150	−0.299	0.299
Social	263	1.00	3.00	2.23	0.49	−0.228	0.150	−0.095	0.299
Enhancement	263	1.00	3.00	1.95	0.48	0.178	0.150	−0.339	0.299
AUDIT	263	0	40	12.93	9.47	0.814	0.150	−0.179	0.299
Age	263	18	35	29.29	4.29	−0.531	0.150	−0.664	0.299

TABLE 3 | Descriptive statistics for motives, AUDIT, and age across groups.

		N	Minimum	Maksimum	Średnia	Odchylenie standardowe	Skewness	SE Skewness	Kurt	SE Kur
Current low risk (Group 1)	Coping	79	1.00	3.00	1.8523	0.46455	0.229	0.271	−0.002	0.535
	Conformity	79	1.00	3.00	1.4473	0.49753	1.122	0.271	0.955	0.535
	Social	79	1.00	3.00	2.0506	0.51499	−0.239	0.271	−0.263	0.535
	Enhancement	79	1.00	3.00	1.6793	0.46053	0.679	0.271	0.510	0.535
	AUDIT	79	0	7	4.08	1.591	−0.323	0.271	−0.155	0.535
	Age	79	18	35	28.78	4.590	−0.362	0.271	−0.979	0.535
Current dependent (Group 2)	Coping	82	1.00	3.00	2.2520	0.51203	−0.122	0.266	−0.312	0.526
	Conformity	82	1.00	3.00	2.0772	0.59097	0.129	0.266	−0.816	0.526
	Social	82	1.33	3.00	2.3577	0.45294	0.016	0.266	−0.914	0.526
	Enhancement	82	1.00	3.00	2.2480	0.46793	−0.050	0.266	−0.545	0.526
	AUDIT	82	20	40	25.21	5.452	1.327	0.266	1.006	0.526
	Age	82	21	35	30.29	3.851	−0.674	0.266	−0.481	0.526
Former heavy user current low risk (Group 3)	Coping	46	1.00	2.67	1.8406	0.45400	−0.158	0.350	−0.435	0.688
	Conformity	46	1.00	2.00	1.2899	0.37587	1.045	0.350	−0.355	0.688
	Social	46	1.67	3.00	2.2754	0.38041	0.732	0.350	−0.548	0.688
	Enhancement	46	1.33	2.67	1.9130	0.34737	0.063	0.350	−0.390	0.688
	AUDIT	46	3	14	9.04	3.204	−0.185	0.350	−0.921	0.688
	Age	46	19	35	29.78	4.033	−1.292	0.350	1.588	0.688
Former dependent current low risk (Group 4)	Coping	56	1.00	3.00	1.9881	0.62592	−0.186	0.319	−0.954	0.628
	Conformity	56	1.00	3.00	1.5357	0.53439	0.897	0.319	0.187	0.628
	Social	56	1.00	3.00	2.2500	0.50553	−0.466	0.319	0.126	0.628
	Enhancement	56	1.00	2.67	1.9286	0.39550	−0.380	0.319	−0.411	0.628
	AUDIT	56	2	15	10.64	4.002	−0.681	0.319	−0.744	0.628
	Age	56	20	35	28.11	4.393	−0.016	0.319	−1.100	0.628

conducted. As a result, two factorial structures of DMQ-R SF were tested, and a shorter one (with three factors) was proven to perform well or better (according to some parameters) on the investigated sample. Interestingly, two out of four original factors remained unchanged (coping and conformity), and the remaining two were shortened and merged into one (social enhancement). Not repeating the four-factor structure does not have to be treated as a mistake since some measurement approaches assume three factors (O'Hare, 1997, 2001; Labouvie and Bates, 2002). There are previous studies in which the four factorial structure was not confirmed (Martens et al., 2003; Mushquash et al., 2008). Kuntsche et al. (2005) analysed, available till the year 2005, instrument and theoretical conceptualisation in the field of drinking motives and concluded that the way motives are measured is high heterogeneous (from 10 to 40 items, from 2 up to 10 dimensions). It is, however, unclear whether the four factor DMQ-R SF model does not hold in this sample or does not hold in the sample of young adults (18–35 years) in general. The investigated sample in this study was specific and composed of four subsamples. Each of them is rather too small to perform a set of EFA and confirmatory factor analysis (CFA) on each of them separately. Additionally, the sample is not representative even though it was randomly chosen (from a panel). At this point, caution in interpretation is suggested and further investigation (e.g., in larger, though specific samples). For the purpose of hypothesis testing both, the original four factor model was tested, as well as the new, three factor model. The three factor model performed better in terms of psychometric properties and, hence, is valid.

This study provides an essential insight into the differences in motivational underpinnings of alcohol drinking and the limitation of drinking between various alcohol users. First, the investigated group comparison provided further empirical evidence to support the claim that there are differences between

TABLE 4 | Drinking motives (four-factorial)—group comparison.

Motives	Group	Mean	SE	95% LLCI	95% ULCI	*F* (3,261)	*p*-Value	Partial eta-squared
Coping	Current low risk (Group 1)	1.84[b]	0.058	1.73	1.96	10.51	<0.001	0.109
	Current dependent (Group 2)	2.25[a]	0.057	2.14	2.36			
	Former heavy user current low risk (Group 3)	1.84[b]	0.076	1.69	1.99			
	Former dependent current low risk (Group 4)	1.99[b]	0.069	1.85	2.12			
Conformity	Current low risk (Group 1)	1.45[b]	0.059	1.34	1.57	30.52	0.001	0.262
	Current dependent (Group 2)	2.08[a]	0.057	1.96	2.19			
	Former heavy user current low risk (Group 3)	1.29[b]	0.077	1.14	1.44			
	Former dependent current low risk (Group 4)	1.54[b]	0.069	1.40	1.67			
Social	Current low risk (Group 1)	2.06[b]	0.053	1.96	2.17	5.45	<0.001	0.060
	Current dependent (Group 2)	2.36[a]	0.052	2.26	2.46			
	Former heavy user current low risk (Group 3)	2.28	0.069	2.14	2.41			
	Former dependent current low risk (Group 4)	2.25	0.063	2.13	2.37			
Enhancement	Current low risk (Group 1)	1.69[b]	0.049	1.59	1.78	22.86	<0.001	0.210
	Current dependent (Group 2)	2.25[a]	0.048	2.15	2.34			
	Former heavy user current low risk (Group 3)	1.91[c]	0.063	1.79	2.04			
	Former dependent current low risk (Group 4)	1.93[c]	0.058	1.81	2.04			

SE, standard error; LLCI, lower lever confidence interval; ULCI, upper-level confidence interval. For between-group comparison, Bonferroni post hoc was chosen due to no differences in invariances. Different indices (a–c) indicate differences in means between the groups.

current low risk and current dependent users in their motives to drink. Heavy drinking (such as dependence) is related to coping and conformity (Cooper et al., 1995). Additionally, current dependent users scored higher on social and enhancement motives, which suggests that dependent alcohol users may drink on any occasion or that their drinking serves as compensation and, together with coping, they also have positive expectancies (therefore, social and enhancement motives). This aligns with the literature examining drinking motives among the dependent individuals (Kuntsche et al., 2007; Kuntsche and Kuendig, 2012; Lehavot et al., 2014; Simpson et al., 2014; Wicki et al., 2017).

Interestingly, the two former heavy user groups (Groups 3 and 4) did not differ from the current dependent group (Group 2) on three out of four motives: coping, conformity, and social, but differed on enhancement (in between current low risk and current dependent)—these results shed new light on how former heavy users are motivated to drink. The results showed that the main difference is related to enhancement motive—former heavy users drink currently with low risk, and hence their enhanced motive to drink is lower than in the case of dependent individuals, but all the other motives are at a similar level. Moreover, since other research showed that the enhancement and coping motives are associated with quantity and frequency of alcohol intake, the former heavy users are still at risk. Especially that coping motives are linked to the alcohol-related symptoms (Kuntsche et al., 2007; Kuntsche and Kuendig, 2012; Lehavot et al., 2014; Simpson et al., 2014; Wicki et al., 2017). The question remains whether heavy drinking individuals decreased their drinking due to decreased enhancement motive (e.g., drinking ceased being fun) or were exposed to any intervention that contributed to the decreasing positive expectancies related to drinking. This is particularly interesting since the two former heavy user groups were diagnosed with dependence and received treatment, whereas no one from the former heavy (not dependent) group received treatment. Either way, indicated prevention strategies and harm reduction interventions are promising in lowering the positive expectancies, supporting the development of various coping strategies, and correcting normative beliefs (Blevins and Stephens, 2016). It is essential to underline that the interventions which will not address (directly or indirectly) may fail.

TABLE 5 | A regression model with an AUDIT score as an explained variable and motives to drink as predictors (four-factor model).

	B	SE	Beta	*t*	*p*	*F* (4,261)	*p*	Adj R^2
Coping	2.469	1.011	0.141	2.443	0.015	43.95	<0.001	0.397
Conformity	4.994	0.859	0.317	5.815	0.000			
Social	−0.409	1.176	−0.021	−0.348	0.728			
Enhancement	6.810	1.291	0.347	5.276	0.000			

TABLE 6 | Pearson's correlation with bootstrapping of AUDIT and motives (*N* = 262).

		Coping	Conformity	Social	Enhancement
AUDIT	Pearson's r	0.433***	0.515***	0.331***	0.544***
	95% LLCI	0.326	0.400	0.209	0.433
	95% ULCI	0.538	0.618	0.434	0.640
Coping	Pearson's r		0.385***	0.404***	0.513***
	95% LLCI		0.258	0.292	0.400
	95% ULCI		0.498	0.516	0.615
Conformity	Pearson's r			0.295***	0.431***
	95% LLCI			0.162	0.316
	95% ULCI			0.422	0.542
Social	Pearson's r				0.581***
	95% LLCI				0.494
	95% ULCI				0.661

****p < 0.001.*

TABLE 7 | Multivariate ANOVA (MANOVA) for motives to decrease drinking across groups.

Motives	Groups	Mean	SE	95% LLCI	95% ULCI	*F*(3,261)	*p*-Value	Partial eta-squared
M2_loss	Current low risk (Group 1)	1.67[a]	0.103	1.47	1.88	42.366	<0.001	0.330
	Current dependent (Group 2)	3.23[b]	0.100	3.03	3.42			
	Former heavy user current low risk (Group 3)	2.00[c]	0.134	1.74	2.26			
	Former dependent current low risk (Group 4)	2.33[c]	0.121	2.09	2.57			
M2_outgrowing	Current low risk (Group 1)	2.31[a]	0.132	2.06	2.57	6.540	<0.001	0.071
	Current dependent (Group 2)	3.07[b]	0.129	2.81	3.32			
	Former heavy user current low risk (Group 3)	2.96[b]	0.172	2.62	3.30			
	Former dependent current low risk (Group 4)	2.95[b]	0.156	2.64	3.25			
M2_avoidance	Current low risk (Group 1)	2.22[a]	0.115	1.99	2.45	42.366	<0.001	0.122
	Current dependent (Group 2)	3.17[b]	0.113	2.95	3.39			
	Former heavy user current low risk (Group 3)	2.80[b]	0.150	2.51	3.10			
	Former dependent current low risk (Group 4)	2.88[b]	0.136	2.61	3.14			

Different indices (a–c) indicate differences in means between the groups.

Furthermore, the investigated motives were tested in the regression model. Contrary to some findings (Cooper et al., 1995), one avoidance motive (conformity) and one approach motive (enhancement) were moderately and positively associated with drinking severity. On the other hand, the social motive was not associated with drinking severity, and coping was associated positively but with a low magnitude. Researchers obtaining similar results suggest that the differences are due to cultural factors (Hauck-Filho et al., 2012), but they might also be related to age specificity (in this study, young adults were investigated) and group diversity (four groups). The sample was, however, too small to test the regression models separately for each group. It would also be troublesome due to the application of AUDIT to distinguish the groups (and AUDIT would serve as an explained variable). Such an undertaking would increase the homogeneity of the explained variable.

Furthermore, the lack of significance of social motive could be related to a poor fit of the four-factor DMQ-R SF model. If the effect is replicated, it may be explained by the cultural transition—alcohol use is not the only or the primary way to enhance social experiences. If so, these results would be supported by the work of Lee and Lewis—the researcher found that social motive is a strong predictor of alcohol abuse but in environments that support and encourage alcohol use (Lewis and Neighbors, 2006; Lee et al., 2007).

The investigated groups differed on the motives to reduce drinking—the main difference was between heavy users (both current and former) and current low-risk users. Heavy users scored significantly higher on all the three motives to reduce drinking, but the greatest difference was observed in the loss of control motive. Additionally, the loss of control differentiated current low-risk, current dependent, and former heavy users (with the last group scoring between the two current groups). This result is significant because it shows the proximity between current dependent and current low-risk users with heavy use in the past. It supports the results obtained in the field of drinking motives (Blevins and Stephens, 2016; Hammarberg et al., 2017). In addition, it is essential to notice that the motives to reduce drinking were measured in two ways—the first one was based on the results from the qualitative arm of this study and resulted in a proposed factorial structure; the second one was based on the RALD (Epler et al., 2009). This study did not confirm the original factorial structure, and a new one was employed to test the hypotheses.

Nevertheless, the new factors were similar to the original ones, with some items migrating between the factors. The results, however, showed that the two former heavy user groups differed on two out of three factors, namely, the control and the convictions. In both cases, former dependent users scored higher. Dependent individuals had higher convictions and loss of control motives to limit their drinking, and they were successful. They also had to limit their drinking significantly more than the other former group (from dependent to low-risk). This might implicate that in the case of successfully limiting own drinking, the stronger the motives to limit drinking are, the better the effect.

Furthermore, the regression analysis showed that convictions' motives are positively and moderately associated with drinking severity, whereas adverse consequences motive—moderately but negatively. This result may seem to be reversed, but it is important to note that the regression analysis was run only on two former heavy—current low-risk users; hence the correlation between the motive and the alcohol use severity might be due to the group composition and homogeneity of alcohol severity results (AUDIT). Second, it may be that those who score a bit higher in the AUDIT belong to the former dependent group, and therefore a higher conviction played a protective role. If so, this result is congruent with the literature on the preventive aspects of religion (e.g., Lee et al., 2017). Furthermore, the negative association between the negative consequences and drinking severity is aligned with the literature—the more severe the negative consequences, the less severe the drinking is (Epler et al., 2009). However, whether the association is direct and causal or indirect remains unclear and should be treated as an indicator for alcohol-related problems (such as, unsuccessful attempts to limit drinking) (Epler et al., 2009).

The implications of investigating motives to decrease and reasons for liming drinking could be in the prevention domain. First, it was demonstrated that positive expectancies

(e.g., in terms of enhancement motive) are challenged in the group of young adults (Epler et al., 2009). Some of the approaches were already implemented (Wood et al., 2007). As a result, apart from improving various skills (e.g., stress management), public health strategies could be focused on normative peer interventions to elevate the convictions (without prior experience of heavy drinking) (Lewis and Neighbors, 2006; Epler et al., 2009). Additionally, more insight into RALD may help assess the beliefs and even readiness to change stage, since strong religious and upbringing convictions are usually formed during childhood and could act as a protective factor, whereas experiencing negative consequences is related to an already existing problem.

Unequivocally, before further recommendations can be formed, further research investigating the relationship between the reasons and motives to limit/decrease drinking and drinking severity is needed.

LIMITATIONS

The study is not free from limitations. It is important to note that primary purpose of the study was investigated in a cross-sectional design and not in a longitudinal one. The groups were carefully chosen, various inclusion and exclusion criteria were used, but the motives were investigated for the time being between the groups and not within the same group over time. Because of that, it cannot be stated with a higher level of certainty how the motives change together with the change of drinking patterns. Additionally, the group sizes were relatively small and, therefore, small effect sizes were possible for detection only for correlation and regression analysis but not for group comparison (in which case only medium to large effect sizes were possible for detection) (Malone et al., 2016).

Furthermore, the group participation was assessed based on the declarations from participants with no additional way to confirm the diagnosis. The only additional measure used was the AUDIT. Group 3 (former heavy user current low risk) was established with the most difficulty, and a modified AUDIT was used to enable it. It is important to note that the modification was not previously checked for its reliability and validity.

Finally, the RALD items yielded a different structure than the one obtained by Epler et al. (2009). Therefore, it is rather difficult to compare the results obtained in this study with the results obtained by other researchers. Other researchers, however, pointed out that the structure suggested by Epler et al. (2009) does not seem to be universal. Nevertheless, the stated hypothesis could not be verified due to the different factorial structure of the RALD.

DATA AVAILABILITY STATEMENT

The data analyzed in this study were obtained from PARPA, after the author designed and conducted the study. The following licenses/restrictions apply: the author can analyze the raw data and prepare any report/article/presentation. Requests to access these datasets should be directed to PARPA, parpa@parpa.pl.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Maria Grzegorzewska University Ethics Committee. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

MR designed the study, analysed statistically the data, and prepared the first draft of the manuscript in full.

FUNDING

This study was funded by The State Agency for the Prevention of Alcohol-Related Problems. Grant Agreement number: 112/40/3.4.3/19/DEA.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.734350/full#supplementary-material

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