Predicting Moderate and Vigorous Physical Activity: Bodily Shame and the AFFEXX Questionnaire

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Abstract

Background

Regular physical activity has many health benefits, such as a decrease in mental illnesses and all-cause mortality. While physical activity benefits are widely known, many people do not adhere to physical activity recommendations. Predicting physical activity levels has been proven to be difficult. This study investigated the relationship between anticipatory bodily shame and moderate and vigorous physical activity levels. This research introduced bodily shame as a new antecedent appraisal to the AFFEXX questionnaire. This questionnaire is a direct result of the Affective-Reflective Theory (ART) of inactivity and exercise. It aims to determine whether prior exercise experiences have given the idea of "exercise" a positive or negative connotation, through antecedent appraisals and core affective experiences. This study aimed to determine whether bodily shame could meaningfully enhance our understanding of people's motivation to engage in moderate and vigorous physical activity. This was measured using the core affective experiences "calmness versus tension" from the AFFEXX questionnaire, as well as feelings of calmness and tension through an Implicit Association Test.

Methods

The research involved 80 participants and employed a cross-sectional, quantitative study design, using a survey to measure the variables of bodily shame, feelings of calmness and tension, and moderate and vigorous physical activity levels.

Results

The results did not align with the hypotheses; bodily shame does not significantly predict moderate and vigorous physical activity levels. It was determined that bodily shame and physical activity are not significantly related. Mediation analyses revealed that calmness versus tension, explicitly and implicitly, did not significantly mediate this relationship between bodily shame and moderate and vigorous physical activity.

Conclusion

To conclude, a new antecedent appraisal of bodily shame to the AFFEXX questionnaire does not significantly contribute to the AFFEXX questionnaire's ability to predict physical activity levels. Future research should focus on employing a larger sample

size and objective measures of physical activity levels to validate these findings and explore the effects of feelings of anticipatory pride on moderate and vigorous physical activity levels.

Keywords: physical activity, bodily shame

Introduction

Physical activity can reduce various physical and mental illnesses, as well as the threat of all-cause mortality (World Health Organization: WHO, 2022). Although many of the benefits of regular physical activity are commonly known, more than 25% of the global adult population did not meet the WHO (World Health Organization) recommendations in 2016. These recommendations consist of at least 150 minutes of moderate-intensity training a week, or at least 75 minutes of vigorous-intensity training a week (World Health Organization, 2022). Research has shown that it is difficult to predict physical activity levels as multiple factors influence our exercise behaviours, such as personality, exercise identity, and self-conscious emotions (Kruk et al., 2019; Rhodes et al., 2004; Meade et al., 2019). To design interventions to increase physical activity levels globally, understanding the factors behind engaging in physical activity is important. Research states that emotions, especially self-conscious emotions, such as pride, honour, shame, and guilt, play a role in physical activity levels (Mack et al., 2015; Meade et al., 2019). Additionally, there is evidence that individuals suffering from feelings of bodily shame are less inclined to participate in exercise-related behaviours (Bennett et al., 2017). A theory about the significance of positive and negative associations a person has with physical (in)activity is called the Affective-Reflective Theory (ART) of physical inactivity and exercise. This dual framework focuses on implicit and explicit associations (Brand & Ekkekakis, 2017). A result of this framework is the Affective Exercise Experiences (AFFEXX) questionnaire, which was created to evaluate whether earlier exercise experiences have led to a negative or positive association with exercise. While the AFFEXX does represent shame, it does not represent the concept of bodily shame, which has been proven to influence levels of physical activity (Bennett et al., 2017). The current research aimed to discover whether a new antecedent appraisal of anticipatory bodily shame would be a meaningful addition to the AFFEXX questionnaire, in understanding people's motivation to engage in moderate and vigorous physical activity. Additionally, this research aimed to examine how including bodily shame in the AFFEXX questionnaire could increase our understanding of what motivates people to engage in moderate and vigorous physical activity.

While it is difficult to predict actual physical activity levels accurately, understanding which factors influence physical activity levels might contribute to the formation of a precise

and complete model, making the process of predicting PA levels easier in the future. Additionally, an increased understanding may make developing effective exercise behaviour interventions less complex. Most previous research about physical inactivity is based on motivation and how people evaluate their ideas and emotions (Brand & Ekkekakis, 2017). However, according to Brand and Ekkekakis, these studies have probably inflated the ability people have to act rationally. Therefore, a dual-process framework has been built upon pre-existing research while adding the roles of automaticity and affect, meaning that automatic associations are activated by exercise-related stimulants. When resources for self-control are available, reflective evaluations follow. This framework is called the Affective-Reflective Theory (ART) of physical inactivity and exercise. The emphasis of the ART is on the significance of both the negative and positive associations one has with physical activity and inactivity (Brand & Ekkekakis, 2017). The ART of physical inactivity and exercise is called a dual-process framework because it aims to explain the interaction between two different processes, which can affect behaviour. These processes are, as stated before, reflective, and automatic associations. Automatic associations are valuations, meaning assessments of worth, which can either be positive or negative, whereas reflective associations are evaluations that happen consciously. In the context of physical inactivity and exercise, the automatic valuation is connected to an action impulse that drives the individual to actively change, or not change, their current condition. The automatic valuation additionally acts as a foundation for the controlled reflective evaluation. This controlled evaluation can emerge into an action plan. The action plan and action impulse may be in concordance with each other. However, there could also be a discrepancy, meaning they do not lead to the same behaviour. Which behaviour or action will be executed by the individual experiencing this discrepancy will be determined by the resources of self-control that are available at the moment (Brand & Ekkekakis, 2017).

A framework about attitudes proposes that attitudes are summaries of assessments. Meaning that through experiences, attitudes become easily attainable and are more likely to direct an individual's thoughts and actions (Fazio, 2007, as cited in Ekkekakis et al., 2021). By the concepts of "affective valuation" derived from the ART, as well as "attitude" from Fazio's model, it is suggested that affective exercise events influence an individual's exercise-related behaviours (Ekkekakis et al., 2021).

The Affective Exercise Experiences (AFFEXX) questionnaire is a direct result of the ART of physical inactivity and exercise and the attitude model by Fazio. The questionnaire was designed to determine whether prior exercise encounters have given the concept of "exercise" a positive or negative connotation. It is important to note that the AFFEXX questionnaire solely measures the explicit emotional evaluation one has of exercise. The AFFEXX questionnaire is different from other theoretical frameworks and measurements as it does not represent cognitions, solely affective associations. The questionnaire is divided into three main constructs, which are "antecedent appraisals", "core affective experiences", and "attraction-antipathy". In this model, antecedent appraisals influence core affective experiences, which result in an attraction of antipathy towards physical activity. One of the factors within the antecedent appraisal construct is honour/pride vs. shame/guilt. This factor has been included because engaging in exercise is seen as morally good, which can have positive effects on an individual when they engage in regular physical activity. However, this moral characterisation of exercise can also have negative emotional effects when an individual does not engage in regular physical activity, such as the experience of negative self-conscious emotions like shame and guilt. (Ekkekakis et al., 2021).

Additionally, self-conscious emotions are related to the AFFEXX construct of showing off vs. shying away. This means that individuals want to show off their body, hard work, or skills when engaging in physical activity, or shy away to not get noticed. Experiencing self-conscious emotions may result in the wish to shy away from others while engaging in physical activity, and may, therefore, prevent individuals from engaging in exercise (Ekkekakis et al., 2021; Pila et al., 2020).

Although the constructs of honour/pride vs. shame/guilt and showing off vs. shying away from the AFFEXX questionnaire capture the feeling of shame to some extent, they do not represent the feeling of anticipatory bodily shame, which has been shown to influence one's physical activity levels. This means that the concept of anticipatory bodily shame has not yet enough weight within the AFFEXX questionnaire, as the abovementioned constructs measure shame after missing a scheduled workout (shame/guilt) and how people think about being watched while participating in physical activity (showing off/shying away). Additionally, the antecedent appraisal of showing off versus shying away does not

specifically relate to body image, as skills, personality, and overall confidence may play a role.

Anticipatory shame, also called shame anxiety, is defined as “anticipatory anxiety about the imminent threat of being exposed, humiliated, belittled, or rejected” (Dolezal, 2022; as cited in Pattison, 2000). When faced with anticipatory shame in any circumstance, the individual may aim to limit or prevent the threat they are confronted with and conceal or hide themselves (Leroux et al., 2023). In the context of physical activity, experiencing anticipatory shame could indicate that the individual would be less inclined to engage. Anticipatory shame is related to (anticipatory) anxiety, meaning that feeling ashamed before exercising, as a non-regular exerciser, induces anxious feelings and gives individuals an incentive to not engage in PA. While anticipatory shame may be experienced for a variety of reasons, this research focuses solely on anticipatory bodily shame (Feil et al., 2022).

Self-conscious emotions, such as shame, guilt, honour, and pride, are closely related to exercise behaviours. In a 2020 study about guilt and shame, participants revealed they experienced higher levels of shame and guilt on days they missed a scheduled physical activity session than on days they did not miss a PA session (Meade et al., 2019). Provided with the knowledge that shame and guilt are often experienced when an individual does not engage in a scheduled PA session, it could be expected that feelings of shame and guilt could have the ability to motivate an individual to engage in scheduled physical activity. This is, according to this research, not true; feelings of guilt were negatively related to the intention to exercise, whereas feelings of shame were found to be not related to the intention to exercise. (Meade et al., 2019). Although the aforementioned results suggest that feelings of guilt and shame do not increase the intention individuals have to engage in physical activity, this does not directly translate to actual PA behaviour. Further research is needed to explore that relationship. There is a significant positive relationship between feelings of pride and moderate-vigorous physical activity (MVPA), as well as intention to exercise (Mack et al., 2015; Meade et al., 2019). Additionally, individuals may have an increased incentive to tolerate temporary expenses in exchange for long-term gains, meaning that long-term benefits, such as physical and emotional health, may encourage people to engage in physical activity even though they might experience pain or tiredness (Williams & DeSteno, 2008, as cited in Mack et al., 2015).

Additional perspectives on experiencing self-conscious emotions are about physical abilities (how well the individual is at performing movements and how physically skilled the individual is and perceives themselves) as well as physical perceptions of appearance. A 2020 study suggests that feelings of shame regarding physical appearance generally negatively influence an individual's commitment to exercise. (Pila et al., 2020). However, these emotions might work in one of two ways: they can motivate an individual to engage in more physical activity or discourage that individual from engaging in more physical activity. There is no concrete evidence yet, that could explain how this occurs. Additionally, a study about post-bariatric surgery patients has shown a significant negative relationship between the Body Image Shame Scale (BISS) and exercise behaviours (Teeter, 2021). To sum up, there is evidence that anticipatory bodily shame negatively influences exercise-related behaviours, however, this has not yet been widely tested.

Feelings of shame before engaging in physical activity are related to (anticipatory) anxiety and stress and may result in a decline in the desire to engage in physical activity in the future. (Feil et al., 2022). However, there is an experience between anticipatory shame and the desire to be physically active; namely tension. Experiencing stress and anxiety, as a result of anticipatory shame, may lead to feeling tense before, during, or after physical activity (De Muynck et al., 2020). One of the core affective experiences mentioned in the AFFEXX questionnaire is called calmness vs. tension. This construct relates to a set of items measuring explicitly how (consciously) calm or tense people feel when confronted with physical (in)activity. In this context, explicit emotions refer to consciously accessible emotions that are not automatic and which we can self-report (Martinussen et al., 2018). Feelings of calmness or tension partly explain an individual's attraction or antipathy towards physical activity, which is, in turn, related to actual PA (Ekkekakis et al., 2021).

An additional way people experience emotions, different from the explicit way mentioned above, is implicit. Implicit emotions are automatic and unconscious and do not have to be rational. This means that implicit emotions cannot be measured using introspection, as it requires an indirect approach, such as exercises measuring reaction times (Martinussen et al., 2018). These implicit emotions ought to be measured to be able to fully understand the way anticipatory bodily shame influences moderate and vigorous physical activity levels, as such emotions are too quick to be consciously recognised, while still

influencing everyday decisions (Moranges et al., 2021). This explains why, during this research, the concepts of calmness and tension were not only measured explicitly (through the AFFEXX questions of this construct) but also implicitly, through an IAT (Implicit Association Test). According to a 2021 study, IATs are especially beneficial when results can be compared to results from previous studies (Greenwald et al., 2021).

The goal of this study was to introduce a new construct to the antecedent appraisals of the AFFEXX questionnaire, namely "bodily shame", and empirically test the relationship between bodily shame and physical activity. Furthermore, the study aimed to learn to understand this relationship. The first research question was "Is a new antecedent appraisal of anticipatory bodily shame a meaningful addition to the AFFEXX questionnaire, in understanding people's motivation to engage in moderate and vigorous physical activity?". The second research question was "How does including bodily shame in the theoretical model behind the AFFEXX questionnaire increase our understanding of what motivates people to engage in moderate and vigorous physical activity?" Related to the first research question is hypothesis 1.

- H1: Feelings of bodily shame are associated negatively with a self-reported weekly level of moderate and vigorous physical activity after controlling for the antecedent appraisal of showing off versus shying away.

To answer the second research question two mediation analyses were conducted by means of hypotheses 2 through 9. Mediation one can be seen in Figure 1 and mediation two can be seen in Figure 2.

Mediation 1:

- H2: Feelings of anticipatory bodily shame are associated with higher feelings of tension surrounding physical activity.
- H3: High feelings of tension regarding physical activity predict lower levels of moderate and vigorous physical activity.
- H4: The predictive effect of anticipatory bodily shame on moderate and vigorous physical activity is mediated by explicit feelings of tension.

Mediation 2:

- H5: Feelings of anticipatory bodily shame are associated with an increase in implicit feelings of tension.

- H6: Increased implicit feelings of tension predict lower levels of moderate and vigorous physical activity.
- H7: The predictive effect of anticipatory bodily shame on moderate and vigorous physical activity is mediated by implicit feelings of tension.

Additionally, to fully answer the second research question, two additional hypotheses were formulated:

- H8: The predictive effect of anticipatory bodily shame on moderate and vigorous physical activity is mediated through both explicit and implicit mechanisms.
- H9: There is a relationship between the explicit and implicit mechanisms and physical activity levels.

Figure 1

Mediation 1

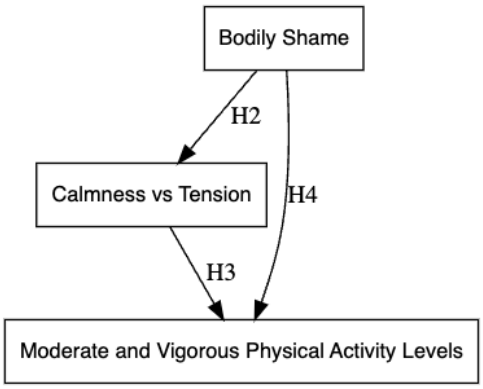
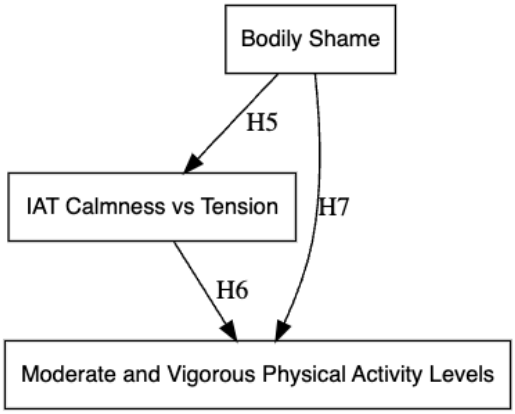


Figure 2

Mediation 2



Methods

Design

The design of the research was cross-sectional and quantitative. The data was obtained from participants using a survey at one point in time. The design was correlational, and the study aimed to examine the relationship between anticipatory bodily shame and moderate and vigorous physical activity levels, mediated by feelings of calmness versus tension.

Participants

The study used a sample of 80 participants (Mage = 25, range = 18-56 years). Participant demographics, as well as the descriptive statistics on physical activity, and Body Image Shame Scale, can be found in Table 1, Table 2, and Table 3. All participants completed the entire questionnaire, as incomplete submissions were deleted and not used for the results. A number of participants from this sample were recruited via the sign-up system through the SONA website, which permits students from the University of Twente to participate in scientific research studies in exchange for credits. The remaining participants were recruited in different ways through convenience sampling. The sample size was not predetermined and was based on the number of people willing to participate. There were a number of exclusion criteria, namely people younger than the age of 18 years old. This was

ensured through the survey by a specific mention in the informed consent form as well as an additional question in the survey, where participants were instructed to state their age. People who did not possess the English language were also excluded from this research.

Table 1

Participant Demographics

Gender	**N**	**Nationality**	**N**
Male	33	Dutch	48
Female	45	German	14
Other	2	Other	18

Table 2

Participant Physical Activity Levels in Minutes Per Week

	Mean	**Median**	**Min.**	**Max.**	**95% CI**
Moderate	290.21	240	0	1260	234.18;246.25
Vigorous	227.38	180	0	1260	179.52;275.23
Moderate and Vigorous	517.59	472.5	0	2520	432.08;603.10

Table 3

Descriptive Statistics of the Body Image Shame Scale

	Mean	Median	Min.	Max.	95% CI
BISS	1.86	1.71	1	4	1.70;2.02

Note. The numbers indicate scores on a 5-point Likert scale and range from 0 (“never”) to 4 (“almost always”).

Materials

After the creation of the survey and before the start of the experiment, the BMS Ethics Committee approved the research, with ethical approval number 240366. During the experiment, the participants used their own technological devices to complete the survey. The survey was constructed with the SoSci website, and distributed via the SONA website of the University of Twente, meant for students at the University of Twente. The survey was additionally distributed with a link to the SoSci website, which was meant for the participants who were not students at the University of Twente. Through the survey for this particular research, a number of variables were measured; informed consent and demographics (age, gender, and nationality), bodily shame, antecedent appraisals showing off versus shying away, core affective experiences of calmness versus tension, calmness versus tension as measured using an IAT, and moderate and vigorous physical activity. Multiple other constructs were measured in the questionnaire, however, these will not be addressed in this research as those constructs were only relevant for different studies.

Bodily Shame

The first variable that was measured was bodily shame. Questions measuring bodily shame were extracted from the internalised dimensions of the Body Image Shame Scale (BISS), in which body image is used as a measurement for the source of shame. The survey consists of 14 items in which the internal and external dimensions of bodily shame are measured. The survey uses a 5-point Likert scale and ranges from 0 (“never”) to 4 (“almost

always"). The questionnaire is a reliable instrument in which participants have to self-report accordingly. A Cronbach's Alpha of .90 was found (Duarte et al., 2014).

Antecedent Appraisals: Showing Off Versus Shying Away

To assess the participants' tendencies to show themselves off or to shy away in settings where physical activity is taking place, the antecedent appraisal "showing off versus shying away" from the AFFEXX was used. This variable consists of three items and uses a 7-point Likert scale, where one would answer with one, two, or three when one of the statements matches perfectly with what they would say, or the participant would answer with seven, six, or five if the opposite statement matched perfectly with what they would say. The participant is expected to answer with four if neither statement is applicable to them. One item was reversed. A Cronbach's Alpha of .842 was found for this antecedent appraisal (Ekkekakis et al., 2021).

Core Affective Experiences: Calmness Versus Tension

Additionally, the core affective experiences of calmness versus tension from the AFFEXX were measured. As mentioned in the introduction, the construct of calmness versus tension consists of four items measuring how calm or tense people feel when confronted with physical (in)activity. This variable uses a 7-point scale as well, where the participant would answer with one, two, or three if the first statement matched with what they would say, or the participant would answer with seven, six, or five if the opposite statement matched with what they would say. Again, the participant was expected to answer with four if neither statement was applicable to them. This questionnaire complies with test-retest reliability, validity, and consistency -requirements. Additionally, a Cronbach's Alpha of .860 was found (Ekkekakis et al., 2021).

Implicit Association Test: Calmness Versus Tension

Furthermore, this research has measured "calmness versus tension" implicitly, in relation to moderate and vigorous activity, using a Single Category Implicit Association Test (SC IAT). During this IAT, words associated with calmness were paired with words associated with moderate or vigorous activity, against words that are typically associated with tension.

This was also done the other way around. Words associated with calmness were peace, peacefulness, calm, serenity, untroubled, restful, and harmony. Words associated with tension were stress, anxiousness, nervous, pressure, restless, and tense. During the cognition test, the participants' reaction times were measured in which they responded to the associations. This answers the question of how strong associations are between certain constructs in each individual. This is done using Greenwald's d-score, which has the ability to take latencies that are too large into account. Additionally, the d-score is unsusceptible to extreme scores (Greenwald et al., 2021). The average test-retest reliability of IATs is .50, which is why the usage of an IAT is not recommended on its own to diagnose individuals or assign those individuals certain traits. However, this test-retest reliability is sufficient for correlational research (Greenwald et al., 2021).

Moderate and Vigorous Physical Activity (PA)

The dependent variable of moderate and vigorous physical activity in minutes per week was measured using the IPAQ-SF (International Physical Activity Questionnaire – Short Form). A total of four questions were used to measure this variable, which the participants answered numerically. The questions consisted of how many days participants participated in vigorous physical activity in the last week, what time they spent doing that per day, how many days participants participated in moderate and vigorous physical activity in the last week, and lastly, what time they spent doing that per day. The amount of time participants spent on moderate and vigorous physical activity each day was measured in hours and minutes. A reliability of 0.66 to 0.88 was found within the IPAQ-SF (Lee et al., 2011).

Procedure

The survey took place on the participants' technological device of choice, at a place of their choice. Completing the whole survey cost each participant around 40 minutes. The participants were either informed of this study via SONA, in which they could sign up to participate, or via social media or mouth-to-mouth advertising of the researchers, in which case the participants were provided a link or QR code. After clicking on the link, the participants were sent to the soscisurvey website. Here the participants were informed about the intentions of the study, what the study would look like for them, the inclusion and exclusion criteria, risks of partaking in the study, contact information in the case of

questions, and more. On this page, the participants were also asked to confirm that they had read the information, were older than 18 years, and gave their consent to participate. On the next page, the participants could create their own personal code with the first letters of their first and last name, as well as the last two numbers of their year of birth. Next, the participants were asked to answer questions about their demographics. Additionally, the participants were asked to answer questions about sports history and current sports regimes, as well as intention to exercise, sleep, thoughts and feelings, and bodily shame. All questions could be answered with a multiple-point scale in which they could either strongly agree, strongly disagree, or something in between.

After answering the aforementioned questions, the participants were asked to participate in an association game, in which the participants received written instructions on how to play the game. The game consisted of six rounds. After completing the survey and the association game, the participants were thanked for their time.

Data Analysis

The data was analysed using the statistical software R Studio, version 2023.03.0+386. Firstly, the data was imported, cleaned and prepared, deleting any rows with inaccurate or incomplete data, as well as adding rows with necessary information. Secondly, descriptive analyses were conducted. After this, the data was examined for the assumptions of linear regression. Lastly, statistical analyses for the bivariate and multivariate relationships were performed. The following packages were used during the data analysis: ‘tidyverse’, ‘reader’, ‘readxl’, ‘psych’, ‘dplyr’, ‘quantreg’, ‘SparseM’, ‘mediation’, and ‘Mass’. The R codes for the analyses can be found in Appendix A.

Data Preparation and Descriptive Analyses

During the data cleaning process, the first row was deleted, as those were filled with descriptives. Additionally, missing and inaccurate values were deleted. Furthermore, rows with data that could not be analysed (e.g. with words rather than numbers) were recoded manually. Where necessary, reverse scoring was used. After this, the row depicting ‘moderate and vigorous physical activity in minutes per week’ (PA) was created by multiplying hours and minutes of moderate and vigorous activity per day with days of moderate and vigorous physical activity in the past 7 days. Lastly, the data was made

numeric. Demographic data, such as age, gender, and nationality, were summarised and described, in order to get an overview of the participants' demographics, as well as to check for any abnormalities. Additionally, the mean, minimum value, maximum value, and 95% Confidence Intervals were retrieved from the participants' exercise demographics, regarding their moderate and vigorous physical activity levels per week. This was done using the 'summary()' and 'describe()' functions.

Assumptions of Linear Regression

The regression models were analysed to check the assumptions of linear regression: Normal distribution of residuals, linearity, homoscedasticity, and independence. First, the models were fitted. The normality of residuals was checked by the Shapiro-Watson normality test. Linearity was tested through a scatterplot. Additionally, homoscedasticity was examined by a residual plot. Lastly, independence was tested through the Durban Watson test. Only one variable met the assumption of normality, namely the IAT for calmness versus tension. Additionally, the assumption of independence was met in the relationship between bodily shame and PA. The remaining assumptions were not met. As the data did not comply with the assumptions of linear regression, non-parametric tests were used. The analyses conducted in this research could be done without the data meeting the assumptions.

Statistical Analyses

Bivariate Relationships

The relationships between shying away and PA, and bodily shame and PA were first determined using stepwise linear regression with the "Mass" package (Venables and Ripley, 2002). Using this package it was investigated whether anticipatory bodily shame was a greater independent explanatory variable for PA in comparison to the construct of shying away. This was done via stepwise regression. Additionally, for the analysis between shying away and PA, Spearman's Rank Correlation (Spearman's rho) was used with the 'Psych' package (Revelle, 2024: Zar, 2005).

Additionally, the p-value was used to determine the significance of the relationship, where $p \leq 0.05$ indicates a statistically significant relationship. The relationships between

bodily shame and PA, ”core affective experiences: calmness versus tension” and PA, the IAT and PA, and the core affective experiences: calmness versus tension and the IAT, were also measured using Spearman’s rho and its p-value. The relationship between bodily shame and the core affective experiences: calmness versus tension, as well as the relationship between bodily shame and the IAT, were measured using Kendall’s tau (Kendall, 1938).

Multivariate Relationships

The research contained three multivariate relationships. The first mediation model had an independent variable of bodily shame, a mediator named “core affective experiences: calmness versus tension” and a dependent variable of PA. The second mediation model had an independent variable of bodily shame, a mediator named “IAT: calmness versus tension” and a dependent variable of PA. The last mediation model comprised of both mediations, where bodily shame was again the independent variable, “core affective experiences: calmness versus tension” and “IAT: calmness versus tension” were both mediators, and PA was once again the dependent variable. The multivariate relationships were measured using mediation analyses, resulting in coefficients, R-squared values which indicate the percentage of variance in the dependent variable that is explained by the independent variables, as well as the p-values. The mediation analyses were conducted using the ‘mediation’ package, as well as the ‘quantreg’ and ‘SparseM’ packages (Tingley et al., 2014; Koenker, 2005; Koenker and NG, 2003).

Results

Bodily Shame versus Shying Away and Vigorous Physical Activity

The association between the antecedent appraisal “shying away” from the AFFEXX questionnaire and moderate and vigorous physical activity was analysed using Spearman’s correlation coefficient rho (ρ). The analysis resulted in an average (ρ) = -0.22 with a p = .07, which is statistically not significant. The correlation between bodily shame and moderate and vigorous physical activity was measured using Spearman’s rho as well. The analysis uncovered (ρ) = -0.16 with a p = .16, which is statistically non-significant. Furthermore, stepwise regression was used to determine the added value of bodily shame, while accounting for the effect of shying away. The stepwise regression analysis for shying away

and PA resulted in an unstandardized relationship coefficient of -89.10, and an adjusted r-squared of .04, with p = .03. Additionally, the regression analysis for bodily shame and PA showed an unstandardized regression coefficient of -41.14, and an adjusted r-squared of .01, with p = .51. Lastly, a regression coefficient of 39.58, with an adjusted r-squared of .04 and p = .09, was found for bodily shame on moderate and vigorous physical activity, while accounting for the effect of shying away.

Mediation 1

The mediation analysis used to assess the relationship between the dependent variable “moderate and vigorous activity”, independent variable “bodily shame” and mediator “calmness v. tension” showed an insignificant relationship and has revealed an R-squared of 0.32 with p = .08.

Mediation 2

The mediation analysis used to assess the relationship between dependent variable “moderate and vigorous activity”, independent variable “bodily shame” and mediator “IAT: calmness v. tension ” revealed that IAT scores did not significantly mediate the relationship between bodily shame and physical activity (β = 40.31, p = .70). Furthermore, the mediation model has resulted in an R-squared of 0.22 with p = .28.

Discussion

This study aimed to introduce " bodily shame" into the AFFEXX questionnaire and explore how it relates to engagement in moderate and vigorous physical activity. This was done to retrieve the answers to the research questions. The first research question was whether a new antecedent appraisal of anticipatory bodily shame would be a meaningful addition to the AFFEXX questionnaire in understanding people’s motivation to engage in moderate and vigorous physical activity. Against predictions, the current study did not find bodily shame to be a significantly meaningful addition to the AFFEXX questionnaire. The second research question related to how including bodily shame in the AFFEXX questionnaire could increase our understanding of what motivates people to engage in moderate and vigorous physical activity. By aiming to answer this research question, feelings

of tension were also measured implicitly to determine whether feelings of shame are mediated implicitly or implicitly in their relationship with physical activity. As this study did not find bodily shame to be a significant addition to the AFFEXX questionnaire, the second research question was not pursued.

In this study, bodily shame did not add explanatory value above the existing antecedent appraisal of showing off versus shying away, on physical activity. Additionally bodily shame is not significantly associated with physical activity, while mediated by implicit or explicit feelings of tension.

The results are partly in line with existing research. For example, the research by Pila et al. (2020) concluded that feelings of shame regarding one's physical appearance have the ability to influence one's commitment to exercise negatively. This has been concluded in a 2021 study as well, where post-bariatric surgery patients showed a negative relationship between the BISS and physical activity (Teeter, 2021). However, a 2019 study concluded that there is no relationship between bodily shame and exercise behaviours (Meade et al., 2019). To conclude, while this research is in line with some studies, definitive results are still inconclusive.

The antecedent appraisal of showing off versus shying away was expected to be significantly associated with PA. However, the results were insignificant. This elicits us to question this antecedent appraisal's validity. Additionally, the question arises whether wanting to show off or shy away when exercising actually contributes to significantly higher or lower levels of physical activity. There is evidence that pupils who tend to hide during physical education (PE) develop negative associations with the subject and possibly with physical exercise entirely. Additionally, it was found that those same pupils experienced a decrease in exercise-related joy (Lyngstad et al., 2016). However, to my knowledge, little research has been conducted on the relationship between showing off versus shying away when engaging in physical activity and actual engagement in physical exercise.

Despite the results being in line with other research, it was unexpected that both mediations were insignificant. The explanation about the invalidity of the implicit association tests may partly describe why mediation two (implicit) was insignificant. However, when following the theoretical framework of the AFFEXX questionnaire, it would be expected that mediation 1 (explicit) would be significant. This prompts an investigation into the validity of

the AFFEXX questionnaire. The research done on the validity of the items suggests the data fits decently, however, to my knowledge, no other studies about the validity of the AFFEXX questionnaire have yet been conducted, in addition to this research indicating that there is no significant relationship between the core affective experiences 'calmness versus tension' and PA. Further research should aim to investigate the discrepancies in results to determine the true validity of the AFFEXX questionnaire. This could involve conducting validation studies in which the structure of the questionnaire as well as its construct validity are researched. This is important in order to use the AFFEXX questionnaire reliably in predicting attraction or antipathy towards physical exercise.

Furthermore, while the BISS is generally seen as a reliable instrument to measure internalized and externalized bodily shame, there are some important limitations to the usage of this measurement tool (Duarte et al., 2014). Firstly, studies on the reliability and validity of the instrument have been done on Portuguese men and women, this means that cross-cultural reliability should be researched to ensure comparability across various populations. Additionally, the scale should be tested among populations with distinct risk factors, such as age and occupation (Duarte & Ferreira, 2022; Duarte et al., 2014).

Additionally, a study with objective measures has shown that the IPAQ SF tends to overestimate physical activity levels (Lee et al., 2011). This means that the numbers used for physical activity in this study may not be accurate representations of the participant's physical activity levels. This measurement bias could have masked any significant effects of bodily shame on physical activity in the current study. Future research should aim to use objective measures to identify participants' physical activity levels.

There are some limitations to this research. First, the relatively small number of participants may have reduced the statistical power of the analyses. This may have resulted in more difficulties in identifying significant relationships. It is advised that future research will focus on including a larger sample size to ensure validity and generalisability. Another limitation was that anticipatory pride was not included in this study, despite other studies showing significant results for the positive relationship between anticipatory bodily pride and physical activity levels (Mack et al., 2015; Meade et al., 2019). Future research should include the effects of bodily pride and compare those results to the effects of bodily shame on physical activity.

To conclude, the results of this study have shown that feelings of anticipatory bodily shame are not negatively associated with engagement in moderate and vigorous physical activity, after controlling for the antecedent appraisal of showing off versus shying away from the AFFEXX. Therefore, a new antecedent appraisal of anticipatory bodily shame would not be a meaningful addition to the AFFEXX questionnaire, in understanding people's motivation to engage in moderate and vigorous physical activity.

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Appendix A

R Codes

```
library(tidyverse)
library(readr)
library(readxl)

ThesisDataNew <- read_xlsx ("/Users/annemarievandenberg/Desktop/DataThesisNew.xlsx")
View(ThesisDataNew)

# Cleaning the data

CleandataAssumptions <- ThesisDataNew %>%
  select(C101_01, C104, C105, C106, C110, C111, C112, C201_01, C203_01, D102_02,
D103_01, D103_02, D106_01, D107_01, D107_02, E102_08, E102_24, E102_27, E102_17,
E102_19, E102_22, E102_31, F201_01, F201_02, F201_03, F201_04, F201_05, F201_06,
F201_07, F201_08, F201_09, F201_10, F201_11, F201_12, F201_13, F201_14, G201i0,
G201xD, G201xD1, G201xD2, G201xD3)
View(CleandataAssumptions)

# Deleting first row with text
CleandataAssumptions = CleandataAssumptions[-1,]

# All missing values are deleted, the rows they were in too
CleandataAssumptions <- CleandataAssumptions[complete.cases(CleandataAssumptions), ]

# There are now 82 people in the dataset

# Making the age data numeric
CleandataAssumptions$C101_01 <-
  as.numeric(CleandataAssumptions$C101_01)

# Making the "Present number: over the past month..." data numeric
CleandataAssumptions$C203_01 <-
  as.numeric(CleandataAssumptions$C203_01)

# Manually change values using conditional statements
CleandataAssumptions$D102_02 <- ifelse(CleandataAssumptions$D102_02 == "5 days a
week", 5, CleandataAssumptions$D102_02)  # Change "5 days a week" to 5
CleandataAssumptions$D103_01 <- ifelse(CleandataAssumptions$D103_01 == "2-3", 1.5,
CleandataAssumptions$D103_01)

CleandataAssumptions = CleandataAssumptions[-76,]
CleandataAssumptions = CleandataAssumptions[-81,]

# Now there are 80 people still in the data set
```

```
# Insert a new column named "VigorousActivityMinutesPerDay" at the end of the data frame about vigorous activity in minutes per day
CleandataAssumptions$VigorousActivityMinutesPerDay <- NA

# Manually assign values to each cell in the new column about vigorous activity minutes per day, as the other colums did not give the right numbers
CleandataAssumptions$VigorousActivityMinutesPerDay <- c("90", "90", "120", "0", "0", "60", "120", "120", "105", "30", "120", "60", "0", "90", "120", "45", "0", "90", "60", "90", "90", "75", "90", "60", "10", "0", "60", "0", "90", "0", "0", "50", "60", "90", "150", "90", "30", "150", "60", "0", "120", "240", "0", "10", "60", "90", "60", "0", "120", "45", "90", "90", "90", "60", "120", "90", "0", "210", "0", "120", "90", "120", "90", "60", "90", "0", "0", "120", "10", "70", "120", "60", "80", "90", "90", "60", "0", "30", "30", "60")

# Insert a new column named "Vig.Act.Min.P.W."
CleandataAssumptions$Vig.Act.Min.P.W. <- NA

CleandataAssumptions$D102_02<-
  as.numeric(CleandataAssumptions$D102_02)
CleandataAssumptions$VigorousActivityMinutesPerDay<-
  as.numeric(CleandataAssumptions$VigorousActivityMinutesPerDay)

# Manually assign values to each cell in the new column about vigorous activity minutes per week, as the other colums did not give the right numbers
CleandataAssumptions$Vig.Act.Min.P.W. <- CleandataAssumptions$D102_02 *
CleandataAssumptions$VigorousActivityMinutesPerDay

# Insert a new column named "Moderateminutesperweek"
CleandataAssumptions$Moderateminutesperweek <- NA

# Manually assign values to each cell in the new column about moderate activity minutes per week, as the other colums did not give the right numbers
CleandataAssumptions$Moderateminutesperweek <- c("210", "210", "240", "120", "120", "0", "120", "630", "180", "480", "240", "60", "60", "0", "450", "120", "120", "315", "240", "420", "240", "60", "840", "120", "300", "240", "0", "840", "195", "600", "0", "180", "180", "300", "900", "540", "180", "210", "120", "72", "1080", "420", "300", "0", "420", "180", "420", "225", "240", "360", "120", "315", "405", "60", "280", "180", "240", "1260", "270", "420", "420", "630", "240", "240", "150", "450", "0", "480", "0", "100", "150", "0", "40", "300", "210", "630", "750", "420", "300", "60")

CleandataAssumptions$Moderateminutesperweek<-
  as.numeric(CleandataAssumptions$Moderateminutesperweek)

# Insert a new column named "MODVIGMINPW"
CleandataAssumptions$MODVIGMINPW <- NA

# New column about moderate and vigorous activity in minutes per week:
```

```
CleandataAssumptions$MODVIGMINPW <- CleandataAssumptions$Vig.Act.Min.P.W. +
CleandataAssumptions$Moderateminutesperweek

# Make numeric
CleandataAssumptions$MODVIGMINPW<-
  as.numeric(CleandataAssumptions$MODVIGMINPW)

# Changing to numbers
CleandataAssumptions$E102_08 <- ifelse(CleandataAssumptions$E102_08 == "When I
exercise, I'd rather be invisible. [1]", 1, CleandataAssumptions$E102_08)
CleandataAssumptions$E102_08 <- ifelse(CleandataAssumptions$E102_08 == "When I
exercise, I love showing off. [7]", 7, CleandataAssumptions$E102_08)
CleandataAssumptions$E102_08 <- ifelse(CleandataAssumptions$E102_08 == "[2]", 2,
CleandataAssumptions$E102_08)
CleandataAssumptions$E102_08 <- ifelse(CleandataAssumptions$E102_08 == "[3]", 3,
CleandataAssumptions$E102_08)
CleandataAssumptions$E102_08 <- ifelse(CleandataAssumptions$E102_08 == "[4]", 4,
CleandataAssumptions$E102_08)
CleandataAssumptions$E102_08 <- ifelse(CleandataAssumptions$E102_08 == "[5]", 5,
CleandataAssumptions$E102_08)
CleandataAssumptions$E102_08 <- ifelse(CleandataAssumptions$E102_08 == "[6]", 6,
CleandataAssumptions$E102_08)

# Making the "E102_08" data numeric
CleandataAssumptions$E102_08 <-
  as.numeric(CleandataAssumptions$E102_08)

# Reverse scoring E102_08
max_val <- max(CleandataAssumptions$E102_08)
min_val <- min(CleandataAssumptions$E102_08)
CleandataAssumptions$E102_08 <- ifelse(CleandataAssumptions$E102_08 != max_val &
CleandataAssumptions$E102_08 != min_val, max_val - CleandataAssumptions$E102_08 +
min_val, CleandataAssumptions$E102_08)

# Making E102_24 numeric
CleandataAssumptions$E102_24 <- ifelse(CleandataAssumptions$E102_24 == "When others
look at me when I exercise, it makes me feel great. [1]", 1, CleandataAssumptions$E102_24)
CleandataAssumptions$E102_24 <- ifelse(CleandataAssumptions$E102_24 == "When others
look at me when I exercise, it makes me feel terrible. [7]", 7,
CleandataAssumptions$E102_24)
CleandataAssumptions$E102_24 <- ifelse(CleandataAssumptions$E102_24 == "[2]", 2,
CleandataAssumptions$E102_24)
CleandataAssumptions$E102_24 <- ifelse(CleandataAssumptions$E102_24 == "[3]", 3,
CleandataAssumptions$E102_24)
CleandataAssumptions$E102_24 <- ifelse(CleandataAssumptions$E102_24 == "[4]", 4,
CleandataAssumptions$E102_24)
```

```
CleandataAssumptions$E102_24 <- ifelse(CleandataAssumptions$E102_24 == "[5]", 5,
CleandataAssumptions$E102_24)
CleandataAssumptions$E102_24 <- ifelse(CleandataAssumptions$E102_24 == "[6]", 6,
CleandataAssumptions$E102_24)

# Making E102_27 numeric
CleandataAssumptions$E102_27 <- ifelse(CleandataAssumptions$E102_27 == "[1]", 1,
CleandataAssumptions$E102_27)
CleandataAssumptions$E102_27 <- ifelse(CleandataAssumptions$E102_27 == "I hate it
when others watch me as I exercise. [7]", 7, CleandataAssumptions$E102_27)
CleandataAssumptions$E102_27 <- ifelse(CleandataAssumptions$E102_27 == "[2]", 2,
CleandataAssumptions$E102_27)
CleandataAssumptions$E102_27 <- ifelse(CleandataAssumptions$E102_27 == "[3]", 3,
CleandataAssumptions$E102_27)
CleandataAssumptions$E102_27 <- ifelse(CleandataAssumptions$E102_27 == "[4]", 4,
CleandataAssumptions$E102_27)
CleandataAssumptions$E102_27 <- ifelse(CleandataAssumptions$E102_27 == "[5]", 5,
CleandataAssumptions$E102_27)
CleandataAssumptions$E102_27 <- ifelse(CleandataAssumptions$E102_27 == "[6]", 6,
CleandataAssumptions$E102_27)

# Making the "E102_24 and E102_27" data numeric
CleandataAssumptions$E102_24 <-
  as.numeric(CleandataAssumptions$E102_24)

CleandataAssumptions$E102_27 <-
  as.numeric(CleandataAssumptions$E102_27)

# Make shame questionnaire numerical
CleandataAssumptions$F201_01 <- factor(CleandataAssumptions$F201_01, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_02 <- factor(CleandataAssumptions$F201_02, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_03 <- factor(CleandataAssumptions$F201_03, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_04 <- factor(CleandataAssumptions$F201_04, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_05 <- factor(CleandataAssumptions$F201_05, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_06 <- factor(CleandataAssumptions$F201_06, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_07 <- factor(CleandataAssumptions$F201_07, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_08 <- factor(CleandataAssumptions$F201_08, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_09 <- factor(CleandataAssumptions$F201_09, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
```

```
CleandataAssumptions$F201_10 <- factor(CleandataAssumptions$F201_10, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_11 <- factor(CleandataAssumptions$F201_11, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_12 <- factor(CleandataAssumptions$F201_12, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_13 <- factor(CleandataAssumptions$F201_13, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))
CleandataAssumptions$F201_14 <- factor(CleandataAssumptions$F201_14, levels =
c("Never", "Seldom", "Sometimes", "Often", "Almost always"), labels = c(1, 2, 3, 4, 5))

# Make shame questionnaire numerical:
CleandataAssumptions$F201_01 <-
  as.numeric(CleandataAssumptions$F201_01)

CleandataAssumptions$F201_02 <-
  as.numeric(CleandataAssumptions$F201_02)

CleandataAssumptions$F201_03 <-
  as.numeric(CleandataAssumptions$F201_03)

CleandataAssumptions$F201_04 <-
  as.numeric(CleandataAssumptions$F201_04)

CleandataAssumptions$F201_05 <-
  as.numeric(CleandataAssumptions$F201_05)

CleandataAssumptions$F201_06 <-
  as.numeric(CleandataAssumptions$F201_06)

CleandataAssumptions$F201_07 <-
  as.numeric(CleandataAssumptions$F201_07)

CleandataAssumptions$F201_08 <-
  as.numeric(CleandataAssumptions$F201_08)

CleandataAssumptions$F201_09 <-
  as.numeric(CleandataAssumptions$F201_09)

CleandataAssumptions$F201_10 <-
  as.numeric(CleandataAssumptions$F201_10)

CleandataAssumptions$F201_11 <-
  as.numeric(CleandataAssumptions$F201_11)

CleandataAssumptions$F201_12 <-
  as.numeric(CleandataAssumptions$F201_12)
```

```
CleandataAssumptions$F201_13 <-
  as.numeric(CleandataAssumptions$F201_13)

CleandataAssumptions$F201_14 <-
  as.numeric(CleandataAssumptions$F201_14)

# Making E102_17 numeric
CleandataAssumptions$E102_17 <- ifelse(CleandataAssumptions$E102_17 == "For me,
exercise is a relaxing activity. [1]", 1, CleandataAssumptions$E102_17)
CleandataAssumptions$E102_17 <- ifelse(CleandataAssumptions$E102_17 == "For me,
exercise is a stressful activity. [7]", 7, CleandataAssumptions$E102_17)
CleandataAssumptions$E102_17 <- ifelse(CleandataAssumptions$E102_17 == "[2]", 2,
CleandataAssumptions$E102_17)
CleandataAssumptions$E102_17 <- ifelse(CleandataAssumptions$E102_17 == "[3]", 3,
CleandataAssumptions$E102_17)
CleandataAssumptions$E102_17 <- ifelse(CleandataAssumptions$E102_17 == "[4]", 4,
CleandataAssumptions$E102_17)
CleandataAssumptions$E102_17 <- ifelse(CleandataAssumptions$E102_17 == "[5]", 5,
CleandataAssumptions$E102_17)
CleandataAssumptions$E102_17 <- ifelse(CleandataAssumptions$E102_17 == "[6]", 6,
CleandataAssumptions$E102_17)

# Making E102_19 numeric
CleandataAssumptions$E102_19 <- ifelse(CleandataAssumptions$E102_19 == "Exercise
gives me serenity. [1]", 1, CleandataAssumptions$E102_19)
CleandataAssumptions$E102_19 <- ifelse(CleandataAssumptions$E102_19 == "Exercise
stresses me out. [7]", 7, CleandataAssumptions$E102_19)
CleandataAssumptions$E102_19 <- ifelse(CleandataAssumptions$E102_19 == "[2]", 2,
CleandataAssumptions$E102_19)
CleandataAssumptions$E102_19 <- ifelse(CleandataAssumptions$E102_19 == "[3]", 3,
CleandataAssumptions$E102_19)
CleandataAssumptions$E102_19 <- ifelse(CleandataAssumptions$E102_19 == "[4]", 4,
CleandataAssumptions$E102_19)
CleandataAssumptions$E102_19 <- ifelse(CleandataAssumptions$E102_19 == "[5]", 5,
CleandataAssumptions$E102_19)
CleandataAssumptions$E102_19 <- ifelse(CleandataAssumptions$E102_19 == "[6]", 6,
CleandataAssumptions$E102_19)

# Making E102_22 numeric
CleandataAssumptions$E102_22 <- ifelse(CleandataAssumptions$E102_22 == "Exercise
soothes me. [1]", 1, CleandataAssumptions$E102_22)
CleandataAssumptions$E102_22 <- ifelse(CleandataAssumptions$E102_22 == "Exercise
makes me feel tense. [7]", 7, CleandataAssumptions$E102_22)
CleandataAssumptions$E102_22 <- ifelse(CleandataAssumptions$E102_22 == "[2]", 2,
CleandataAssumptions$E102_22)
```

```
CleandataAssumptions$E102_22 <- ifelse(CleandataAssumptions$E102_22 == "[3]", 3,
CleandataAssumptions$E102_22)
CleandataAssumptions$E102_22 <- ifelse(CleandataAssumptions$E102_22 == "[4]", 4,
CleandataAssumptions$E102_22)
CleandataAssumptions$E102_22 <- ifelse(CleandataAssumptions$E102_22 == "[5]", 5,
CleandataAssumptions$E102_22)
CleandataAssumptions$E102_22 <- ifelse(CleandataAssumptions$E102_22 == "[6]", 6,
CleandataAssumptions$E102_22)

# Making E102_31 numeric
CleandataAssumptions$E102_31 <- ifelse(CleandataAssumptions$E102_31 == "Exercise
makes me feel peaceful. [1]", 1, CleandataAssumptions$E102_31)
CleandataAssumptions$E102_31 <- ifelse(CleandataAssumptions$E102_31 == "Exercise
makes me feel aggravated. [7]", 7, CleandataAssumptions$E102_31)
CleandataAssumptions$E102_31 <- ifelse(CleandataAssumptions$E102_31 == "[2]", 2,
CleandataAssumptions$E102_31)
CleandataAssumptions$E102_31 <- ifelse(CleandataAssumptions$E102_31 == "[3]", 3,
CleandataAssumptions$E102_31)
CleandataAssumptions$E102_31 <- ifelse(CleandataAssumptions$E102_31 == "[4]", 4,
CleandataAssumptions$E102_31)
CleandataAssumptions$E102_31 <- ifelse(CleandataAssumptions$E102_31 == "[5]", 5,
CleandataAssumptions$E102_31)
CleandataAssumptions$E102_31 <- ifelse(CleandataAssumptions$E102_31 == "[6]", 6,
CleandataAssumptions$E102_31)

# Making the "E102_17, E102_19, E102_22, E102_31" data numeric
CleandataAssumptions$E102_17 <-
  as.numeric(CleandataAssumptions$E102_17)

CleandataAssumptions$E102_19 <-
  as.numeric(CleandataAssumptions$E102_19)

CleandataAssumptions$E102_22 <-
  as.numeric(CleandataAssumptions$E102_22)

CleandataAssumptions$E102_31 <-
  as.numeric(CleandataAssumptions$E102_31)


CleandataAssumptions$G201xD <-
  as.numeric(CleandataAssumptions$G201xD)

# Demographics

# Percentages of ages
View(Cleandata)
Cleandata %>%
```

```
  group_by(C101_01) %>% summarise(n = n()) %>% mutate(percentage = n / sum(n))


# Making the age data numeric
Cleandata$C101_01 <-
  as.numeric(Cleandata$C101_01)

C101_01_mean <-
  mean(Cleandata$C101_01)
print(C101_01_mean)

# Percentages of genders
View(Cleandata)
Cleandata %>%
  group_by(C105) %>% summarise(n = n()) %>% mutate(percentage = n / sum(n))


# Percentages of nationalities
View(Cleandata)
Cleandata %>%
  group_by(C106) %>% summarise(n = n()) %>% mutate(percentage = n / sum(n))


# Information about "Present number: over the past month..."
View(Cleandata)
Cleandata %>%
  group_by(C203_01) %>% summarise(n = n()) %>% mutate(percentage = n / sum(n))


# Making the "Present number: over the past month..." data numeric
Cleandata$C203_01 <-
  as.numeric(Cleandata$C203_01)


C203_01_mean <-
  mean(Cleandata$C203_01)
print(C203_01_mean)


# Testing the assumptions

# Assumtions PA:
# Normality
# Histogram
hist(CleandataAssumptions$MODVIGMINPW, main="Histogram of variable_name",
xlab="variable_name", col="lightblue", border="black")
```

```
# Q-Q Plot
qqnorm(CleandataAssumptions$MODVIGMINPW, main="Q-Q Plot of variable_name")
qqline(CleandataAssumptions$MODVIGMINPW, col="red")

# Shapiro-Wilk Test
shapiro.test(CleandataAssumptions$variable_name)


# Normality Assumpsion Bodily Shame
# Load required packages
library(ggplot2)

column_names <- c("F201_01", "F201_02", "F201_03", "F201_04", "F201_05", "F201_06",
                  "F201_07", "F201_08", "F201_09", "F201_10", "F201_11", "F201_12",
                  "F201_13", "F201_14")

# Loop through each column
for (col in column_names)

shapiro_result <- shapiro.test(CleandataAssumptions[[col]])
print(paste("Shapiro-Wilk test for", col))
print(shapiro_result)


# Normality Assumption Shying away

# Load required packages
library(ggplot2)

column_names <- c("E102_08", "E102_24", "E102_27")

# Loop through each column
for (col in column_names)

  shapiro_result <- shapiro.test(CleandataAssumptions[[col]])
print(paste("Shapiro-Wilk test for", col))
print(shapiro_result)


# Normality Assumption Core Affective Experiences

# Load required packages
library(ggplot2)

column_names <- c("E102_17", "E102_19", "E102_22", "E102_31")

# Loop through each column
```

```
for (col in column_names)

  shapiro_result <- shapiro.test(CleandataAssumptions[[col]])
print(paste("Shapiro-Wilk test for", col))
print(shapiro_result)


# Normality Assumption IAT

# Load required packages
library(ggplot2)

column_names <- c("G201xD")

# Loop through each column
for (col in column_names)

  shapiro_result <- shapiro.test(CleandataAssumptions[[col]])
print(paste("Shapiro-Wilk test for", col))
print(shapiro_result)

install.packages("car")
library(car)
install.packages("carData")
library(carData)

# Multiple regression model 1 to test the assumptions:
model <- lm(cbind(Vig.Act.Min.P.W., G201xD, E102_17, E102_19, E102_22, E102_31) ~ .,
data = Cleandata[, c("Vig.Act.Min.P.W.", "G201xD", "E102_17", "E102_19", "E102_22",
"E102_31", "F201_01", "F201_02", "F201_03", "F201_04", "F201_05", "F201_06",
"F201_07", "F201_08", "F201_09", "F201_10", "F201_11", "F201_12", "F201_13",
"F201_14", "E102_08", "E102_24", "E102_27")])

# Check for multicollinearity in model
vif_values <- vif(model)

# Check for linearity using scatterplots in model
par(mar = c(1, 1, 1, 1) + 0.1)
scatterplotMatrix(~ Vig.Act.Min.P.W. + G201xD + E102_17 + E102_19 + E102_22 + E102_31 +
F201_01 + F201_02 + F201_03 + F201_04 + F201_05 + F201_06 + F201_07 + F201_08 +
F201_09 + F201_10 + F201_11 + F201_12 + F201_13 + F201_14 + E102_08 + E102_24 +
E102_27, data = Cleandata)

# Check for normality of residuals
qqPlot(model, id = 0.05, main = "QQ Plot")

# Check for homoscedasticity
```

```
spreadLevelPlot(model)

# Check for independence of residuals
durbinWatsonTest(model)


# Bivariate analyses
# Shying away AFFEXX and PA

library(psych)

# Spearman correlation for PA and shying away from the AFFEXX
correlation_matrix <- cor.test(CleandataAssumptions$MODVIGMINPW,
CleandataAssumptions$E102_08, method = "spearman")
correlation_matrix2 <- cor.test(CleandataAssumptions$MODVIGMINPW,
CleandataAssumptions$E102_24, method = "spearman")
correlation_matrix3 <- cor.test(CleandataAssumptions$MODVIGMINPW,
CleandataAssumptions$E102_27, method = "spearman")
# Print correlation matrix
print(correlation_matrix)
print(correlation_matrix2)
print(correlation_matrix3)

> print(correlation_matrix)

cor1 <- cor(CleandataAssumptions$MODVIGMINPW, CleandataAssumptions$E102_08,
method = "spearman")
cor2 <- cor(CleandataAssumptions$MODVIGMINPW, CleandataAssumptions$E102_24,
method = "spearman")
cor3 <- cor(CleandataAssumptions$MODVIGMINPW, CleandataAssumptions$E102_27,
method = "spearman")

# Compute the average of the correlations
average_correlation <- mean(c(cor1, cor2, cor3))

# Print the average correlation
print(average_correlation)
```

- 0.2155314

```
# Correlation spearman PA and SHYING AWAY with p-value
dependent_variable <- CleandataAssumptions$MODVIGMINPW
independent_variables <- c("E102_08", "E102_24", "E102_27")
p_values <- numeric(length(independent_variables))
for (i in seq_along(independent_variables)) {
  correlation <- cor.test(dependent_variable,
CleandataAssumptions[[independent_variables[i]]], method = "spearman")
```

```
  p_values[i] <- correlation$p.value
}

average_p_value <- mean(p_values)
print(average_p_value)
```

p = 0.07232394

```
# Shame and PA

library(dplyr)

MODVIGMINPW <- CleandataAssumptions$MODVIGMINPW
correlation_matrix <- cor.test(MODVIGMINPW, "F201_01", "F201_02", "F20_03", "F201_04",
"F201_05", "F201_06", "F201_07", "F201_08", "F201_09", "F201_10", "F201_11",
"F201_12", "F201_13", "F201_14", method = "spearman")

# Print the correlation coefficient
print(correlation_matrix)


# Core Affective Experiences and PA

# Spearman correlation PA and CAE Calmness/ Tension
cor5 <- cor(CleandataAssumptions$MODVIGMINPW, CleandataAssumptions$E102_17,
method = "spearman")
cor6 <- cor(CleandataAssumptions$MODVIGMINPW, CleandataAssumptions$E102_19,
method = "spearman")
cor7 <- cor(CleandataAssumptions$MODVIGMINPW, CleandataAssumptions$E102_22,
method = "spearman")
cor8 <- cor(CleandataAssumptions$MODVIGMINPW, CleandataAssumptions$E102_31,
method = "spearman")

# Compute the average of the correlations
average_correlation <- mean(c(cor5, cor6, cor7, cor8))

# Print the average correlation
print(average_correlation)
```

-0.2349761

```
# Spearman correlation PA and CAE calmness/ tension individually:
correlation_matrix <- cor.test(CleandataAssumptions$MODVIGMINPW,
CleandataAssumptions$E102_17, method = "spearman")
```

```
correlation_matrix2 <- cor.test(CleandataAssumptions$MODVIGMINPW,
CleandataAssumptions$E102_19, method = "spearman")
correlation_matrix3 <- cor.test(CleandataAssumptions$MODVIGMINPW,
CleandataAssumptions$E102_22, method = "spearman")
correlation_matrix4 <- cor.test(CleandataAssumptions$MODVIGMINPW,
CleandataAssumptions$E102_24, method = "spearman")

# Print correlation matrix
print(correlation_matrix)
```

Spearman's rank correlation rho

```
data:  CleandataAssumptions$MODVIGMINPW and CleandataAssumptions$E102_17
S = 115937, p-value = 0.00108
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
-0.3588479
print(correlation_matrix2)
```

Spearman's rank correlation rho

```
data:  CleandataAssumptions$MODVIGMINPW and CleandataAssumptions$E102_19
S = 99349, p-value = 0.145
alternative hypothesis: true rho is not equal to 0
sample estimates:
     rho
-0.164426

print(correlation_matrix3)
```

Spearman's rank correlation rho

```
data:  CleandataAssumptions$MODVIGMINPW and CleandataAssumptions$E102_22
S = 101307, p-value = 0.09605
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
-0.1873716


print(correlation_matrix4)
```

Spearman's rank correlation rho

```
data:  CleandataAssumptions$MODVIGMINPW and CleandataAssumptions$E102_24
S = 106472, p-value = 0.0266
```

```
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
-0.2479193


OUTPUT:
> print(correlation_matrix)

Spearman's rank correlation rho

data:  CleandataAssumptions$MODVIGMINPW and CleandataAssumptions$E102_17
S = 115937, p-value = 0.00108
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
-0.3588479

# Correlation spearman PA and CALMNESS TENSION with p-value
dependent_variable <- CleandataAssumptions$MODVIGMINPW
independent_variables <- c("E102_17", "E102_19", "E102_22", "E102_31")
p_values <- numeric(length(independent_variables))
for (i in seq_along(independent_variables)) {
  correlation <- cor.test(dependent_variable,
CleandataAssumptions[[independent_variables[i]]], method = "spearman")
  p_values[i] <- correlation$p.value
}

average_p_value <- mean(p_values)
print(average_p_value)

p = 0.07072882


# IAT and PA

correlation <- cor.test(CleandataAssumptions$G201xD,
CleandataAssumptions$MODVIGMINPW, method = "spearman")

print(correlation)

Spearman's rank correlation rho

data:  CleandataAssumptions$G201xD and CleandataAssumptions$MODVIGMINPW
S = 90531, p-value = 0.5905
alternative hypothesis: true rho is not equal to 0
sample estimates:
```

```
      rho
-0.06107285
```

```
# Multivariate analyses
# Shame – IAT – PA

install.packages("quantreg")
library(quantreg)
install.packages("SparseM")
library(SparseM)

library(mediation)

# Specify the mediation model
model_formula <- MODVIGMINPW ~ G201xD + F201_01 + F201_02 + F201_03 + F201_04 +
F201_05 + F201_06 + F201_07 + F201_08 + F201_09 + F201_10 + F201_11 + F201_12 +
F201_13 + F201_14
mediator_formula <- G201xD ~ F201_01 + F201_02 + F201_03 + F201_04 + F201_05 +
F201_06 + F201_07 + F201_08 + F201_09 + F201_10 + F201_11 + F201_12 + F201_13 +
F201_14

# Perform mediation analysis
mediation_result <- mediate(model_formula, mediator_formula, data =
CleandataAssumptions)

# Print mediation results
summary(mediation_result)
```

OUPUT:

```
Call: mediate(y = model_formula, x = mediator_formula, data = CleandataAssumptions)

No mediator specified leads to traditional regression
        MODVIGMINPW     se     t df     Prob
Intercept      739.33 156.11  4.74 64 1.25e-05
G201xD          11.62 104.24  0.11 64 9.12e-01
F201_01        -10.41  57.62 -0.18 64 8.57e-01
F201_02       -129.63 109.60 -1.18 64 2.41e-01
F201_03        -79.25  76.24 -1.04 64 3.02e-01
F201_04         23.14  76.04  0.30 64 7.62e-01
F201_05       -138.07  78.62 -1.76 64 8.38e-02
F201_06          0.38  76.93  0.00 64 9.96e-01
F201_07          0.33  53.66  0.01 64 9.95e-01
F201_08        100.15  89.00  1.13 64 2.65e-01
F201_09        -46.59  64.50 -0.72 64 4.73e-01
```

F201_10 -97.25 80.95 -1.20 64 2.34e-01
F201_11 83.08 60.40 1.38 64 1.74e-01
F201_12 116.71 59.89 1.95 64 5.57e-02
F201_13 -97.49 46.29 -2.11 64 3.91e-02
F201_14 108.06 81.18 1.33 64 1.88e-01

R = 0.47 R2 = 0.22 F = 1.23 on 15 and 64 DF p-value: 0.277

Shame – Core affective experiences – PA

```
model_formula <- MODVIGMINPW ~ E102_17 + E102_19 + E102_22 + E102_31 + F201_01 +
F201_02 + F201_03 + F201_04 + F201_05 + F201_06 + F201_07 + F201_08 + F201_09 +
F201_10 + F201_11 + F201_12 + F201_13 + F201_14
mediator_formula <- E102_17 + E102_19 + E102_22 + E102_31 ~ F201_01 + F201_02 +
F201_03 + F201_04 + F201_05 + F201_06 + F201_07 + F201_08 + F201_09 + F201_10 +
F201_11 + F201_12 + F201_13 + F201_14

# Perform mediation analysis
mediation_result <- mediate(model_formula, mediator_formula, data =
CleandataAssumptions)

# Print mediation results
summary(mediation_result)
```

OUTPUT:

Call: mediate(y = model_formula, x = mediator_formula, data = CleandataAssumptions)

No mediator specified leads to traditional regression

	MODVIGMINPW	se	t	df	Prob
Intercept	923.04	177.28	5.21	61	2.39e-06
E102_17	-106.88	42.76	-2.50	61	1.51e-02
E102_19	13.03	46.59	0.28	61	7.81e-01
E102_22	-16.64	52.53	-0.32	61	7.53e-01
E102_31	-4.78	49.24	-0.10	61	9.23e-01
F201_01	8.98	55.61	0.16	61	8.72e-01
F201_02	-78.39	108.27	-0.72	61	4.72e-01
F201_03	-115.85	77.69	-1.49	61	1.41e-01
F201_04	5.93	73.40	0.08	61	9.36e-01
F201_05	-157.65	76.51	-2.06	61	4.36e-02
F201_06	-15.13	73.99	-0.20	61	8.39e-01
F201_07	21.17	51.98	0.41	61	6.85e-01
F201_08	157.54	89.14	1.77	61	8.22e-02

```
F201_09       -72.28  62.16 -1.16 61 2.49e-01
F201_10       -84.05  77.76 -1.08 61 2.84e-01
F201_11       111.60  60.34  1.85 61 6.92e-02
F201_12        61.46  62.94  0.98 61 3.33e-01
F201_13       -44.75  48.73 -0.92 61 3.62e-01
F201_14       123.59  78.00  1.58 61 1.18e-01

R = 0.57 R2 = 0.32   F = 1.63 on 18 and 61 DF   p-value:  0.0817
```

```
# Whole model

# Specify the mediation model
model_formula <- MODVIGMINPW ~ G201xD + E102_17 + E102_19 + E102_22 + E102_31 +
  F201_01 + F201_02 + F201_03 + F201_04 + F201_05 +
  F201_06 + F201_07 + F201_08 + F201_09 + F201_10 +
  F201_11 + F201_12 + F201_13 + F201_14

mediator1_formula <- G201xD ~ F201_01 + F201_02 + F201_03 + F201_04 + F201_05 +
  F201_06 + F201_07 + F201_08 + F201_09 + F201_10 +
  F201_11 + F201_12 + F201_13 + F201_14

mediator2_formula <- E102_17 + E102_19 + E102_22 + E102_31 ~ F201_01 + F201_02 +
  F201_03 + F201_04 + F201_05 + F201_06 + F201_07 +
  F201_08 + F201_09 + F201_10 + F201_11 + F201_12 +
  F201_13 + F201_14

# Perform mediation analysis
mediation_result <- mediate(model_formula, mediator1_formula, mediator2_formula,
                    data = CleandataAssumptions)

# Print mediation results
summary(mediation_result)
```

OUTPUT:

```
Call: mediate(y = model_formula, x = mediator1_formula, m = mediator2_formula,
   data = CleandataAssumptions)

No mediator specified leads to traditional regression
        MODVIGMINPW     se     t df     Prob
Intercept      912.22 180.65  5.05 60 4.41e-06
G201xD          40.31 103.03  0.39 60 6.97e-01
E102_17       -108.46  43.25 -2.51 60 1.49e-02
E102_19         15.57  47.37  0.33 60 7.43e-01
```

```
E102_22       -14.57  53.17 -0.27 60 7.85e-01
E102_31        -7.93  50.23 -0.16 60 8.75e-01
F201_01        10.87  56.21  0.19 60 8.47e-01
F201_02       -73.47 109.75 -0.67 60 5.06e-01
F201_03      -113.55  78.46 -1.45 60 1.53e-01
F201_04         2.65  74.38  0.04 60 9.72e-01
F201_05      -157.85  77.05 -2.05 60 4.49e-02
F201_06       -17.58  74.78 -0.24 60 8.15e-01
F201_07        18.87  52.68  0.36 60 7.21e-01
F201_08       156.46  89.80  1.74 60 8.66e-02
F201_09       -66.92  64.07 -1.04 60 3.00e-01
F201_10       -83.20  78.34 -1.06 60 2.92e-01
F201_11       114.62  61.25  1.87 60 6.62e-02
F201_12        59.83  63.52  0.94 60 3.50e-01
F201_13       -48.38  49.94 -0.97 60 3.37e-01
F201_14       126.85  78.99  1.61 60 1.14e-01

R = 0.57 R2 = 0.33   F = 1.53 on 19 and 60 DF   p-value:  0.109


# Stepwise linear regression

# Model 1: Shying Away only
model1 <- lm(MODVIGMINPW ~ shying_away, data = CleandataAssumptions)
summary(model1)

Call:
lm(formula = MODVIGMINPW ~ shying_away, data = CleandataAssumptions)

Residuals:
   Min     1Q  Median     3Q    Max
-625.63 -236.97  -51.07  139.08 1924.08

Coefficients:
            Estimate Std. Error t value
(Intercept)   892.94     178.50   5.002
shying_away   -89.10      41.19  -2.163
            Pr(>|t|)
(Intercept) 3.41e-06 ***
shying_away   0.0336 *
---
Signif. codes:
 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1
 ‘ ’ 1

Residual standard error: 375.6 on 78 degrees of freedom
Multiple R-squared:  0.05661,           Adjusted R-squared:  0.04452
```

```
F-statistic: 4.681 on 1 and 78 DF,  p-value: 0.03357

# Model 1b: bodidly shame only
model1b <- lm(MODVIGMINPW ~ bodily_shame, data = CleandataAssumptions)
summary(model1b)

Call:
lm(formula = MODVIGMINPW ~ bodily_shame, data = CleandataAssumptions)

Residuals:
   Min     1Q  Median     3Q    Max
-517.77 -232.90  -52.47  174.16 2002.23

Coefficients:
             Estimate Std. Error t value
(Intercept)    594.18     122.52   4.850
bodily_shame   -41.14      61.60  -0.668
             Pr(>|t|)
(Intercept)  6.19e-06 ***
bodily_shame    0.506
---
Signif. codes:
 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1
 ‘ ’ 1

Residual standard error: 385.6 on 78 degrees of freedom
Multiple R-squared:  0.005686,          Adjusted R-squared:  -0.007061
F-statistic: 0.4461 on 1 and 78 DF,  p-value: 0.5062

# Model 2: Shying Away and Bodily Shame
model2 <- lm(MODVIGMINPW ~ shying_away + bodily_shame, data =
CleandataAssumptions)
summary(model2)

Call:
lm(formula = MODVIGMINPW ~ shying_away + bodily_shame, data =
CleandataAssumptions)

Residuals:
   Min     1Q  Median     3Q    Max
-643.06 -237.57  -50.09  150.34 1911.48

Coefficients:
             Estimate Std. Error t value
(Intercept)    880.44     180.71   4.872
shying_away   -103.63      48.95  -2.117
bodily_shame    39.58      71.33   0.555
```

```
          Pr(>|t|)
(Intercept)  5.78e-06 ***
shying_away    0.0375 *
bodily_shame   0.5805
---
Signif. codes:
 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1
 ‘ ’ 1

Residual standard error: 377.3 on 77 degrees of freedom
Multiple R-squared:  0.06037,           Adjusted R-squared:  0.03596
F-statistic: 2.474 on 2 and 77 DF,  p-value: 0.09096
```