

Psychological predictors of perceived barriers to physical activity among women with overweight or obesity: Secondary analysis

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ABSTRACT

Background: Physical activity is a key element in the fight against obesity. Understanding the barriers to physical activity would promote the adoption of physical activity behaviours. This study aimed to test the influence of self-efficacy for physical activity, negative self-perception due to past physical activity experiences and depressive symptoms on the perception of different barriers to physical activity. **Methods:** One hundred twenty-nine women (mean age = 48.05 years; mean BMI = 37.74 kg/m²) enrolled in a weight management program that included physical activity completed a questionnaire booklet. Stepwise multiple regression analyses were performed. **Results:** Self-efficacy for physical activity predicted barriers related to health issues and organisational concerns, whereas negative self-perceptions predicted barriers related to limitations in experiencing pleasure. Depressive symptoms had a limited role in predicting a few barriers. **Conclusion:** These results suggest that certain psychological variables could be organisers of certain types of barriers and suggest that the role of negative self-perception due to past experiences of physical activity in the process of non-engagement in physical activity should be further considered in relation to the process of identity building related to physical activity.

Keywords: Sport science, Health, Exercise, Self-efficacy, Self-concept, Vulnerability, Identity.

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INTRODUCTION

Overweight and obesity have been demonstrated to be associated with numerous co-morbidities, and their management has become a public health priority (World Health Organization (WHO), 2021). This includes the development of strategies to encourage individuals to engage in and maintain regular physical activity (PA) (World Health Organization (WHO), 2021). However, despite the widely acknowledged role of PA in the prevention and management of overweight and obesity, a significant proportion of the French population does not engage in regular PA, particularly among women (Gleizes & Pénicaud, 2017; van Baak et al., 2021). Consequently, a comprehensive understanding of perceptions of barriers to PA is a necessary step in supporting interventions targeting this particular dimension. Many studies have attempted to identify barriers to PA and/or determine their impact on the process of engagement and adherence to PA in people with overweight or obesity (Baillot et al., 2021; McIntosh et al., 2016). However, to our knowledge, few studies have focused on its predictors, and in particular on variables related to self-perception.

Among the various psychological variables most commonly studied in relation to the practice of PA, perceived self-efficacy has emerged as an essential determinant of both sedentary behaviour and people's engagement in PA or maintenance in PA programs (Choi et al., 2017; Roordink et al., 2021; Szczuka et al., 2021). Perceived self-efficacy is defined as an individual's confidence in their ability to complete a task successfully and their belief in their ability to mobilise and maintain the motivational, cognitive, and behavioural resources necessary to overcome obstacles to the pursuit of the activity and achievement of a goal (Bandura, 1997). Self-efficacy is derived from an individual's assessment of their capabilities in consideration of various sources of information, with the most significant being active mastery experience (Bandura, 1997). It is, therefore, the result of a process involving the individual's previous experiences. In this logic, Reynes et al. (2019) proposed to take into account the negative self-perception due to past PA experience (NSPPPAE) to understand PA involvement. However, this perception may be indicative of an objective view of oneself and past experiences but also of a tendency to self-devalue as part of depressive symptoms (American Psychiatric Association, 2013), which appears to be associated with low self-efficacy and barriers to PA (Kangas et al., 2015; Mannan et al., 2016).

The objective of the present article was to enhance understanding of the influence that perceptions of one's capacity to perform physical activity (PA self-efficacy; PASE), NSPPPAE, and depressive symptoms exerted on perceptions of various barriers to PA in women with overweight or obesity. This study is a secondary analysis of a feasibility and benefit assessment study of a multidisciplinary obesity management program (Dumoulin et al., 2017). The hypothesis was formulated that the PASE and NSPPPAE variables, as well as depressive symptoms, would be significant predictors of perceived barriers to PA. More specifically, it was expected that NSPPPAE and depressive symptoms would be associated with higher perceived barrier scores, whereas PASE would be associated with lower perceived barrier scores.

MATERIAL AND METHODS

Participants and procedure

The present study's participants comprised women enrolled in an obesity management program that included PA (Dumoulin et al., 2017). The participants were referred by their general practitioner, endocrinologist, cardiologist, or surgeon, although some were also self-referred. Initially open only to people with obesity, access to the program has been extended to people with overweight. This research was approved and supported by the National Association for Research and Technology (Association Nationale de la Recherche et de la Technologie, 2013/1514) was conducted in compliance with the Declaration of Helsinki on Human

Research. The inclusion criteria were: a body mass index (BMI) greater than 25 kg/m², a minimum age of 18 years, no contraindication to the practice of PA, voluntariness, and availability to participate in the various workshops and measures included in the program follow-up. At the time of engagement, participants were informed about the study and gave their informed consent; then they were requested to complete a questionnaire booklet. If they refused to take part in the research, only the data needed to monitor the programme was collected. The present study's sample of women was selected on the basis of the completion of questionnaires assessing PASE, NSPPPAE, depressive symptoms and perceived barriers. The sample comprised 129 women aged between 18 and 64 years ($M = 48.05 \pm 10.94$ years). The characteristics of the participants are presented in Table 1.

Table 1. Characteristics of the population (N = 129).

	n (%)		n (%)
Education		Work status	
Less than A-level	33 (25.58)	Student	2 (1.55)
A-Level	24 (18.60)	Working	86 (66.67)
Higher education	30 (23.26)	Unemployed	17 (13.18)
Bachelor	17 (13.18)	Retired	13 (10.08)
Postgraduate	22 (17.05)	No response	11 (8.53)
No response	3 (2.33)		
Candidate for bariatric surgery		Grade of obesity	
Yes	9 (6.98)	25.1-29.9	11 (8.53)
No	120 (93.02)	30-34.9 kg/m ²	33 (25.58)
		35-39.9 kg/m ²	50 (38.76)
		40-50 kg/m ²	30 (23.26)
		>50 kg/m ²	5 (3.88)
Associated health problems		Leisure sports activities (min/week)**	
None	26	None	37
One or more	32	ene-60	6
cardiovascular	7	61-120	7
endocrine		121-180	4
Type 1 diabetes	1	181 and above	4
Type 2 diabetes	1	Data not available*	71
Thyroid	11		
Locomotor	8		
respiratory	5		
psychological	3		
Data not available*	71		

Note. * Due to equipment theft, ** Includes walking and strolling outside of daily travel activities, min/week: minutes per week.

Measures

Barriers to PA

The selection of barriers to consider in this study was guided by the systematic review conducted by Baillot et al. (2021). This systematic review is notable for two features: its recency and its utilisation of a rating scale ranging from 0 to 3 to assign a quantitative value to the barriers identified in each of the reviewed studies. This methodological approach enabled a quantitative assessment of the relative importance of the various barriers, thus incorporating the qualitative dimension of their relevance to the populations studied. A barrier was assigned a score of 3 if at least 50% of the participants in the study reviewed mentioned it as a barrier to PA. The barriers were grouped into categories, which were then further grouped into a general factor. For example, the item poor health (Napolitano et al., 2011) received a score of 1, while the item lack of general good health (Adachi-Mejia & Schifferdecker, 2016) received a score of 2. These two items were part of a category of barriers that included seven other items. This category was entitled poor health and constituted

part of the Physical factors. This scoring system, therefore, allows the weight of each barrier category to be assessed by calculating a ratio based on the total score obtained for a given category in regard to the theoretical maximum score (theoretical maximum score: 81. This is the score that would have been obtained if this category had been reported in each of the 27 studies included in the systematic review, with a score of 3). The formula employed was thus: $\text{ratio} = \text{total score of the category of barriers considered} / 81$. The maximum ratio was represented by a ratio of 1. In order to select the most salient barriers for people with overweight or obesity, and as well as to maintain a representative sample of barriers reported in the literature, it was necessary to consider the categories of barriers with a ratio greater than or equal to 0.20 (inclusive). The application of the ratio yielded the identification of eleven categories (a ratio of 0.25 would have resulted in the retention of only six categories): three categories out of six for Physical factors, three out of eight for Psychological factors, and five out of nine for Socio-ecological factors (see Table 2). Subsequently, an item was formulated for each of these eleven categories, with the exception of the categories Too many obligations and Fatigue/lack of energy. The former category was differentiated into Family obligations and Professional obligations. For the latter category, the decision was taken to retain the generic term Fatigue and to create an item to illustrate its psychological dimension, namely, Lack of enthusiasm/weariness. The final set of barriers under consideration in this study amounted to thirteen.

Table 2. Title of barriers retained and correspondence to categories developed by Baillot et al. (2021).

Title of barriers	Category	Factor	Score*	Ratio**
Pain	Pain/ physical discomfort	Phys.	31.50	.39
Fatigue	Fatigue/lack of energy	Phys.	23.50	.29
Health problems	Poor health	Phys.	20.00	.25
Lack of desire to exercise	Lack of self-discipline or motivation	Psycho.	34.50	.43
Lack of enjoyment of exercise	Lack of interest or enjoyment	Psycho.	17.70	.22
Feeling of lack of competence/ not being able to do physical exercise	Lack of skill or confidence	Psycho.	17.00	.21
Lack of enthusiasm/weariness	-	-	-	-
Lack of time	Lack of time	Soc-ecol.	28.30	.35
Lack of practice partners	Lack of social support	Soc-ecol.	24.00	.30
Cost	Cost	Soc-ecol.	22.00	.27
Difficulty accessing equipment	Lack of access to equipment. facilities or professional	Soc-ecol.	17.20	.21
Family obligations	Too many obligations	Soc-ecol.	16.75	.21
Professional obligations	Too many obligations	Soc-ecol.	16.75	.21

Note. * Total scores obtained by Baillot et al. (2021), ** Ratios calculated for the present study from scores obtained by Baillot et al. (2021), Phys = physical, Psycho = psychological, Soc-ecol = socio-ecological.

A total of 13 labels pertaining to barriers were created for this study. Participants were required to indicate the extent to which each of these barriers could interfere with their PA practice by selecting one of five statements presented in the following order: not at all an obstacle, rarely an obstacle, sometimes an obstacle, often an obstacle, really an obstacle. A score ranging from 1 to 5 was then assigned to each of the five statements. A high score indicates that the given barrier was perceived as a significant barrier to PA adherence. The presentation of the obstacles was not organised according to any specific sequence.

PA self-efficacy (PASE)

PA self-efficacy was assessed as the confidence in an individual's ability or capacity to perform a physical task, as well as the confidence that the person has in their ability to overcome a particular set of barriers to activity (Bandura, 1997, 2006). However, self-efficacy in overcoming barriers seems to intervene more as a factor favouring people's maintenance in PA, while perceived self-efficacy in performing physical exercises seems to intervene more as a factor conditioning engagement in PA (Higgins et al., 2014). In line with (Rogers

et al., 2006), in the present study, PASE was assessed by measuring confidence in the ability to perform a series of four tasks: walk briskly for 20 minutes without stopping, run for 10 minutes without stopping, climb three flights of stairs without stopping, and exercise for 20 minutes at a level hard enough to cause a large increase in heart rate and breathing. Participants were asked to rate their confidence in their ability to perform each task on a scale from 0% to 100% at 10% intervals. The standardised Cronbach's alpha coefficient was .78. A high score indicates high perceived self-efficacy.

Negative Self-Perception due to Past PA Experiences (NSPPPAE)

The NSPPPAE assesses self-deprecation in the context of PA. It is a measure consisting of 3 items ("*I have never been good in sports*"; "*sport was not made for me*"; "*I am not made for physical activity*") (Reynes et al., 2019). These items were scored on a 6-point Likert scale (from 1: strongly disagree to 6: strongly agree). The standardised Cronbach's alpha coefficient was .86. A high score indicates a strong internalisation.

Depressive symptoms (HADS-D)

Depressive symptoms were assessed using the depression scale of the Hospital Anxiety and Depression Scale (HADS) (French National Authority for Health, 2014; Zigmond & Snaith, 1983). The HADS is a questionnaire consisting of 14 items (seven assessing depressive symptoms and seven assessing anxiety symptoms). Each item has four response options, resulting in a score ranging from 0 to 3. The response options vary from item to item. A high score is associated with a state of high depression. The standardised Cronbach's alpha coefficient was .72.

Body Mass Index (BMI)

The relationship between BMI and the perception of barriers has not been clearly established. For example, McGuire et al. (2016) showed that BMI did not predict the perception of barriers. On the other hand, Napolitano et al. (2011) showed in sedentary women that the weight attributed to different barriers varied according to the person's BMI, and Adachi-Mejia & Schifferdecker (2016) that the evoked barriers varied according to the degree of obesity considered. In this context, we decided to include BMI in our analyses. Weight (W, in kg) was measured using an electronic scale (My Weigh XL-550; accuracy 100 g); the person reported height (T, in m); BMI was calculated using the equation: $BMI = P [kg]/T [m^2]$.

Statistical analysis

The variables were described by their mean and standard deviation. A factor analysis with standardised varimax rotation was carried out on all 13 barriers in order to clarify the results of the principal analyses (multiple regression analyses). A Pearson correlation test was used to describe the relationships between the independent variables and their relationships with the 13 barriers. Finally, in order to fulfil the purpose of the study, multiple linear regression analyses were carried out using the ascending stepwise hierarchical method. With this method of analysis, only the variables that influence the model are included in the analysis, one after the other, according to their ability to explain the dependent variable under study. The dependent variables were each of the 13 barriers. The independent variables selected for analysis were age, BMI, PASE score, NSPPPAE score, and HADS-D score. The significance level was set at $p < .05$.

RESULTS

Means and standard deviations for participant characteristics are shown in Table 3.

Table 3. Mean and standard deviation for participant characteristics and barrier scores (N = 129).

	Mean	SD
Age	48.05	10.94
Body mass index	37.74	7.00
Physical activity self-efficacy	52.64	21.47
Negative self-perception due to past physical activity	3.13	1.45
Hospital anxiety and depression scale-depression scale	6.78	3.53
Barriers		
Pain	3.27	1.24
Fatigue	3.22	1.03
Health problems	2.71	1.34
Lack of desire to exercise	3.23	1.32
Lack of enjoyment of exercise	2.80	1.27
Feeling of lack of competence/not being able to do physical exercise	3.24	1.21
Lack of enthusiasm/weariness	3.26	0.97
Lack of time	2.84	1.23
Lack of practice partners	3.05	1.41
Cost	3.29	1.20
Difficulty accessing equipment	2.67	1.14
Family obligations	2.54	1.29
Professional obligations	2.56	1.44

Table 4. Perceived barriers to physical activity and factorial weight of each of them on the different factors extracted (factorial analysis with standardised varimax rotation; N = 129).

	Factor 1*	Factor 2*	Factor 3*	Factor 4*
Pain			.81/.82	
Fatigue	.53/--		.50/--	
Lack of enthusiasm/weariness	.78/.77			
Health problems			.90/.90	
Lack of desire to exercise	.82/.82			
Lack of enjoyment of exercise	.71/.73			
Lack of competence	.68/.68			
Lack of time		.85/.85		
Lack of practice partners	.70/.71			
Cost				.83/.82
Difficulty accessing equipment				.81/.82
Family obligations		.80/.82		
Professional obligations		.85/.84		
Percentage of variance explained	28.59/27.38	16.85/18.25	12.32/13.26	8.70/9.68
Total percentage of variance explained:	66.91/68.57			
Eigenvalue	3.71/3.29	2.19/2.19	1.60/1.59	1.19/1.16
Standardised Cronbach's alpha	.82/.81	.79	.72/.74	.62

Note. * Results with the item *Fatigue*/without the item *Fatigue*.

Factor analysis

The thirteen barriers resulted in 4 factors explaining 66.91% of the variance (Table 4). Only the item *Fatigue* had a factorial weight greater than 0.30 on several factors (Factor 1: 0.53 and Factor 3: 0.50). In each of these two factors, it was the item with the lowest factorial weight. For the rest of the analyses, the item "*Fatigue*" was retained as the scores for the different barriers were not aggregated. The analyses, therefore, focused on each of the barriers considered in isolation. If we refer to the three main categories of factors identified by Baillot et al. (2021), Factor 1 (28.59%) combined all the psychological barriers (the three barriers coming from Baillot et al.'s psychological factor plus the barrier *Lack of enthusiasm/weariness*) as well as the barriers *Fatigue* (Baillot et al.'s physical factor) and *Lack of practice partner* (Baillot et al.'s socio-ecological

factors). Factor 2 (16.85%) grouped three barriers from Baillot et al.'s socio-ecological factor: *Lack of time*, *Professional obligations*, and *Family obligations*. Factor 3 (12.32%) grouped three barriers from Baillot et al.'s physical factor (*Pain*, *Health Problems*, and *Fatigue*). Finally, Factor 4 (8.70%) grouped two barriers from Baillot et al.'s socio-environmental factor: *Cost* and *Difficulty accessing equipment*. *Nota bene*: in the following analyses, the order of presentation of the barriers is the one resulting from the factorial analysis.

Pearson correlation

Correlations between independent variables

The PASE score was negatively correlated with the NSPPPAE score ($r = -.38, p < .0001$). These two variables were also correlated with the depressive symptoms score (HADS-D, $r = -.35, p < .0001$ and $r = .18, p = .04$, respectively) and with BMI ($r = -.38, p < .0001$ and $r = .19, p = .03$, respectively). Note that only BMI and PASE scores were (negatively) correlated with age ($r = -.18, p = .04$ and $r = -.36, p < .0001$, respectively) (Table 5).

Table 5. Relationships of independent variables to each other and to PA barriers (Pearson correlation; $N = 129$).

	Age	BMI	PASE	NSPPPAE	HADS-D
Age	-	-.18*	-.36***	.04	.10
BMI		-	-.38***	.19*	.13
PASE			-	-.38***	-.35***
NSPPPAE				-	.18*
Barriers					
Lack of desire to exercise	-.05	-.03	-.12	.53***	.03
Lack of enthusiasm/weariness	-.09	.09	-.16	.38***	.21*
Lack of enjoyment of exercise	.01	.06	-.25**	.58***	.08
Lack of practice partners	-.07	.11	-.17	.26**	.13
Lack of competence	-.11	.32***	-.31***	.49***	.21*
Fatigue	.03	.18*	-.29**	.33***	.28**
Lack of time	-.14	-.17*	.27**	-.02	-.11
Professional obligations	-.26**	.00	.26**	-.08	-.07
Family obligations	.04	-.06	.14	.01	.04
Pain	.09	.26**	-.42***	.31**	.16
Health problems	.23**	.16	-.43***	.12	.28**
Difficulty accessing equipment	-.17*	.22*	-.06	-.01	.02
Cost	-.14	.28**	-.23**	.11	.19*

Note. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$; BMI = Body mass index; PASE = Physical activity self-efficacy; NSPPPAE = Negative self-perception due to past physical activity; HADS-D = Hospital anxiety and depression scale-depression scale.

Correlations between independent variables and barriers

The results presented in Table 5 demonstrate a correlation between the PASE score and all four types of barriers identified in the factor analysis (correlation coefficients in absolute value ranged from $|r| = .23$ to $|r| = .43$). The PASE score demonstrated a negative correlation with barriers from Factor 1, Factor 3, and Factor 4, while it exhibited a positive correlation with barriers from Factor 2. The NSPPPAE score demonstrated a correlation with all Factor 1's barriers and with the *Pain* barrier (correlation coefficient ranged from $r = .26$ to $r = .58$). The HADS-D score demonstrated correlation only with some barriers included in Factors 1, 3, and 4 (correlation coefficient ranged from $r = .19$ to $r = .28$).

Hierarchical multiple linear regression analyses

Multiple linear regression models were found to explain between 5 and 29% of the variance of the different barriers (see Table 6).

Table 6. Multiple linear regression models (stepwise hierarchical ascending method) explaining the perception of barriers according to the components age, body mass index, physical activity self-efficacy score, negative self-perception of past physical activity score, and depressive symptoms score.

Model of:	β (SD)	t	p-value
Lack of desire to exercise – $F(3,125) = 18.30$ $p < .0001$; Adjusted $R^2 = .29$			
NSPPPAE	0.56 (0.08)	7.35	<.0001
BMI	-0.15 (0.08)	-1.99	.049
Age	-0.10 (0.08)	-1.33	.187
Lack of enthusiasm / weariness – $F(3,125) = 9.15$ $p < .0001$; Adjusted $R^2 = .16$			
NSPPPAE	0.36 (0.08)	4.33	<.0001
HADS-D	0.16 (0.08)	1.92	.057
Age	-0.12 (0.08)	-1.42	.157
Lack of enjoyment of exercise – $F(1,127) = 64.45$ $p < .0001$; Adjusted $R^2 = .33$			
NSPPPAE	0.58 (0.07)	8.03	<.0001
Lack of practice partners – $F(1,127) = 9.40$ $p < .003$; Adjusted $R^2 = .06$			
NSPPPAE	0.26 (0.09)	3.07	.003
Lack of competence – $F(5,123) = 11.62$ $p < .0001$; Adjusted $R^2 = .29$			
NSPPPAE	0.40 (0.08)	4.95	<.0001
BMI	0.15 (0.09)	1.78	.077
HADS-D	0.08 (0.08)	1.07	.287
Age	-0.16 (0.09)	-1.84	.068
PASE	-0.13 (0.10)	-1.29	.198
Fatigue – $F(3,125) = 8.55$ $p < .0001$; Adjusted $R^2 = .15$			
NSPPPAE	0.26 (0.09)	2.79	.006
HADS-D	0.19 (0.09)	2.19	.030
PASE	-0.13 (0.09)	-1.38	.173
Lack of time – $F(2,126) = 5.40$ $p < .006$; Adjusted $R^2 = .06$			
PASE	0.30 (0.09)	3.28	.001
NSPPPAE	0.09 (0.09)	1.02	.309
Professional obligations – $F(2,126) = 7.02$ $p < .001$; Adjusted $R^2 = .09$			
Age	-0.19 (0.09)	-2.13	.035
PASE	0.19 (0.09)	2.10	.038
Family obligations – $F(3,125) = 1.64$ $p = .184$; Adjusted $R^2 = .01$			
PASE	0.21 (0.10)	2.12	.036
HADS-D	0.11 (0.09)	1.14	.258
Age	0.11 (0.09)	1.12	.265
Pain – $F(3,125) = 11.60$ $p < .0001$; Adjusted $R^2 = .20$			
PASE	-0.32 (0.09)	-3.50	.001
NSPPPAE	0.17 (0.09)	2.03	.045
BMI	0.11 (0.09)	1.26	.210
Health problems – $F(3,125) = 11.27$ $p < .0001$; Adjusted $R^2 = .19$			
PASE	-0.35 (0.09)	-3.82	<.0001
HADS-D	0.15 (0.08)	1.78	.077
Age	0.09 (0.09)	1.09	.276
Difficulty accessing equipment – $F(2,126) = 4.39$ $p = .014$; Adjusted $R^2 = .05$			
BMI	0.19 (0.09)	2.18	.031
Age	-0.14 (0.09)	-1.60	.113
Cost – $F(4,124) = 4.97$ $p < .001$; Adjusted $R^2 = .11$			
BMI	0.15 (0.10)	1.51	.135
HADS-D	0.12 (0.09)	1.30	.196
Age	-0.20 (0.10)	-2.08	.039
PASE	-0.21 (0.11)	-1.95	.054

Note. BMI = Body mass index; PASE = Physical activity self-efficacy; NSPPPAE = Negative self-perception due to past physical activity; HADS-D = Hospital anxiety and depression scale-depression scale.

PA Self-efficacy (PASE)

The PASE score was only statistically significant in predicting barriers related to Factor 2 or Factor 3. However, whereas perceived barriers related to Factor 2 were predicted by high self-efficacy (Lack of time, $\beta = 0.27$; Professional obligations, $\beta = 0.19$), perceived barriers related to Factor 3 were predicted by low self-efficacy (*Pain*, $\beta = -0.32$; *Health problems*, $\beta = -0.35$).

Negative self-perception due to past PA experiences (NSPPPAE)

The NSPPPAE score predicted all Factor 1's barriers (from $\beta = 0.26$ to $\beta = 0.56$) as well as barrier *Pain* ($\beta = 0.17$).

Depressive symptoms (HADS-D)

The HADS-D score only demonstrated a statistically significant contribution to the prediction of the barrier *Fatigue* ($\beta = 0.19$).

DISCUSSION

The present article sought to examine the associations between various barriers to PA and particular psychological factors in women with overweight or obesity. The psychological variables considered were self-efficacy to perform PA (PASE), negative self-perception due to past PA experiences (NSPPPAE), and depressive symptoms (HADS-D).

Factorial analysis of barriers

The factorial analysis conducted on the thirteen selected barriers in the present study yielded a four-factor solution, which differs from the grouping proposed by Baillot et al. (2021). The primary divergence was observed in Factor 1, which included all the barriers from Baillot et al.'s psychological factor, as well as *Fatigue* (Baillot et al.'s physical factor) and *Lack of practice partners* (Baillot et al.'s socio-ecological factor). Beyond a psychological dimension, Factor 1 appeared to group barriers related to limitations in experiencing pleasure associated with PA. It is also notable that in the present study, the barriers arising from Baillot et al.'s socio-ecological factor give rise to two specific factors. One of these is related to personal constraints (Factor 2), and the other is related to operational constraints (Factor 4). Finally, Factor 3 grouped barriers related to health-related issues.

Hierarchical multiple linear regression analyses

The results indicated that the three psychological variables contributed to explaining specific types of barriers.

PA self-efficacy (PASE)

PASE was identified as a significant predictor of barriers associated with personal constraints (Factor 2) and health-related issues (Factor 3) only. However, the positive valence of the relationship for Factor 2 was an unexpected outcome, which suggests that for these women, these barriers may not be merely rationalisations but rather real impediments. A further unexpected finding was that the PASE score was a negative predictor solely for health-related barriers. Indeed, the correlation analysis also demonstrated this negative relationship with the barriers *Lack of competence*, *Lack of enjoyment*, or *Fatigue*. These results may be explained by the PASE measure employed in the present study, which refers to concrete bodily experiences. Of the various barriers examined in the present study, *Pain* and *Health problems* are the most closely related to bodily experience. It can be assumed that bodily perceptions (e.g., discomfort, breathlessness, pain) associated with everyday physical activity affect PASE ratings (as measured here), which, in turn, influence perceptions of these two barriers.

Negative self-perception due to past PA experiences (NSPPPAE)

This variable is the primary predictor of all the barriers that comprise Factor 1 (limitations in experiencing pleasure). The experience of pleasure is a central element in the processes of engagement and adherence to physical activity (Lewis et al., 2016; Shaffer & Wittes, 2006) as well as in the process of forming and internalising an identity associated with PA (Rhodes et al., 2016), and the NSPPPAE has been considered as a consequence of the internalisation of a devaluation of oneself in relation to the PA/sport object (Reynes et al., 2019). These relationships may be indicative of a vulnerability to the alteration of positive affect, suggesting that the experience of displeasure or the absence of pleasure may re-activate negative self-perceptions. Consequently, these relationships give rise to the broader question of the impact of identity construction in the process of adherence to or rejection of PA. In particular, this raises the question of the effect on PA behaviours of the construction of an identity that is developed outside of an identity as a sportsperson or physical activity practitioner, or even an identity developed in an oppositional counter-identity that would make non-PA behaviour consistent with other structuring elements of the person's overall identity. Such an elaboration of identity would likely increase the weight of barriers and/or rationalisation-justification processes and promote distancing from PA. Numerous studies have examined the contribution of the concepts of self-schemata (Markus, 1977) and identities (Stryker & Burke, 2000) to understanding engagement and maintenance in PA (Rhodes et al., 2016). Self-schemas and identities are two very similar constructs (Rhodes et al., 2016). In essence, identities/self-schemata are shaped by our past experiences and correspond to how people perceive themselves through their different roles, behaviours, and social status (Rhodes et al., 2016). These variables are of primary importance in explaining engagement in behaviours as well as their maintenance, particularly due to their relationship with intention, their role in the strength of the intention-behaviour relationship, and their relationship with the use of self-regulatory strategies (Rhodes et al., 2016). In alignment with the theoretical framework of "*self-as-doer identity*" (Houser-Marko & Sheldon, 2006), Brouwer (2020) has postulated that the link between behaviour and identity is the principal motivating factor for behaviour. The self-as-doer identity is defined as the process of self-definition in which the individual, the active agent of the behaviour, identifies with doing a behaviour (e.g., I am an exerciser) and develops attitudes and cognitions that contribute to strengthening the coherence between identity and behaviour. Concurrently, these attitudes and cognitions are extended to other domains, thereby nourishing and strengthening this identity, resulting in a congruent whole in which behaviours, values, and cognitions are aligned (Brouwer & Mosack, 2015; Rhodes et al., 2016; Strachan & Brawley, 2008), which, in turn, enhances the probability of successfully overcoming barriers (Brouwer, 2020). However, to our knowledge, the various approaches to identity applied to the context of PA have only examined the question of self-identity as an athlete but have not addressed the possible construction of the self in an identity of non-exerciser. As non-behaviour is a form of behaviour in itself, non-sport/PA behaviour can also be conceptualised as a form of support for possible identifications and suggests at least three different processes. Firstly, non-sport/PA behaviour could be examined through the lens of its relationship with PA. Repeated negative experiences in PA may lead to self-devaluation and the internalisation of perceived incompetence in PA (NSPPPAE), resulting in non-sport/AP behaviour (Reynes et al., 2019) and the development of a non-exerciser identity (which may subsequently be reinforced by associated factors). Second, non-sport/AP behaviour might be rooted in self-devaluation unrelated to PA itself. For example, for some women whose identity is shaped by being overweight or obese, it is the negative perception of their body image and/or sensitivity to the gaze of others that would prevent them from engaging in PA (Dikareva et al., 2016). In this case, NSPPPAE would no longer serve as the primary framework for understanding non-participation in PA but rather as a justification or rationalisation. Finally, the non-sport/AP behaviour could be linked to an alignment with a strongly structured identity (asserted, openly claimed), within which PA is rejected. In this case, NSPPPAE would be considered irrelevant in explaining the non-participation in PA. These relationships need to be further investigated.

Depressive symptoms

The present study found that depressive symptoms were not associated with any specific type of barrier; however, they were a significant predictor of barriers *Fatigue* and *Lack of enthusiasm/weariness*. Given that items are components of depressive symptomatology (American Psychiatric Association, 2013), these outcomes are not surprising. It is noteworthy that the absence of participation in the explanation of other barriers suggests that the observed relationships between these other barriers and either PASE or NSPPAE scores are independent of depressive symptoms.

Strengths and limitations

The present study's strength lies in its examination of the psychological determinants of physical activity (PA) barriers in women with overweight or obesity. To our knowledge, only a few studies have done so specifically. Moreover, the study highlights the potential value of considering negative self-perceptions due to past experiences in PA in studies dealing with issues of engagement or maintenance in PA, thereby opening up interesting research questions. However, some limitations should be noted. Firstly, the participants were all in the process of enrolling in an AP program and had thus already initiated a behavioural change (Prochaska & DiClemente, 1982). This may have influenced their perception of PA barriers. This study is, therefore, unable to be generalised or considered a representative sample of French women with overweight or obesity. Secondly, with regard to the independent variables retained, it was not possible to take into account the PA level of the participants, as this data was only available for less than half of the participants (see Table 1). This variable could be a confounding factor as it has been linked to perceived barriers as well as feelings of PASE (Call et al., 2020; Choi et al., 2017; Szczuka et al., 2021). Thirdly, this study constituted a secondary analysis, the objective of which was not to establish an exhaustive explanatory model of the various barriers. In fact, some variables that could influence the perception of barriers were not considered (e.g., self-efficacy in the person's ability to overcome barriers or to plan regular exercise sessions or motivational variables) (DuCharme & Brawley, 1995; Eynon et al., 2019). Fourthly, one of the two measures employed to calculate BMI was a self-reported measure (height). This may have resulted in measurement error in the calculation of this index, in the sense of an overestimation of height and, therefore, an underestimation of BMI (Gorber et al., 2007). Finally, although each barrier was treated as a distinct item rather than aggregated into a more global score, the questionnaire used to collect perceptions of barriers was not validated. Therefore, these results should be regarded as a starting point for further questions rather than an additional contribution to the literature.

CONCLUSION

The present study demonstrates the existence of relationships between particular categories of barriers and psychological variables. To our knowledge, these findings have not been documented in the extant literature before. Notably, a specific relationship with the internalisation of a devaluation of oneself due to past PA experiences. Such internalisation may be indicative of a vulnerability that would lead people to remain outside the AP or be sources of dropout. If confirmed by studies specifically designed for this purpose, the internalisation of a devaluation of oneself due to past PA experiences would then be a significant element to collect in future PA programmes. Finally, the results of the present study suggest possible relationships between certain types of obstacles and a non-athlete identity that deserve further investigation.

AUTHOR CONTRIBUTIONS

All authors have contributed to all phases of the project. Eric Reynes was involved in conceptualisation, methodology, formal analysis, writing- original draft and writing-review. Coralie Dumoulin was involved in

conceptualisation, methodology, project administration, data curation, funding acquisition, investigation and writing review. Sophie E. Berthouze was involved in conceptualisation, supervision, methodology, project administration, funding acquisition, investigation and writing review.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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