

Supplementary materials

Independent variable: obesity

We used data on weight and standing height measured objectively to calculate body mass index (BMI) and generate obesity status. In Study 1 (ELSA), participants' weight without shoes and in light clothing was assessed to the nearest 0.1 kg using Tanita THD-305 portable electronic scales (Tanita Corporation, Arlington Heights, IL) and height without shoes was measured to the nearest millimetre using a portable stadiometer by a trained nurse at baseline (Wave 4) (Daly et al., 2019). In Study 2 (HRS), as part of the enhanced face-to-face interview (EFTF), trained interviewers used the Healthometer 830KL scale to measure participants' weight in light clothing without shoes to the nearest half pound at baseline (Waves 9 and 10). Standing height without shoes was assessed to the nearest quarter inch using a tape measure (Crimmins et al., 2008). BMI was calculated by dividing in kilogram (kg) by height in metres squared (m^2). Obesity was defined as $BMI \geq 30 \text{ kg}/m^2$.

Dependent variable: physiological dysregulation (for robustness analyses)

For robustness analyses, we used a different method to develop an overall measure of physiological dysregulation at baseline and follow-up. Firstly, each biomarker was dichotomised and the category that indicates a more unfavourable physiological condition was coded 1 (the value of the biomarker exceeded a given cut-off point). For example, high blood pressure was defined as systolic blood pressure $\geq 140 \text{ mmHg}$ or diastolic blood pressure $\geq 90 \text{ mmHg}$ (Chobanian et al., 2003). The resting pulse $> 100 \text{ bpm}$ was categorised as high (Ostchega et al., 2011). In addition, a ratio above 6 between total cholesterol and high-density lipoprotein (HDL) was assigned as a high category although this cut-off point is not well established (Heart UK, n.d.). Glycated haemoglobin (HbA1c) level $\geq 42 \text{ mmol/mol}$ was used to define a high risk of diabetes (National Institute for Health and Care Excellence, 2017). Low-grade inflammation was indicated by the level of C-reactive protein (CRP) $> 3 \text{ mg/L}$ (Osimo et al., 2019). The summary score of physiological dysregulation ranging from 0 to 5 was developed by adding all biomarkers, with a higher value indicating worsening physiological conditions.

Psychological measures

Depressive symptoms

Depressive symptoms were assessed using a validated 8-item version of the Centre for Epidemiology Depression Scale (CED-S) (Turvey et al., 1999). This tool has been widely used to screen people who are at risk of depression in population studies (Radloff, 1977). A short version of CED-S has also been found to have good internal consistency in each ELSA wave (White et al., 2016). Participants provided a dichotomous answer, "yes" or "no" (scored as 1 and 0, respectively) on whether they felt negative

emotions during the past week (e.g., *“Did you feel depressed?”*, *“Did you feel everything you did was an effort?”*). Responses were summed to provide a total score ranging from 0 to 8, with a higher score indicating greater depressive symptoms.

Enjoyment of life

Following previous studies (Steptoe, Demakakos, de Oliveira, et al., 2012; Steptoe & Wardle, 2012; Zaninotto et al., 2016), enjoyment of life was assessed using three items and one item from the pleasure and self-realisation sub-scales, respectively, from the Control, Autonomy, Self-Realization and Pleasure (CASP-19) CASP-19 quality of life questionnaire (Hyde et al., 2003). For the enjoyment of life scale, participants' responses on a 4-point Likert scale from 0=*“often”* to 3=*“never”* on four items (*“I enjoy the things that I do,” “I enjoy being in the company of others,” “On balance, I look back on my life with a sense of happiness,” “I feel full of energy these days”*) were reverse-coded and then totalled, resulting in an enjoyment of life index with a possible range from 0 to 12. A higher score indicates greater enjoyment of life.

Eudemonic wellbeing

Similar to a previous approach (Steptoe, Demakakos, & de Oliveira, 2012), eudemonic wellbeing was developed by combining the remaining 15 items from CASP-19 that were not used in defining enjoyment of life (e.g., *“How often feels what happens to them is out of their control,” “How often feels left out of things”*). This scale portrays some aspects of the concept of eudemonia described by Ryff and Keyes (1995), such as control, autonomy, purpose in life, personal growth, and self-acceptance by taking into account different domains of CASP-19 (Control, Autonomy, Self-realisation and Pleasure) (Hyde et al., 2003). The summary score of this scale ranged from 0 to 45 with a higher score indicating a greater level of eudemonic wellbeing.

Life satisfaction

Satisfaction with Life Scale (SWLS) by Diener et al. (1985) as a measure of evaluative wellbeing was used to evaluate life satisfaction. This scale has been widely used to assess subjective wellbeing in academic research (Pavot & Diener, 2008). This measure consists of five items (e.g., *“in most ways my life is close to my ideal,” “the conditions of my life are excellent”*) with seven options of response on a Likert scale (1=*“strongly disagree”* to 7=*“strongly agree”*). A summary score was calculated by summing the responses of all items. Greater life satisfaction is indicated by a higher score, with a possible range of 1-to-35 for a total score.

Loneliness

Three-item loneliness scale (Hughes et al., 2004) from the widely-used 20-item Revised UCLA loneliness scale (Russell, 1996), was used to quantify loneliness. Participants were asked the following

question, “How often do you feel: you lack companionship?”, “isolated from others?”, “left out?”) with three available answers, “hardly ever or never,” “some of the time,” and “often” that were scored 1, 2, and 3, respectively. We followed a previous approach (Davies et al., 2021) to generate a total score by summing responses of all three items, ranging from 1 to 9, with a higher score indicating a higher level of loneliness.

Social support

This was measured in terms of participants’ positive experiences of social support for each relationship (i.e., spouse or partner, children, other immediate family members, and friends). Three items on a four-point scale (1=“a lot” to 4=“not at all”) were used to assess positive experience (e.g., “How much do they really understand the way you feel about things?”, “How much can you rely on them if you have a serious problem?”) (Khondoker et al., 2017). Responses were reverse-coded to indicate a more positive experience for a higher value and then averaged for each relationship. The final score for overall social support, ranging from 1 to 4, was generated by re-averaging the social support scores from all the reported relationships.

Social strain

As the opposite of social support, social strain represents negative experiences received from each relationship with a spouse or partner, children, other immediate family members, and friends. Three items were used to assess social strain (e.g., “How much do they criticise you?”, “How much do they let you down when you are counting on them?”) (Khondoker et al., 2017). Participants’ responses from 1=“a lot” to 4=“not at all” were also reverse-coded to indicate more negative experiences for a greater value and then averaged for each relationship. Similar to social support, an overall score of social strain ranging from 1 to 4 was determined by re-averaging the average social strain scores from all the reported relationships.

Weight-related stigma

Perceived weight-related stigma was documented as part of forms of discrimination experiences, assessed using the Perceived Everyday Experiences with Discrimination Scale (Williams et al., 1997). Participants were asked to report how frequently they experienced a set of five discriminatory behaviours (e.g., “you are treated with less respect or courtesy”, “you are threatened or harassed”) for different reasons (e.g., weight) in their day-to-day life on a six-point Likert scale from “almost every day” to “never”. Following previous studies (Daly et al., 2019; Robinson et al., 2017), perceived weight-related stigma was defined if participants had ever reported (from “almost every day” to “less than once a year”) that their weight was the reason why they were treated unfairly. Perceived weight-related stigma was treated as a dichotomous variable (yes; no).

Positive affect

Positive affect was assessed using the positive affect domain, derived from the Positive and Negative Affect scale (PANAS-X) (Watson & Clark, 1994). This measure documented what ELSA participants felt in the past 30 days through 13 items (e.g., *“During the last 30 days, to what degree did you feel: determined?”*, *“enthusiastic?”*) with five possible responses from 1=“not at all” to 5=“very much”. A total score was summed from all items, with a higher score indicating greater positive affect on a scale from 1 to 65.

Negative affect

Negative affect was evaluated using the Positive and Negative Affect scale (PANAS-X) (Watson & Clark, 1994). Participants responded to 12 items from the negative affect domain, depicting what degree they felt negative emotions in the last 30 days (e.g., *“During the last 30 days, to what degree did you feel: afraid?”*, *“upset?”*). Similar to the scoring system for positive affect, participants’ answers from 1=“not at all” to 5=“very much” for each item were added together, resulting in a total score ranging from 1 to 60. A higher score indicates greater negative affect.

Purpose in life

Purpose in life was assessed using a domain of purpose in life from the Ryff Measures of Psychological Wellbeing (Ryff, 1989; Ryff & Keyes, 1995). The domain consists of seven items (e.g., *“I enjoy making plans for the future and working to make them a reality.”*, *“I am an active person in carrying out the plans I set for myself.”*) with six options of response on a Likert scale (1=“strongly disagree” to 6=“strongly agree”). Participants’ responses for all items were summed to create a total score ranging from 1 to 42 with a higher score indicating greater purpose in life.

Anxiety

Anxiety was evaluated using five items from Beck Anxiety Inventory (BAI) (Beck et al., 1988). Participants were asked how they felt in the past week (e.g., *“I had fear of the worst happening”*, *“I was nervous”*) with four possible responses from 1=“never” to 4=“most of the time”. A total score with a possible range of 1 to 20 was generated by summing the responses of all items. A higher level of anxiety is indicated by a higher total score.

Hopelessness

Hopelessness was assessed using two items adapted from Beck et al. (1974) and two from Everson et al. (1997) (e.g., *“I feel it is impossible for me to reach the goals that I would like to strive for.”*, *“I don’t expect to get what I really want.”*). The responses of all items on a six-point Likert scale (1=“strongly disagree” to 6=“strongly agree”) were added together to provide a total score ranging from 1 to 24 with a higher score indicating greater hopelessness.

Optimism

Three items (e.g., *"I'm always optimistic about my future."*, *"In uncertain times, I usually expect the best."*) on a six-point Likert scale (1=*"strongly disagree"* to 6=*"strongly agree"*) from the Life Orientation Test-Revised (LOT-R) (Scheier et al., 1994) were used to assess optimism. A summary score was calculated by adding the responses of all items together. Greater optimism is indicated by a higher score, with a possible range of 1 to 18 for a total score.

Pessimism

Other three items (e.g., *"If something can go wrong for me it will."*, *"I hardly ever expect things to go my way."*) with a similar Likert scale (1=*"strongly disagree"* to 6=*"strongly agree"*) from the Life Orientation Test-Revised (LOT-R) (Scheier et al., 1994) were used to evaluate pessimism. A total score ranging from 1 to 18 was generated by summing the responses of all items.

Cynical hostility

Five items (e.g., *"Most people dislike putting themselves out to help other people."*, *"Most people will use somewhat unfair means to gain profit or an advantage rather than lose it."*) on a six-point Likert scale (1=*"strongly disagree"* to 6=*"strongly agree"*) from the Cook-Medley Hostility Inventory (Cook & Medley, 1954; Costa et al., 1986) were used to measure cynical hostility. A total score was summed from all items, with a higher score indicating greater cynical hostility on a scale from 1 to 30.

Perceived constraints

Participants reported their perceptions regarding constraints over their life circumstances. Five items (e.g., *"I often feel helpless in dealing with the problems of life."*, *"Other people determine most of what I can and cannot do."*) on a six-point Likert scale (1=*"strongly disagree"* to 6=*"strongly agree"*) were used to evaluate perceived constraints in HRS (Infurna & Mayer, 2015). To create a summary score, the responses of all items were summed, resulting in a total score with a possible range of 1 to 30. A higher score indicates a higher level of perceived constraints.

Perceived mastery

Perceived mastery represents one's beliefs to perform specific behaviours. Participants responded to five items (e.g., *"I can do just about anything I really set my mind to."*, *"When I really want to do something, I usually find a way to succeed at it."*) on a six-point Likert scale (1=*"strongly disagree"* to 6=*"strongly agree"*) (Infurna & Mayer, 2015). A possible range of 1 to 30 for a total score was determined by summing the responses of all items with a higher score indicating greater perceived mastery.

Neuroticism

As a domain of the big five personality traits, neuroticism was assessed using the Midlife Development Inventory (MIDI) Personality Scales (Lachman & Weaver, 1997). Four items (e.g., *"Please indicate how well each of the following describes you: moody", "worrying", etc.*) with a four-point Likert scale from 4=*"a lot"* to 1=*"not at all"* were used. A total score ranging from 1 to 16 was developed by summing responses from all the items with a higher score indicating greater neuroticism.

Extraversion

Similar tools were used to evaluate extraversion, MIDI Personality Scales (Lachman & Weaver, 1997). Participants responded to five items (e.g., *"Please indicate how well each of the following describes you: outgoing", "friendly", etc.*) with a four-point Likert scale from 4=*"a lot"* to 1=*"not at all"*. The responses from all items were added together to generate a total score ranging from 1 to 20 with a higher score indicating greater extraversion.

Conscientiousness

MIDI Personality Scales (Lachman & Weaver, 1997) were also used to measure conscientiousness. Five items (e.g., *"Please indicate how well each of the following describes you: organised", "responsible", etc.*) with a four-point Likert scale from 4=*"a lot"* to 1=*"not at all"* were administered to participants. The summary score for conscientiousness ranged from 1 to 20 with a higher score indicating greater conscientiousness.

Agreeableness

Similar to other domains, MIDI Personality Scales (Lachman & Weaver, 1997) were used to quantify agreeableness. Participants' responses from all five items (e.g., *"Please indicate how well each of the following describes you: helpful", "warm", etc.*) on a four-point Likert scale from 4=*"a lot"* to 1=*"not at all"* were summed. The total score for agreeableness ranged from 1 to 20 with a higher score indicating higher agreeableness.

Openness

Seven items from MIDI Personality Scales (Lachman & Weaver, 1997) (e.g., *"Please indicate how well each of the following describes you: creative", "imaginative", etc.*) were used to measure openness to experience. Participants' responses from all five items on a four-point Likert scale (4=*"a lot"* to 1=*"not at all"*) were summed to generate a total score ranging from 1 to 28. Greater openness to experience is indicated by a higher score.

The following table summarises studies that support psychological measures potentially associated with obesity and/or worsening physiological or physical health.

Table A1. Previous studies supporting psychological measures associated with obesity and/or physiological health

Psychological measures	Association with obesity	Association with physiological or physical health
Depressive symptoms	Luppino et al. (2010) Frank et al. (2022)	CRP and HDL: Gowe et al. (2019) Glucose level: Boyle et al. (2007)
Enjoyment of life	<i>(little research on this)</i>	Mortality: Zaninotto et al. (2016)
Eudemonic wellbeing	<i>(little research on this)</i>	CRP and WBC: Fancourt and Steptoe (2020)
Life satisfaction	Ball et al. (2004) Katsaiti (2012)	WBC: Fancourt and Steptoe (2020)
Loneliness	Hajek et al. (2021)	CRP: Van Bogart et al. (2022) Mortality: Holt-Lunstad et al. (2015)
Social support	Kershaw et al. (2014)	CRP: Lee and Way (2019) Mortality: Uhing et al. (2021)
Social strain	<i>(little research on this)</i>	Blood pressure: Sneed and Cohen (2014) Mortality: Uhing et al. (2021)
Weight stigma	Jackson et al. (2015) Puhl et al. (2008)	CRP: Sutin et al. (2014) Triglycerides: Pearl et al. (2017) Allostatic load: Vadiveloo and Mattei (2017)
Positive affect	Jorm et al. (2003)	WBC: Fancourt and Steptoe (2020)
Negative affect	Pasco et al. (2013)	Inflammation cytokines: Graham-Engeland et al. (2018)
Purpose in life	Sutin et al. (2021)	Mortality: Hill and Turiano (2014)
Anxiety	Burke and Storch (2015) Garipey et al. (2010)	CRP: Vogelzangs et al. (2013)
Hopelessness	Murphy et al. (2009)	Cardiovascular disease: Anda et al. (1993)
Optimism	Tindle et al. (2018)	Mortality: Rozanski et al. (2019)
Pessimism	Tindle et al. (2018)	Insulin resistance: Tindle et al. (2018)
Cynical hostility	Tindle et al. (2018)	Mortality: Tindle et al. (2009)
Perceived constraint	<i>(little research on this)</i>	Functional health: Toyama and Hektner (2022) Mortality: Elliot et al. (2018)
Perceived mastery	Gisch et al. (2022)	Functional health: Toyama and Hektner (2022) Mortality: Surtees et al. (2010)
Neuroticism	Bagnjuk et al. (2019)	Cardiovascular disease: Almas et al. (2017)
Extraversion	Wimmelmann et al. (2018) Bagnjuk et al. (2019)	Blood pressure: Liang et al. (2022)
Conscientiousness	Wimmelmann et al. (2018) Bagnjuk et al. (2019)	Blood pressure: Terracciano et al. (2014) Mortality: Taylor et al. (2009)
Agreeableness	Wimmelmann et al. (2018) Bagnjuk et al. (2019)	Blood pressure: Terracciano et al. (2014)
Openness	Wimmelmann et al. (2018) Bagnjuk et al. (2019)	Mortality: Taylor et al. (2009)

CRP=C-reactive protein; HDL=high-density lipoprotein; WBC=white blood cells

Table A2. Spearman's rank correlations between psychological measures in Study 1 (ELSA) (n=14)

Psychological measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Depressive symptoms	1													
2. Enjoyment of life	-0.390	1												
3. Eudemonic wellbeing	-0.453	0.709	1											
4. Life satisfaction	-0.346	0.551	0.620	1										
5. Loneliness	0.368	-0.410	-0.489	-0.439	1									
6. Social support	-0.154	0.388	0.355	0.357	-0.298	1								
7. Social strain	0.178	-0.241	-0.293	-0.226	0.249	-0.280	1							
8. Positive affect	-0.311	0.551	0.560	0.461	-0.324	0.313	-0.163	1						
9. Weight stigma	0.107	-0.119	-0.142	-0.083	0.098	-0.055	0.116	-0.085	1					
10. Neuroticism	0.300	-0.307	-0.346	-0.247	0.300	-0.158	0.277	-0.326	0.071	1				
11. Extraversion	-0.157	0.451	0.389	0.261	-0.219	0.259	-0.061	0.583	-0.059	-0.176	1			
12. Conscientiousness	-0.143	0.262	-0.300	0.184	-0.155	0.152	0.094	0.414	-0.065	-0.181	0.410	1		
13. Agreeableness	0.021	0.225	0.145	0.146	-0.071	0.245	-0.060	0.348	0.011	-0.024	0.526	0.374	1	
14. Openness	-0.145	0.290	0.304	0.183	-0.133	0.156	-0.003	0.509	-0.038	-0.144	0.569	0.416	0.388	1

Table A3. Spearman’s rank correlations between psychological measures in Study 2 (HRS) (n=21)

Psychological measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Depressive symptoms	1																				
2. Life satisfaction	-0.383	1																			
3. Loneliness	0.375	-0.427	1																		
4. Social support	-0.142	0.287	-0.300	1																	
5. Social strain	0.220	-0.293	0.342	-0.323	1																
6. Weight stigma	0.152	-0.149	0.184	-0.096	0.178	1															
7. Positive affect	-0.379	0.471	-0.401	0.298	-0.209	-0.143	1														
8. Negative affect	0.427	-0.415	0.488	-0.225	0.423	0.171	-0.416	1													
9. Purpose in life	-0.310	0.344	-0.353	0.251	-0.177	-0.160	0.561	-0.348	1												
10. Anxiety	0.397	-0.342	0.357	-0.157	0.310	0.142	-0.378	0.589	-0.323	1											
11. Hopelessness	0.345	-0.401	0.383	-0.261	0.242	0.169	-0.523	0.349	-0.517	0.370	1										
12. Optimism	-0.231	0.391	-0.254	0.215	-0.170	-0.111	0.438	-0.315	0.362	-0.269	-0.400	1									
13. Pessimism	0.300	-0.324	0.327	-0.231	0.253	0.140	-0.431	0.298	-0.405	0.333	0.694	-0.355	1								
14. Cynical hostility	0.197	-0.211	0.265	-0.289	0.289	0.114	-0.268	0.184	-0.241	0.227	0.420	-0.139	0.501	1							
15. Perceived constrain	0.359	-0.386	0.412	-0.243	0.290	0.142	-0.510	0.453	-0.479	0.412	0.592	-0.312	0.493	0.350	1						
16. Perceived mastery	-0.234	0.393	-0.299	0.224	-0.192	-0.116	0.473	-0.371	0.403	-0.316	-0.410	0.379	-0.273	-0.142	-0.494	1					
17. Neuroticism	0.353	-0.318	0.364	-0.171	0.347	0.119	-0.410	0.620	-0.309	0.503	0.325	-0.324	0.308	0.185	0.391	-0.308	1				
18. Extraversion	-0.172	0.268	-0.248	0.271	-0.064	-0.102	0.502	-0.218	0.390	-0.193	-0.279	0.299	-0.238	-0.132	-0.278	0.323	-0.216	1			
19. Conscientiousness	-0.210	0.232	-0.184	0.177	-0.144	-0.115	0.415	-0.240	0.450	-0.240	-0.319	0.225	-0.261	-0.158	-0.312	0.305	-0.243	0.352	1		
20. Agreeableness	-0.071	0.166	-0.136	0.269	-0.091	-0.047	0.386	-0.101	0.314	-0.101	-0.221	0.229	-0.198	-0.174	-0.213	0.230	-0.128	0.532	0.384	1	
21. Openness	-0.154	0.190	-0.130	0.147	-0.013	-0.054	0.469	-0.125	0.393	-0.175	-0.305	0.268	-0.251	-0.141	-0.277	0.325	-0.203	0.510	0.415	0.383	1

Data analysis

Inverse probability weighting

Inverse probability weighting approach was used to address missing values and possible selection bias as there might be some characteristics that influence sample attrition (Chesnaye et al., 2022). The increasing age of participants in Study 1, and being male and having fewer years of education in Study 2, were associated with a lower likelihood of having complete longitudinal data. In both Studies 1 and 2, participants who were married (relative to separated/divorced/widowed), White, and from higher quintiles of the total household index had a higher likelihood of being included in the analytical sample of ELSA and HRS. Baseline covariates were used to estimate the probability or propensity scores of being retained at follow-up (i.e., having no missing values for all variables) from a logistic regression model. Weights were calculated as the inverse probability of retention at follow-up. These weights were then applied in the analysis to compensate for the differences in baseline characteristics between those lost to follow-up and retained in the analytic sample (Chesnaye et al., 2022; Mansournia & Altman, 2016). These weights were also combined with weights from biomarker assessments (i.e., blood sample collection) at the baseline to more accurately account for baseline non-response characteristics (e.g., as in Daly et al. (2019)).

Multiple imputation

Multiple imputation by chained equations (MICE) was another approach used to treat missing values (Azur et al., 2011). Information about MICE and the imputation procedure using STATA is available elsewhere (UCLA, 2021). This approach included imputations for all variables, including the outcome in the prediction models to generate a number of imputed 10 datasets. Each dataset had final sample sizes of 6,250 and 9,664 for Studies 1 (ELSA) and 2 (HRS), respectively. We assumed missing at random (MAR) since some variables with no missing values were predictive of non-response in the dataset and used as auxiliary variables for the imputation model (e.g., as in Zaninotto et al. (2016)). Variables of age and marital status were used as auxiliary variables for the imputation model in Study 1. Whilst in Study 2, auxiliary variables consisted of sex and household wealth. The MICE approach was used to carry out mediation analyses for the standard variable of obesity status (relative to non-obesity) and different obesity classes (relative to normal weight).

Regression analyses

We developed some linear regression models to examine whether any psychological factors separately or together predict changes in physiological dysregulation, independently of obesity. We aimed to provide an alternative set of findings when obesity predicts changes in physiological dysregulation not through the pathway we proposed in our main hypotheses. We first examined the

association between each psychological measure and physiological dysregulation at follow-up in separate linear regression models, adjusting for obesity, baseline physiological dysregulation, and covariates (Tables B7 and C7 for Studies 1 and 2, respectively). We then tested whether any psychological measure could independently predict psychological dysregulation in the presence of all other psychological measures, obesity, baseline physiological dysregulation, and covariates in a regression model (Tables B8 and C8 for Studies 1 and 2, respectively).

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Supplementary Tables

Study 1 (ELSA)

Table B1. Single mediation models using inverse probability weighting (**Obesity Classes vs. Normal Weight**)

Mediation models (Reference group: normal weight [BMI < 25 kg/m ²])	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms (n=3,801)			
<i>Class I obesity</i>			
Total effect	0.094*	0.009, 0.179	
Direct effect	0.093*	0.008, 0.178	
Indirect effect	0.001	-0.010, 0.011	
<i>Class II & III obesity</i>			
Total effect	0.119	-0.001, 0.238	
Direct effect	0.112	-0.007, 0.231	
Indirect effect	0.006	-0.005, 0.018	
Mediator: Enjoyment of life (n=3,532)			
<i>Class I obesity</i>			
Total effect	0.120*	0.028, 0.211	
Direct effect	0.111*	0.020, 0.203	
Indirect effect	0.008	-0.006, 0.022	
<i>Class II & III obesity</i>			
Total effect	0.147*	0.025, 0.270	
Direct effect	0.140*	0.018, 0.263	
Indirect effect	0.007	-0.007, 0.021	
Mediator: Eudemonic wellbeing (n=3,531)			
<i>Class I obesity</i>			
Total effect	0.120*	0.029, 0.211	
Direct effect	0.115*	0.024, 0.206	
Indirect effect	0.005	-0.006, 0.016	
<i>Class II & III obesity</i>			
Total effect	0.148*	0.025, 0.271	
Direct effect	0.139*	0.016, 0.262	
Indirect effect	0.009	-0.003, 0.021	
Mediator: Life satisfaction (n=3,535)			
<i>Class I obesity</i>			
Total effect	0.115*	0.024, 0.206	
Direct effect	0.113*	0.022, 0.204	
Indirect effect	0.002	-0.007, 0.011	
<i>Class II & III obesity</i>			
Total effect	0.149*	0.027, 0.271	
Direct effect	0.151*	0.028, 0.273	
Indirect effect	-0.002	-0.011, 0.007	
Mediator: Loneliness (n=3,530)			
<i>Class I obesity</i>			
Total effect	0.118*	0.026, 0.209	
Direct effect	0.118*	0.027, 0.209	

Indirect effect	-0.000	-0.003, 0.003	
<i>Class II & III obesity</i>			
Total effect	0.150*	0.028, 0.272	
Direct effect	0.148*	0.025, 0.270	
Indirect effect	0.002	-0.004, 0.009	
Mediator: Social support (n=3,570)			
<i>Class I obesity</i>			
Total effect	0.113*	0.023, 0.203	
Direct effect	0.110*	0.020, 0.200	
Indirect effect	0.003	-0.004, 0.010	
<i>Class II & III obesity</i>			
Total effect	0.151*	0.030, 0.273	
Direct effect	0.147*	0.025, 0.268	
Indirect effect	0.005	-0.003, 0.013	
Mediator: Social strain (n=3,566)			
<i>Class I obesity</i>			
Total effect	0.116*	0.026, 0.206	
Direct effect	0.111*	0.021, 0.202	
Indirect effect	0.005	-0.004, 0.013	
<i>Class II & III obesity</i>			
Total effect	0.150*	0.028, 0.272	
Direct effect	0.144*	0.022, 0.265	
Indirect effect	0.007	-0.003, 0.016	
Mediator: Weight stigma (n=3,543)			
<i>Class I obesity</i>			
Total effect	0.075	-0.014, 0.164	
Direct effect	0.056	-0.033, 0.145	
Indirect effect	0.019	-0.004, 0.043	
<i>Class II & III obesity</i>			
Total effect	0.148*	0.025, 0.272	
Direct effect	0.077	-0.057, 0.211	
Indirect effect	0.071**	0.019, 0.124	48.2%
Mediator: Positive affect (n=3,526)			
<i>Class I obesity</i>			
Total effect	0.069	-0.022, 0.161	
Direct effect	0.069	-0.022, 0.160	
Indirect effect	0.000	-0.013, 0.014	
<i>Class II & III obesity</i>			
Total effect	0.142*	0.019, 0.265	
Direct effect	0.138*	0.015, 0.262	
Indirect effect	0.004	-0.010, 0.017	
Mediator: Neuroticism (n=3,527)			
<i>Class I obesity</i>			
Total effect	0.075	-0.017, 0.166	
Direct effect	0.075	-0.016, 0.166	
Indirect effect	-0.000	-0.003, 0.003	

Class II & III obesity

Total effect	0.142*	0.019, 0.265
Direct effect	0.142*	0.019, 0.265
Indirect effect	0.000	-0.003, 0.003

Mediator: Extraversion (n=3,532)*Class I obesity*

Total effect	0.079	-0.013, 0.170
Direct effect	0.080	-0.012, 0.171
Indirect effect	-0.001	-0.008, 0.006

Class II & III obesity

Total effect	0.144*	0.021, 0.267
Direct effect	0.143*	0.020, 0.266
Indirect effect	0.000	-0.007, 0.007

Mediator: Conscientiousness (n=3,530)*Class I obesity*

Total effect	0.077	-0.014, 0.168
Direct effect	0.075	-0.016, 0.167
Indirect effect	0.002	-0.007, 0.010

Class II & III obesity

Total effect	0.142*	0.018, 0.265
Direct effect	0.138*	0.015, 0.262
Indirect effect	0.004	-0.005, 0.012

Mediator: Agreeableness (n=3,534)*Class I obesity*

Total effect	0.076	-0.015, 0.167
Direct effect	0.079	-0.012, 0.170
Indirect effect	-0.003	-0.009, 0.003

Class II & III obesity

Total effect	0.144*	0.021, 0.267
Direct effect	0.146*	0.023, 0.269
Indirect effect	-0.002	-0.007, 0.003

Mediator: Openness (n=3,527)*Class I obesity*

Total effect	0.076	-0.016, 0.167
Direct effect	0.076	-0.016, 0.167
Indirect effect	-0.000	-0.002, 0.001

Class II & III obesity

Total effect	0.141*	0.017, 0.265
Direct effect	0.142*	0.018, 0.266
Indirect effect	-0.000	-0.002, 0.002

*p<0.05; **p<0.01; ***p<0.001

Mediation analyses for overweight vs. normal weight are not presented.

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, educational level, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Table B2. Single mediation models using multiple imputation (**Obesity vs. Non-obesity**)

Mediation models (n=6,250) <i>(Reference group: non-obesity [BMI < 30 kg/m²])</i>	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.118***	0.070, 0.168	
Indirect effect	0.004*	0.000, 0.007	
Mediator: Enjoyment of life			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.117***	0.066, 0.167	
Indirect effect	0.004*	0.001, 0.008	
Mediator: Eudemonic wellbeing			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.115***	0.064, 0.165	
Indirect effect	0.007**	0.002, 0.011	5.8%
Mediator: Life satisfaction			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.120***	0.069, 0.170	
Indirect effect	0.002	-0.002, 0.005	
Mediator: Loneliness			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.121***	0.071, 0.171	
Indirect effect	0.000	-0.001, 0.002	
Mediator: Social support			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.118***	0.069, 0.168	
Indirect effect	0.003	-0.000, 0.006	
Mediator: Social strain			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.118***	0.068, 0.168	
Indirect effect	0.003*	0.000, 0.006	
Mediator: Weight stigma			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.097***	0.044, 0.151	
Indirect effect	0.024**	0.009, 0.038	19.8%
Mediator: Positive affect			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.117***	0.067, 0.168	
Indirect effect	0.004*	0.000, 0.008	
Mediator: Neuroticism			
Total effect	0.121***	0.071, 0.171	
Direct effect	0.121***	0.071, 0.171	
Indirect effect	-0.000	-0.001, 0.001	

Mediator: Extraversion		
Total effect	0.121***	0.071, 0.171
Direct effect	0.120***	0.070, 0.170
Indirect effect	0.001	-0.001, 0.004
Mediator: Conscientiousness		
Total effect	0.121***	0.071, 0.171
Direct effect	0.118***	0.068, 0.168
Indirect effect	0.003*	0.000, 0.006
Mediator: Agreeableness		
Total effect	0.121***	0.071, 0.171
Direct effect	0.122***	0.072, 0.173
Indirect effect	-0.001	-0.003, 0.001
Mediator: Openness		
Total effect	0.121***	0.071, 0.171
Direct effect	0.121***	0.071, 0.171
Indirect effect	0.000	-0.001, 0.001

*p<0.05; **p<0.01; ***p<0.001

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, educational level, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Notes: Two psychological measures (eudemonic wellbeing and weight stigma) were significant at p<0.01 from single mediation models. Using multiple imputation, a multiple mediation model was developed to fit both psychological measures. The overall indirect effect of both psychological measures was 0.027 (95%CI=0.013-0.041; p<0.001) with an effect ratio of 22%. However, the multiple imputation approach did not allow to disentangle how much the aforementioned mediation was contributed by either eudemonic wellbeing or weight stigma. Using a similar approach to handling missing data (multiple imputation), eudemonic wellbeing was not found as a mediator for obesity classes vs. normal weight (see Table B3).

Table B3. Single mediation models using multiple imputation (**Obesity Classes vs. Normal Weight**)

Mediation models (n=6,250) <i>(Reference group: normal weight [BMI < 25 kg/m²])</i>	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.139***	0.066, 0.211	
Indirect effect	0.002	-0.004, 0.008	
<i>Class II & III obesity</i>			
Total effect	0.189***	0.096, 0.279	
Direct effect	0.180***	0.089, 0.271	
Indirect effect	0.008	-0.000, 0.015	
Mediator: Enjoyment of life			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.139***	0.067, 0.211	
Indirect effect	0.002	-0.006, 0.008	
<i>Class II & III obesity</i>			
Total effect	0.188***	0.096, 0.279	
Direct effect	0.183***	0.092, 0.274	
Indirect effect	0.005	-0.003, 0.012	
Mediator: Eudemonic wellbeing			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.137***	0.065, 0.209	
Indirect effect	0.003	-0.003, 0.009	
<i>Class II & III obesity</i>			
Total effect	0.188***	0.096, 0.279	
Direct effect	0.180***	0.090, 0.271	
Indirect effect	0.007	-0.000, 0.015	
Mediator: Life satisfaction			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.141***	0.068, 0.214	
Indirect effect	-0.001	-0.007, 0.006	
<i>Class II & III obesity</i>			
Total effect	0.188***	0.096, 0.279	
Direct effect	0.187***	0.096, 0.277	
Indirect effect	0.001	-0.006, 0.008	
Mediator: Loneliness			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.140***	0.068, 0.213	
Indirect effect	-0.000	-0.002, 0.002	
<i>Class II & III obesity</i>			
Total effect	0.188***	0.096, 0.279	

Direct effect	0.187***	0.096, 0.278	
Indirect effect	0.001	-0.004, 0.006	
Mediator: Social support			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.139***	0.066, 0.211	
Indirect effect	0.002	-0.003, 0.006	
<i>Class II & III obesity</i>			
Total effect	0.188***	0.096, 0.279	
Direct effect	0.184***	0.093, 0.275	
Indirect effect	0.003	-0.002, 0.009	
Mediator: Social strain			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.137***	0.065, 0.209	
Indirect effect	0.003	-0.002, 0.009	
<i>Class II & III obesity</i>			
Total effect	0.188***	0.096, 0.279	
Direct effect	0.182***	0.090, 0.273	
Indirect effect	0.006	-0.001, 0.012	
Mediator: Weight stigma			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.130***	0.058, 0.202	
Indirect effect	0.010	-0.000, 0.021	
<i>Class II & III obesity</i>			
Total effect	0.188***	0.097, 0.279	
Direct effect	0.136**	0.042, 0.230	
Indirect effect	0.052**	0.021, 0.082	27.7%
Mediator: Positive affect			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.140***	0.067, 0.212	
Indirect effect	0.001	-0.007, 0.008	
<i>Class II & III obesity</i>			
Total effect	0.188***	0.097, 0.279	
Direct effect	0.181***	0.090, 0.271	
Indirect effect	0.007	-0.001, 0.015	
Mediator: Neuroticism			
<i>Class I obesity</i>			
Total effect	0.140***	0.068, 0.213	
Direct effect	0.141***	0.069, 0.214	
Indirect effect	-0.001	-0.003, 0.002	
<i>Class II & III obesity</i>			
Total effect	0.188***	0.096, 0.279	
Direct effect	0.188***	0.097, 0.279	
Indirect effect	-0.001	-0.003, 0.002	

Mediator: Extraversion		
<i>Class I obesity</i>		
Total effect	0.140***	0.068, 0.213
Direct effect	0.141***	0.069, 0.213
Indirect effect	-0.001	-0.006, 0.004
<i>Class II & III obesity</i>		
Total effect	0.188***	0.096, 0.279
Direct effect	0.185***	0.094, 0.276
Indirect effect	0.002	-0.003, 0.007
Mediator: Conscientiousness		
<i>Class I obesity</i>		
Total effect	0.140***	0.068, 0.213
Direct effect	0.139***	0.066, 0.211
Indirect effect	0.002	-0.003, 0.006
<i>Class II & III obesity</i>		
Total effect	0.188***	0.096, 0.279
Direct effect	0.182***	0.091, 0.273
Indirect effect	0.006	-0.001, 0.012
Mediator: Agreeableness		
<i>Class I obesity</i>		
Total effect	0.140***	0.068, 0.213
Direct effect	0.143***	0.070, 0.216
Indirect effect	-0.003	-0.007, 0.002
<i>Class II & III obesity</i>		
Total effect	0.188***	0.096, 0.279
Direct effect	0.190***	0.099, 0.281
Indirect effect	-0.002	-0.006, 0.002
Mediator: Openness		
<i>Class I obesity</i>		
Total effect	0.140***	0.068, 0.213
Direct effect	0.140***	0.068, 0.213
Indirect effect	-0.000	-0.001, 0.001
<i>Class II & III obesity</i>		
Total effect	0.188***	0.096, 0.279
Direct effect	0.188***	0.096, 0.279
Indirect effect	0.000	-0.001, 0.001

*p<0.05; **p<0.01; ***p<0.001

Mediation analyses for overweight vs. normal weight are not presented.

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, educational level, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Table B4. Single mediation models using inverse probability weighting (Obesity vs. Overweight)

Mediation models <i>(Reference group: overweight [BMI ≥ 25 – 29.9 kg/m²])</i>	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms (n=3,801)			
Total effect	0.059	-0.011, 0.129	
Direct effect	0.055	-0.015, 0.125	
Indirect effect	0.004	-0.003, 0.010	
Mediator: Enjoyment of life (n=3,532)			
Total effect	0.082*	0.008, 0.155	
Direct effect	0.074*	0.001, 0.148	
Indirect effect	0.007	-0.002, 0.017	
Mediator: Eudemonic wellbeing (n=3,531)			
Total effect	0.081*	0.008, 0.154	
Direct effect	0.072	-0.001, 0.146	
Indirect effect	0.009*	0.000, 0.017	
Mediator: Life satisfaction (n=3,535)			
Total effect	0.081*	0.008, 0.154	
Direct effect	0.079*	0.006, 0.152	
Indirect effect	0.002	-0.003, 0.007	
Mediator: Loneliness (n=3,530)			
Total effect	0.080*	0.007, 0.154	
Direct effect	0.079*	0.006, 0.153	
Indirect effect	0.001	-0.002, 0.003	
Mediator: Social support (n=3,570)			
Total effect	0.072	-0.002, 0.145	
Direct effect	0.068	-0.005, 0.142	
Indirect effect	0.003	-0.002, 0.009	
Mediator: Social strain (n=3,566)			
Total effect	0.073	-0.000, 0.147	
Direct effect	0.071	-0.002, 0.145	
Indirect effect	0.002	-0.003, 0.007	
Mediator: Weight stigma (n=3,543)			
Total effect	0.087*	0.013, 0.161	
Direct effect	0.054	-0.020, 0.128	
Indirect effect	0.033**	0.010, 0.056	38.1%
Mediator: Positive affect (n=3,526)			
Total effect	0.082*	0.007, 0.156	
Direct effect	0.078*	0.003, 0.152	
Indirect effect	0.004	-0.004, 0.012	
Mediator: Neuroticism (n=3,527)			
Total effect	0.087*	0.013, 0.162	
Direct effect	0.087*	0.012, 0.162	
Indirect effect	0.000	-0.002, 0.001	

Mediator: Extraversion (n=3,532)		
Total effect	0.090*	0.014, 0.164
Direct effect	0.089*	0.014, 0.164
Indirect effect	0.001	-0.004, 0.005
Mediator: Conscientiousness (n=3,530)		
Total effect	0.090*	0.015, 0.164
Direct effect	0.087*	0.012, 0.161
Indirect effect	0.003	-0.003, 0.008
Mediator: Agreeableness (n=3,534)		
Total effect	0.087*	0.013, 0.162
Direct effect	0.088*	0.014, 0.163
Indirect effect	-0.001	-0.005, 0.002
Mediator: Openness (n=3,527)		
Total effect	0.088*	0.013, 0.163
Direct effect	0.089*	0.014, 0.163
Indirect effect	-0.000	-0.001, 0.001

*p<0.05; **p<0.01; ***p<0.001

Mediation analyses for normal weight vs. obesity are not presented.

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, educational level, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Notes: Using inverse probability weighting, single mediation models were also developed for **obesity classes vs. overweight**. Only mediation by weight stigma for Class II & III obesity vs. overweight was statistically significant (indirect effect point estimate= 0.070; 95%CI= 0.019-0.121; p<0.01) with an effect ratio of 50.0% (*other findings are not presented*).

Table B5. Single mediation models for physiological dysregulation assessed as the number of biomarkers exceeding a given cut-off point using inverse probability weighting (**Obesity vs. Non-obesity**)

Mediation models <i>(Reference group: non-obesity [BMI < 30 kg/m²])</i>	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms (n=3,801)			
Total effect	0.111**	0.048, 0.173	
Direct effect	0.107**	0.045, 0.170	
Indirect effect	0.003	-0.001, 0.008	
Mediator: Enjoyment of life (n=3,532)			
Total effect	0.125***	0.057, 0.192	
Direct effect	0.121***	0.053, 0.189	
Indirect effect	0.003	-0.001, 0.008	
Mediator: Eudemonic wellbeing (n=3,531)			
Total effect	0.124***	0.056, 0.192	
Direct effect	0.117**	0.050, 0.185	
Indirect effect	0.007*	0.001, 0.013	
Mediator: Life satisfaction (n=3,535)			
Total effect	0.126***	0.059, 0.194	
Direct effect	0.126***	0.058, 0.193	
Indirect effect	0.001	-0.002, 0.003	
Mediator: Loneliness (n=3,530)			
Total effect	0.125***	0.057, 0.193	
Direct effect	0.125***	0.057, 0.193	
Indirect effect	-0.000	-0.002, 0.001	
Mediator: Social support (n=3,570)			
Total effect	0.127***	0.060, 0.194	
Direct effect	0.126***	0.059, 0.193	
Indirect effect	0.001	-0.002, 0.004	
Mediator: Social strain (n=3,566)			
Total effect	0.125***	0.058, 0.192	
Direct effect	0.125***	0.058, 0.192	
Indirect effect	0.000	-0.002, 0.002	
Mediator: Weight stigma (n=3,543)			
Total effect	0.128***	0.061, 0.194	
Direct effect	0.109**	-0.039, 0.178	
Indirect effect	0.019	-0.000, 0.039	
Mediator: Positive affect (n=3,526)			
Total effect	0.115**	0.049, 0.182	
Direct effect	0.113**	0.047, 0.180	
Indirect effect	0.002	-0.002, 0.005	
Mediator: Neuroticism (n=3,527)			
Total effect	0.128***	0.061, 0.195	

Direct effect	0.128***	0.061, 0.195
Indirect effect	0.000	-0.001, 0.001
Mediator: Extraversion (n=3,532)		
Total effect	0.129***	0.062, 0.196
Direct effect	0.129***	0.062, 0.196
Indirect effect	-0.000	-0.003, 0.003
Mediator: Conscientiousness (n=3,530)		
Total effect	0.128***	0.062, 0.195
Direct effect	0.125***	0.059, 0.192
Indirect effect	0.003	-0.002, 0.008
Mediator: Agreeableness (n=3,534)		
Total effect	0.133***	0.066, 0.200
Direct effect	0.137***	0.070, 0.204
Indirect effect	-0.004	-0.009, 0.000
Mediator: Openness (n=3,527)		
Total effect	0.127***	0.060, 0.194
Direct effect	0.128***	0.061, 0.195
Indirect effect	-0.001	-0.003, 0.001

*p<0.05; **p<0.01; ***p<0.001

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, educational level, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Notes: Using inverse probability weighting, single mediation models for physiological dysregulation assessed as the number of biomarkers exceeding a given cut-off point were also developed for **obesity classes vs. normal weight**, but no mediation by any psychosocial measures was statistically significant at p<0.05 (*findings are not presented*).

Table B6. Single mediation models for changes in psychological measures between Waves 4 and 6 using inverse probability weighting (**Obesity vs. Non-obesity**)

Mediation models (Reference group: non-obesity [BMI < 30 kg/m ²])	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms (n=3,792)			
Total effect	0.072*	0.005, 0.140	
Direct effect	0.072*	0.005, 0.140	
Indirect effect	-0.000	-0.001, 0.001	
Mediator: Enjoyment of life (n=3,381)			
Total effect	0.093*	0.021, 0.165	
Direct effect	0.094*	0.022, 0.166	
Indirect effect	-0.001	-0.006, 0.004	
Mediator: Eudemonic wellbeing (n=3,375)			
Total effect	0.093*	0.021, 0.166	
Direct effect	0.095*	0.023, 0.168	
Indirect effect	-0.002	-0.006, 0.002	
Mediator: Life satisfaction (n=3,349)			
Total effect	0.094*	0.022, 0.166	
Direct effect	0.094*	0.022, 0.166	
Indirect effect	-0.000	-0.002, 0.002	
Mediator: Loneliness (n=3,367)			
Total effect	0.090*	0.017, 0.162	
Direct effect	0.090*	0.017, 0.162	
Indirect effect	0.000	-0.001, 0.001	
Mediator: Social support (n=3,422)			
Total effect	0.085*	0.013, 0.157	
Direct effect	0.085*	0.013, 0.157	
Indirect effect	0.000	-0.001, 0.001	
Mediator: Social strain (n=3,419)			
Total effect	0.086*	0.014, 0.158	
Direct effect	0.086*	0.014, 0.158	
Indirect effect	-0.000	-0.000, 0.000	

*p<0.05; **p<0.01; ***p<0.001

Changes in or difference scores of psychological measures between baseline (Wave 4) and follow-up (Wave 6) were fitted, except for weight stigma, positive affect, and big five personality traits that were only available in Wave 5.

All mediation models were adjusted for baseline physiological dysregulation, age, age², sex, paid employment status, ethnicity, marital status, educational level, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Notes: Using inverse probability weighting, single mediation models fitting changes in or difference scores of psychological measures between Waves 4 and 5 were also developed for **obesity vs. non-obesity**, but no mediation by any psychosocial measures was statistically significant at p<0.05 (*findings are not presented*).

Notes: Using inverse probability weighting, single mediation models fitting changes in or difference scores of psychological measures between Waves 4 and 5 and between Waves 4 and 6 were also developed for **obesity classes vs. normal weight**, but no mediation by any psychosocial measures was statistically significant at $p < 0.05$ (*findings are not presented*).

Table B7. Associations between each psychological measure and physiological dysregulation using inverse probability weighting

Psychological measures	β	95% CI
Depressive symptoms (n= 3,801)	0.025**	0.008, 0.042
Enjoyment of life (n= 3,532)	-0.035***	-0.052, -0.019
Eudemonic wellbeing (n= 3,531)	-0.007**	-0.011, -0.003
Life satisfaction (n= 3,535)	-0.006*	-0.011, -0.002
Loneliness (n= 3,530)	0.008	-0.012, 0.028
Social support (n= 3,570)	-0.055	-0.109, 0.000
Social strain (n= 3,566)	0.083*	0.018, 0.149
Positive affect (n=3,526)	-0.006**	-0.009, -0.002
Neuroticism (n=3,527)	0.005	-0.008, 0.018
Extraversion (n=3,532)	-0.011	-0.022, 0.001
Conscientiousness (n=3,530)	-0.015*	-0.027, -0.002
Agreeableness (n=3,534)	-0.009	-0.023, 0.004
Openness (n=3,527)	-0.002	-0.010, 0.006
Weight stigma (<i>yes vs. no</i>) (n=3,543)	0.306**	0.112, 0.499

*p<0.05; **p<0.01; ***p<0.001

Separate regression models were developed for each psychological measure.

All regression models were adjusted for obesity status, baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, educational level, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Table B8. Associations between all psychological measures together and physiological dysregulation using inverse probability weighting

Psychological measures (n=3,239)	β	95% CI
Depressive symptoms	0.012	-0.011, 0.035
Enjoyment of life	-0.018	-0.046, 0.009
Eudemonic wellbeing	0.003	-0.005, 0.010
Life satisfaction	-0.001	-0.008, 0.006
Loneliness	-0.023	-0.049, 0.003
Social support	-0.009	-0.074, 0.056
Social strain	0.073	-0.004, 0.149
Positive affect	-0.005*	-0.009, -0.000
Neuroticism	-0.006	-0.021, 0.008
Extraversion	-0.001	-0.019, 0.017
Conscientiousness	-0.016*	-0.031, -0.002
Agreeableness	-0.002	-0.019, 0.014
Openness	0.012*	0.001, 0.023
Weight stigma (yes vs. no)	0.265*	0.050, 0.481

*p<0.05; **p<0.01; ***p<0.001

The regression model was adjusted for obesity status, baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, educational level, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Table B9. Single mediation models testing weight stigma as a mediator taking into account changes in BMI between Waves 4 and 6 using inverse probability weighting

Mediator: Weight stigma (n=3,460)	Point estimates	95% CI	Effect ratio
(Reference group: non-obesity [BMI < 30 kg/m²])			
<i>Obesity</i>			
Total effect	0.119**	0.052, 0.187	
Direct effect	0.093**	0.024, 0.162	
Indirect effect	0.026**	0.007, 0.046	22.1%
(Reference group: normal weight [BMI < 25 kg/m²])^a			
<i>Class I obesity</i>			
Total effect	0.103*	0.017, 0.189	
Direct effect	0.088*	0.002, 0.174	
Indirect effect	0.015	-0.005, 0.034	
<i>Class II & III obesity</i>			
Total effect	0.228***	0.112, 0.344	
Direct effect	0.177**	0.048, 0.306	
Indirect effect	0.051*	0.005, 0.097	22.5%

*p<0.05; **p<0.01; ***p<0.001

^aFor testing different obesity classes, mediation analyses for overweight vs. normal weight are not presented. All mediation models were adjusted for baseline physiological dysregulation, age, age², sex, paid employment status, ethnicity, marital status, educational level, household wealth, and **changes in BMI between baseline and follow-up waves**.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Study 2 (HRS)

Table C1. Single mediation models using inverse probability weighting (**Obesity Classes vs. Normal Weight**)

Mediation models (Reference group: normal weight [BMI < 25 kg/m ²])	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms (n=7,332)			
<i>Class I obesity</i>			
Total effect	0.236***	0.170, 0.302	
Direct effect	0.236***	0.170, 0.302	
Indirect effect	-0.000	-0.001, 0.001	
<i>Class II & III obesity</i>			
Total effect	0.265***	0.188, 0.343	
Direct effect	0.265***	0.188, 0.342	
Indirect effect	0.000	-0.001, 0.001	
Mediator: Life satisfaction (n=6,395)			
<i>Class I obesity</i>			
Total effect	0.243***	0.172, 0.315	
Direct effect	0.243***	0.172, 0.315	
Indirect effect	0.000	-0.001, 0.001	
<i>Class II & III obesity</i>			
Total effect	0.295***	0.210, 0.379	
Direct effect	0.295***	0.211, 0.375	
Indirect effect	-0.000	-0.002, 0.001	
Mediator: Loneliness (n=6,380)			
<i>Class I obesity</i>			
Total effect	0.237***	0.165, 0.308	
Direct effect	0.237***	0.165, 0.309	
Indirect effect	-0.000	-0.001, 0.001	
<i>Class II & III obesity</i>			
Total effect	0.294***	0.210, 0.379	
Direct effect	0.295***	0.211, 0.379	
Indirect effect	-0.001	-0.005, 0.004	
Mediator: Social support (n=6,430)			
<i>Class I obesity</i>			
Total effect	0.241***	0.170, 0.313	
Direct effect	0.241***	0.170, 0.313	
Indirect effect	0.000	-0.001, 0.001	
<i>Class II & III obesity</i>			
Total effect	0.292***	0.207, 0.376	
Direct effect	0.292***	0.208, 0.377	
Indirect effect	-0.001	-0.004, 0.003	
Mediator: Social strain (n=6,427)			
<i>Class I obesity</i>			
Total effect	0.241***	0.169, 0.312	
Direct effect	0.241***	0.169, 0.312	

Indirect effect	0.000	-0.002, 0.002
<i>Class II & III obesity</i>		
Total effect	0.291***	0.206, 0.375
Direct effect	0.289***	0.205, 0.374
Indirect effect	0.001	-0.002, 0.005
Mediator: Weight stigma (n=6,402)		
<i>Class I obesity</i>		
Total effect	0.240***	0.169, 0.312
Direct effect	0.239***	0.168, 0.311
Indirect effect	0.001	-0.008, 0.009
<i>Class II & III obesity</i>		
Total effect	0.290***	0.206, 0.375
Direct effect	0.288***	0.201, 0.374
Indirect effect	0.003	-0.024, 0.030
Mediator: Positive affect (n=6,370)		
<i>Class I obesity</i>		
Total effect	0.239***	0.168, 0.311
Direct effect	0.238***	0.167, 0.311
Indirect effect	0.000	-0.001, 0.002
<i>Class II & III obesity</i>		
Total effect	0.290***	0.205, 0.375
Direct effect	0.289***	0.204, 0.374
Indirect effect	0.001	-0.002, 0.004
Mediator: Negative affect (n=6,378)		
<i>Class I obesity</i>		
Total effect	0.241***	0.169, 0.313
Direct effect	0.241***	0.170, 0.313
Indirect effect	0.000	-0.001, 0.001
<i>Class II & III obesity</i>		
Total effect	0.293***	0.208, 0.378
Direct effect	0.293***	0.208, 0.378
Indirect effect	0.000	-0.001, 0.001
Mediator: Purpose in life (n=6,349)		
<i>Class I obesity</i>		
Total effect	0.241***	0.169, 0.313
Direct effect	0.241***	0.169, 0.313
Indirect effect	0.000	-0.001, 0.001
<i>Class II & III obesity</i>		
Total effect	0.296***	0.211, 0.381
Direct effect	0.296***	0.211, 0.380
Indirect effect	0.000	-0.004, 0.004
Mediator: Anxiety (n=6,385)		
<i>Class I obesity</i>		
Total effect	0.240***	0.168, 0.311
Direct effect	0.240***	0.168, 0.312

Indirect effect	-0.000	-0.002, 0.002
<i>Class II & III obesity</i>		
Total effect	0.292***	0.207, 0.377
Direct effect	0.292***	0.207, 0.377
Indirect effect	-0.000	-0.001, 0.001
Mediator: Hopelessness (n=6,407)		
<i>Class I obesity</i>		
Total effect	0.238***	0.167, 0.310
Direct effect	0.238***	0.166, 0.310
Indirect effect	0.000	-0.003, 0.003
<i>Class II & III obesity</i>		
Total effect	0.292***	0.208, 0.377
Direct effect	0.289***	0.204, 0.373
Indirect effect	0.003	-0.002, 0.002
Mediator: Optimism (n=6,372)		
<i>Class I obesity</i>		
Total effect	0.242***	0.171, 0.314
Direct effect	0.241***	0.170, 0.313
Indirect effect	0.001	-0.002, 0.004
<i>Class II & III obesity</i>		
Total effect	0.294***	0.210, 0.379
Direct effect	0.294***	0.209, 0.379
Indirect effect	0.001	-0.002, 0.003
Mediator: Pessimism (n=6,371)		
<i>Class I obesity</i>		
Total effect	0.240***	0.169, 0.312
Direct effect	0.241***	0.169, 0.312
Indirect effect	-0.000	-0.003, 0.002
<i>Class II & III obesity</i>		
Total effect	0.291***	0.206, 0.375
Direct effect	0.288***	0.203, 0.373
Indirect effect	0.003	-0.003, 0.009
Mediator: Cynical hostile (n=6,260)		
<i>Class I obesity</i>		
Total effect	0.243***	0.171, 0.314
Direct effect	0.240***	0.168, 0.311
Indirect effect	0.003	-0.003, 0.009
<i>Class II & III obesity</i>		
Total effect	0.303***	0.218, 0.387
Direct effect	0.295***	0.210, 0.379
Indirect effect	0.008	-0.000, 0.016
Mediator: Perceived constrained (n=6,392)		
<i>Class I obesity</i>		
Total effect	0.240***	0.168, 0.312
Direct effect	0.240***	0.168, 0.311

Indirect effect	0.000	-0.001, 0.001
<i>Class II & III obesity</i>		
Total effect	0.291***	0.207, 0.376
Direct effect	0.291***	0.207, 0.376
Indirect effect	0.000	-0.001, 0.001
Mediator: Perceived mastery (n=6,393)		
<i>Class I obesity</i>		
Total effect	0.240***	0.168, 0.311
Direct effect	0.240***	0.169, 0.312
Indirect effect	-0.000	-0.002, 0.002
<i>Class II & III obesity</i>		
Total effect	0.290***	0.205, 0.374
Direct effect	0.291***	0.206, 0.375
Indirect effect	-0.001	-0.003, 0.002
Mediator: Neuroticism (n=6,372)		
<i>Class I obesity</i>		
Total effect	0.244***	0.172, 0.315
Direct effect	0.243***	0.172, 0.315
Indirect effect	0.001	-0.002, 0.003
<i>Class II & III obesity</i>		
Total effect	0.298***	0.214, 0.383
Direct effect	0.298***	0.213, 0.382
Indirect effect	0.001	-0.002, 0.003
Mediator: Extraversion (n=6,380)		
<i>Class I obesity</i>		
Total effect	0.242***	0.171, 0.314
Direct effect	0.242***	0.171, 0.314
Indirect effect	0.000	-0.001, 0.001
<i>Class II & III obesity</i>		
Total effect	0.295***	0.210, 0.380
Direct effect	0.294***	0.210, 0.378
Indirect effect	0.001	-0.002, 0.004
Mediator: Conscientiousness (n=6,372)		
<i>Class I obesity</i>		
Total effect	0.245***	0.173, 0.317
Direct effect	0.244***	0.173, 0.316
Indirect effect	0.001	-0.002, 0.003
<i>Class II & III obesity</i>		
Total effect	0.299***	0.214, 0.383
Direct effect	0.297***	0.213, 0.382
Indirect effect	0.001	-0.003, 0.005
Mediator: Agreeableness (n=6,377)		
<i>Class I obesity</i>		
Total effect	0.243***	0.172, 0.315
Direct effect	0.243***	0.172, 0.315
Indirect effect	0.000	-0.001, 0.001

Class II & III obesity

Total effect	0.298***	0.213, 0.383
Direct effect	0.298***	0.213, 0.383
Indirect effect	0.000	-0.001, 0.002

Mediator: Openness (n=6,356)*Class I obesity*

Total effect	0.243***	0.171, 0.314
Direct effect	0.242***	0.170, 0.314
Indirect effect	0.001	-0.002, 0.003

Class II & III obesity

Total effect	0.290***	0.205, 0.375
Direct effect	0.290***	0.206, 0.375
Indirect effect	-0.001	-0.003, 0.002

*p<0.05; **p<0.01; ***p<0.001

Mediation analyses for overweight vs. normal weight are not presented.

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, years in education, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Table C2. Single mediation models using multiple imputation (**Obesity vs. Non-obesity**)

Mediation models (n=9,664) <i>(Reference group: non-obesity [BMI < 30 kg/m²])</i>	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.171***	0.134, 0.209	
Indirect effect	0.000	-0.000, 0.000	
Mediator: Life satisfaction			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.171***	0.133, 0.208	
Indirect effect	0.000	-0.001, 0.001	
Mediator: Loneliness			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.171***	0.134, 0.209	
Indirect effect	0.000	-0.000, 0.000	
Mediator: Social support			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.171***	0.134, 0.209	
Indirect effect	0.000	-0.001, 0.001	
Mediator: Social strain			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.171***	0.134, 0.209	
Indirect effect	0.000	-0.001, 0.001	
Mediator: Weight stigma			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.166***	0.127, 0.205	
Indirect effect	0.005	-0.004, 0.015	
Mediator: Positive affect			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.171***	0.133, 0.208	
Indirect effect	0.001	-0.001, 0.002	
Mediator: Negative affect			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.171***	0.134, 0.209	
Indirect effect	-0.000	-0.001, 0.001	
Mediator: Purpose in life			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.171***	0.133, 0.208	
Indirect effect	0.001	-0.001, 0.002	
Mediator: Anxiety			
Total effect	0.171***	0.134, 0.209	
Direct effect	0.171***	0.134, 0.209	
Indirect effect	0.000	-0.001, 0.001	

Mediator: Hopelessness		
Total effect	0.171***	0.134, 0.209
Direct effect	0.170***	0.133, 0.208
Indirect effect	0.001	-0.001, 0.003
Mediator: Optimism		
Total effect	0.171***	0.134, 0.209
Direct effect	0.171***	0.134, 0.209
Indirect effect	-0.000	-0.001, 0.001
Mediator: Pessimism		
Total effect	0.171***	0.134, 0.209
Direct effect	0.170***	0.132, 0.207
Indirect effect	0.002	-0.000, 0.004
Mediator: Cynical hostile		
Total effect	0.171***	0.134, 0.209
Direct effect	0.170***	0.132, 0.207
Indirect effect	0.002	-0.000, 0.003
Mediator: Perceived constrain		
Total effect	0.171***	0.134, 0.209
Direct effect	0.171***	0.134, 0.209
Indirect effect	-0.000	-0.000, 0.000
Mediator: Perceived mastery		
Total effect	0.170***	0.132, 0.208
Direct effect	0.170***	0.132, 0.208
Indirect effect	0.000	-0.001, 0.001
Mediator: Neuroticism		
Total effect	0.171***	0.134, 0.209
Direct effect	0.171***	0.134, 0.209
Indirect effect	0.000	-0.001, 0.001
Mediator: Extraversion		
Total effect	0.171***	0.134, 0.209
Direct effect	0.171***	0.134, 0.209
Indirect effect	0.000	-0.001, 0.001
Mediator: Conscientiousness		
Total effect	0.171***	0.134, 0.209
Direct effect	0.171***	0.134, 0.209
Indirect effect	0.000	-0.001, 0.001
Mediator: Agreeableness		
Total effect	0.171***	0.134, 0.209
Direct effect	0.171***	0.134, 0.209
Indirect effect	0.000	-0.001, 0.001

Mediator: Openness		
Total effect	0.171***	0.134, 0.209
Direct effect	0.171***	0.134, 0.209
Indirect effect	0.000	-0.001, 0.001

*p<0.05; **p<0.01; ***p<0.001

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, years in education, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Table C3. Single mediation models using multiple imputation (**Obesity Classes vs. Normal Weight**)

Mediation models (n=9,664) <i>(Reference group: normal weight [BMI < 25 kg/m²])</i>	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms			
<i>Class I obesity</i>			
Total effect	0.218***	0.165, 0.271	
Direct effect	0.218***	0.165, 0.271	
Indirect effect	0.000	-0.001, 0.001	
<i>Class II & III obesity</i>			
Total effect	0.271***	0.209, 0.333	
Direct effect	0.270***	0.208, 0.332	
Indirect effect	0.001	-0.001, 0.003	
Mediator: Life satisfaction			
<i>Class I obesity</i>			
Total effect	0.218***	0.165, 0.271	
Direct effect	0.218***	0.165, 0.271	
Indirect effect	-0.000	-0.001, 0.001	
<i>Class II & III obesity</i>			
Total effect	0.271***	0.209, 0.334	
Direct effect	0.271***	0.209, 0.333	
Indirect effect	0.000	-0.001, 0.001	
Mediator: Loneliness			
<i>Class I obesity</i>			
Total effect	0.218***	0.165, 0.271	
Direct effect	0.218***	0.165, 0.271	
Indirect effect	0.000	-0.001, 0.001	
<i>Class II & III obesity</i>			
Total effect	0.271***	0.209, 0.334	
Direct effect	0.272***	0.209, 0.334	
Indirect effect	-0.000	-0.003, 0.003	
Mediator: Social support			
<i>Class I obesity</i>			
Total effect	0.218***	0.165, 0.271	
Direct effect	0.218***	0.165, 0.271	
Indirect effect	-0.000	-0.001, 0.000	
<i>Class II & III obesity</i>			
Total effect	0.271***	0.209, 0.334	
Direct effect	0.271***	0.271, 0.333	
Indirect effect	0.000	-0.002, 0.002	
Mediator: Social strain			
<i>Class I obesity</i>			
Total effect	0.218***	0.165, 0.271	
Direct effect	0.218***	0.165, 0.271	
Indirect effect	0.000	-0.001, 0.001	

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.209, 0.333
Indirect effect	0.001	-0.002, 0.003

Mediator: Weight stigma*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.216***	0.163, 0.269
Indirect effect	0.002	-0.004, 0.008

Class II & III obesity

Total effect	0.271***	0.209, 0.333
Direct effect	0.264***	0.197, 0.332
Indirect effect	0.007	-0.014, 0.028

Mediator: Positive affect*Class I obesity*

Total effect	0.221***	0.170, 0.272
Direct effect	0.221***	0.170, 0.272
Indirect effect	-0.000	-0.001, 0.002

Class II & III obesity

Total effect	0.265***	0.207, 0.322
Direct effect	0.264***	0.206, 0.321
Indirect effect	0.001	-0.002, 0.002

Mediator: Negative affect*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	0.000	-0.001, 0.001

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.209, 0.333
Indirect effect	0.001	-0.002, 0.003

Mediator: Purpose in life*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	0.000	-0.001, 0.001

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.208, 0.333
Indirect effect	0.000	-0.002, 0.003

Mediator: Anxiety*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	-0.000	-0.002, 0.001

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.209, 0.334
Indirect effect	-0.000	-0.001, 0.001

Mediator: Hopelessness*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.217***	0.164, 0.270
Indirect effect	0.001	-0.002, 0.003

Class II & III obesity

Total effect	0.271***	0.209, 0.333
Direct effect	0.268***	0.205, 0.331
Indirect effect	0.003	-0.001, 0.007

Mediator: Optimism*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	-0.000	-0.001, 0.001

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.209, 0.333
Indirect effect	0.000	-0.001, 0.001

Mediator: Pessimism*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.217***	0.164, 0.270
Indirect effect	0.001	-0.002, 0.003

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.267***	0.204, 0.330
Indirect effect	0.004*	0.000, 0.009

Mediator: Cynical hostile*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.216***	0.162, 0.269
Indirect effect	0.002	-0.001, 0.005

Class II & III obesity

Total effect	0.271***	0.209, 0.333
Direct effect	0.266***	0.203, 0.329
Indirect effect	0.005*	0.000, 0.010

Mediator: Perceived constrained*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	-0.000	-0.001, 0.001

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.209, 0.333
Indirect effect	0.000	-0.001, 0.001

Mediator: Perceived mastery*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	-0.000	-0.002, 0.001

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.209, 0.333
Indirect effect	0.000	-0.001, 0.002

Mediator: Neuroticism*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	0.000	-0.002, 0.002

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.209, 0.334
Indirect effect	-0.000	-0.001, 0.001

Mediator: Extraversion*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	0.000	-0.001, 0.001

Class II & III obesity

Total effect	0.271***	0.209, 0.333
Direct effect	0.270***	0.208, 0.332
Indirect effect	0.001	-0.001, 0.004

Mediator: Conscientiousness*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.217***	0.164, 0.270
Indirect effect	0.001	-0.001, 0.003

Class II & III obesity

Total effect	0.271***	0.209, 0.333
Direct effect	0.269***	0.207, 0.331
Indirect effect	0.002	-0.001, 0.001

Mediator: Agreeableness*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	0.000	-0.001, 0.001

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.209, 0.334
Indirect effect	-0.000	-0.001, 0.001

Mediator: Openness*Class I obesity*

Total effect	0.218***	0.165, 0.271
Direct effect	0.218***	0.165, 0.271
Indirect effect	0.000	-0.001, 0.001

Class II & III obesity

Total effect	0.271***	0.209, 0.334
Direct effect	0.271***	0.209, 0.334
Indirect effect	-0.000	-0.001, 0.001

*p<0.05; **p<0.01; ***p<0.001

Mediation analyses for overweight vs. normal weight are not presented.

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, years in education, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Table C4. Single mediation models using inverse probability weighting (**Obesity vs. Overweight**)

Mediation models (Reference group: <u>overweight</u> [BMI $\geq 25 - 29.9$ kg/m ²])	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms (n=7,332)			
Total effect	0.131***	0.077, 0.185	
Direct effect	0.132***	0.077, 0.186	
Indirect effect	-0.000	-0.001, 0.001	
Mediator: Life satisfaction (n=6,395)			
Total effect	0.151***	0.091, 0.210	
Direct effect	0.151***	0.091, 0.210	
Indirect effect	-0.000	-0.001, 0.001	
Mediator: Loneliness (n=6,380)			
Total effect	0.150***	0.091, 0.210	
Direct effect	0.150***	0.091, 0.210	
Indirect effect	-0.000	-0.001, 0.001	
Mediator: Social support (n=6,430)			
Total effect	0.148***	0.089, 0.208	
Direct effect	0.149***	0.089, 0.208	
Indirect effect	-0.000	-0.002, 0.001	
Mediator: Social strain (n=6,427)			
Total effect	0.148***	0.089, 0.207	
Direct effect	0.147***	0.087, 0.206	
Indirect effect	0.001	-0.001, 0.003	
Mediator: Weight stigma (n=6,402)			
Total effect	0.145***	0.085, 0.204	
Direct effect	0.142***	0.082, 0.202	
Indirect effect	0.003	-0.011, 0.017	
Mediator: Positive affect (n=6,370)			
Total effect	0.143***	0.084, 0.203	
Direct effect	0.143***	0.083, 0.203	
Indirect effect	0.001	-0.001, 0.002	
Mediator: Negative affect (n=6,378)			
Total effect	0.146***	0.086, 0.205	
Direct effect	0.146***	0.086, 0.205	
Indirect effect	0.000	-0.000, 0.000	
Mediator: Purpose in life (n=6,349)			
Total effect	0.147***	0.088, 0.207	
Direct effect	0.147***	0.088, 0.207	
Indirect effect	0.000	-0.002, 0.003	

Mediator: Anxiety (n=6,385)		
Total effect	0.145***	0.086, 0.205
Direct effect	0.146***	0.086, 0.205
Indirect effect	-0.000	-0.002, 0.001
Mediator: Hopelessness (n=6,407)		
Total effect	0.150***	0.090, 0.209
Direct effect	0.149***	0.090, 0.209
Indirect effect	0.001	-0.002, 0.003
Mediator: Optimism (n=6,372)		
Total effect	0.151***	0.091, 0.210
Direct effect	0.150***	0.090, 0.210
Indirect effect	0.000	-0.001, 0.003
Mediator: Pessimism (n=6,371)		
Total effect	0.151***	0.091, 0.210
Direct effect	0.150***	0.091, 0.210
Indirect effect	0.000	-0.001, 0.002
Mediator: Cynical hostile (n=6,260)		
Total effect	0.159***	0.102, 0.215
Direct effect	0.158***	0.102, 0.214
Indirect effect	0.000	-0.003, 0.004
Mediator: Perceived constrain (n=6,392)		
Total effect	0.148***	0.089, 0.208
Direct effect	0.148***	0.089, 0.208
Indirect effect	0.000	-0.001, 0.001
Mediator: Perceived mastery (n=6,393)		
Total effect	0.148***	0.089, 0.208
Direct effect	0.149***	0.090, 0.208
Indirect effect	-0.001	-0.001, 0.001
Mediator: Neuroticism (n=6,372)		
Total effect	0.145***	0.085, 0.204
Direct effect	0.144***	0.085, 0.204
Indirect effect	0.000	-0.001, 0.001
Mediator: Extraversion (n=6,380)		
Total effect	0.144***	0.084, 0.203
Direct effect	0.144***	0.084, 0.203
Indirect effect	0.000	-0.001, 0.001
Mediator: Conscientiousness (n=6,372)		
Total effect	0.146***	0.086, 0.205
Direct effect	0.145***	0.086, 0.205
Indirect effect	0.000	-0.001, 0.002

Mediator: Agreeableness (n=6,377)		
Total effect	0.145***	0.086, 0.205
Direct effect	0.145***	0.086, 0.205
Indirect effect	0.000	-0.001, 0.001
Mediator: Openness (n=6,356)		
Total effect	0.143***	0.084, 0.203
Direct effect	0.143***	0.083, 0.202
Indirect effect	0.001	-0.001, 0.003

*p<0.05; **p<0.01; ***p<0.001

Mediation analyses for normal weight vs. obesity are not presented.

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, years in education, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Notes: Using inverse probability weighting, single mediation models were also developed for **obesity classes vs. overweight**, but no mediation by any psychosocial measures was statistically significant at p<0.05 (*findings are not presented*).

Table C5. Single mediation models for physiological dysregulation assessed as the number of biomarkers exceeding a given cut-off point using inverse probability weighting (**Obesity vs. Non-obesity**)

Mediation models (Reference group: non-obesity [BMI < 30 kg/m ²])	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms (n=7,332)			
Total effect	0.188***	0.142, 0.234	
Direct effect	0.188***	0.143, 0.234	
Indirect effect	-0.000	-0.001, 0.001	
Mediator: Life satisfaction (n=6,395)			
Total effect	0.205***	0.155, 0.255	
Direct effect	0.205***	0.155, 0.254	
Indirect effect	0.000	-0.000, 0.000	
Mediator: Loneliness (n=6,380)			
Total effect	0.209***	0.159, 0.258	
Direct effect	0.209***	0.159, 0.258	
Indirect effect	-0.000	-0.001, 0.001	
Mediator: Social support (n=6,430)			
Total effect	0.204***	0.154, 0.254	
Direct effect	0.203***	0.153, 0.253	
Indirect effect	0.001	-0.001, 0.003	
Mediator: Social strain (n=6,427)			
Total effect	0.203***	0.153, 0.252	
Direct effect	0.202***	0.152, 0.252	
Indirect effect	0.001	-0.001, 0.003	
Mediator: Weight stigma (n=6,402)			
Total effect	0.203***	0.153, 0.253	
Direct effect	0.196***	0.144, 0.247	
Indirect effect	0.007	-0.005, 0.020	
Mediator: Positive affect (n=6,370)			
Total effect	0.202***	0.152, 0.252	
Direct effect	0.201***	0.151, 0.251	
Indirect effect	0.001	-0.001, 0.003	
Mediator: Negative affect (n=6,378)			
Total effect	0.205***	0.155, 0.255	
Direct effect	0.205***	0.155, 0.255	
Indirect effect	0.000	-0.001, 0.001	
Mediator: Purpose in life (n=6,349)			
Total effect	0.206***	0.156, 0.257	
Direct effect	0.207***	0.157, 0.257	
Indirect effect	-0.000	-0.003, 0.002	

Mediator: Anxiety (n=6,385)		
Total effect	0.202***	0.152, 0.251
Direct effect	0.202***	0.152, 0.251
Indirect effect	-0.000	-0.001, 0.001
Mediator: Hopelessness (n=6,407)		
Total effect	0.206***	0.157, 0.256
Direct effect	0.206***	0.156, 0.256
Indirect effect	0.001	-0.001, 0.002
Mediator: Optimism (n=6,372)		
Total effect	0.207***	0.157, 0.257
Direct effect	0.206***	0.156, 0.256
Indirect effect	0.000	-0.001, 0.002
Mediator: Pessimism (n=6,371)		
Total effect	0.208***	0.158, 0.258
Direct effect	0.208***	0.158, 0.258
Indirect effect	0.000	-0.001, 0.001
Mediator: Cynical hostile (n=6,260)		
Total effect	0.203***	0.153, 0.254
Direct effect	0.202***	0.152, 0.253
Indirect effect	0.001	-0.001, 0.003
Mediator: Perceived constrain (n=6,392)		
Total effect	0.207***	0.158, 0.257
Direct effect	0.207***	0.157, 0.257
Indirect effect	0.000	-0.000, 0.001
Mediator: Perceived mastery (n=6,393)		
Total effect	0.206***	0.156, 0.256
Direct effect	0.206***	0.156, 0.256
Indirect effect	-0.000	-0.001, 0.001
Mediator: Neuroticism (n=6,372)		
Total effect	0.206***	0.156, 0.256
Direct effect	0.205***	0.155, 0.255
Indirect effect	0.001	-0.001, 0.003
Mediator: Extraversion (n=6,380)		
Total effect	0.204***	0.154, 0.254
Direct effect	0.204***	0.154, 0.254
Indirect effect	0.000	-0.001, 0.001
Mediator: Conscientiousness (n=6,372)		
Total effect	0.206***	0.156, 0.256
Direct effect	0.206***	0.156, 0.256
Indirect effect	0.000	-0.002, 0.002

Mediator: Agreeableness (n=6,377)		
Total effect	0.205***	0.155, 0.254
Direct effect	0.205***	0.155, 0.254
Indirect effect	-0.000	-0.000, 0.000
Mediator: Openness (n=6,356)		
Total effect	0.204***	0.154, 0.254
Direct effect	0.204***	0.154, 0.254
Indirect effect	-0.000	-0.001, 0.001

*p<0.05; **p<0.01; ***p<0.001

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, years in education, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Notes: Using inverse probability weighting, single mediation models for physiological dysregulation assessed as the number of biomarkers exceeding a given cut-off point were also developed for **obesity classes vs. normal weight**, but no mediation by any psychosocial measures was statistically significant at p<0.05 (*findings are not presented*).

Table C6. Single mediation models of changes in psychological measures between baseline and follow-up waves using inverse probability weighting (**Obesity vs. Non-obesity**)

Mediation models (<i>Reference group: non-obesity [BMI < 30 kg/m²]</i>)	Point estimates	95% CI	Effect ratio
Mediator: Depressive symptoms (n=7,331)			
Total effect	0.170***	0.120, 0.219	
Direct effect	0.170***	0.120, 0.219	
Indirect effect	0.000	-0.000, 0.001	
Mediator: Life satisfaction (n=5,802)			
Total effect	0.170***	0.117, 0.223	
Direct effect	0.170***	0.117, 0.223	
Indirect effect	-0.000	-0.001, 0.001	
Mediator: Loneliness (n=5,780)			
Total effect	0.172***	0.118, 0.225	
Direct effect	0.172***	0.118, 0.225	
Indirect effect	-0.000	-0.002, 0.002	
Mediator: Social support (n=5,884)			
Total effect	0.170***	0.117, 0.223	
Direct effect	0.170***	0.117, 0.223	
Indirect effect	0.000	-0.001, 0.002	
Mediator: Social strain (n=5,876)			
Total effect	0.169***	0.116, 0.222	
Direct effect	0.168***	0.115, 0.221	
Indirect effect	0.001	-0.001, 0.002	
Mediator: Weight stigma (n=5,795)			
Total effect	0.166***	0.113, 0.219	
Direct effect	0.145***	0.091, 0.198	
Indirect effect	0.021**	0.008, 0.035	12.9%
Mediator: Positive affect (n=5,765)			
Total effect	0.164***	0.110, 0.217	
Direct effect	0.165***	0.112, 0.218	
Indirect effect	-0.001	-0.004, 0.001	
Mediator: Negative affect (n=5,775)			
Total effect	0.166***	0.113, 0.219	
Direct effect	0.166***	0.112, 0.219	
Indirect effect	0.000	-0.001, 0.001	
Mediator: Purpose in life (n=5,733)			
Total effect	0.170***	0.117, 0.223	
Direct effect	0.170***	0.117, 0.223	
Indirect effect	-0.000	-0.002, 0.002	
Mediator: Hopelessness (n=5,771)			
Total effect	0.173***	0.120, 0.226	
Direct effect	0.173***	0.120, 0.226	
Indirect effect	0.000	-0.002, 0.002	

Mediator: Optimism (n=5,742)		
Total effect	0.174***	0.121, 0.227
Direct effect	0.173***	0.120, 0.226
Indirect effect	0.001	-0.001, 0.002
Mediator: Pessimism (n=5,744)		
Total effect	0.173***	0.120, 0.227
Direct effect	0.173***	0.120, 0.227
Indirect effect	0.000	-0.001, 0.001
Mediator: Perceived constrain (n=5,780)		
Total effect	0.170***	0.117, 0.223
Direct effect	0.170***	0.117, 0.223
Indirect effect	-0.001	-0.002, 0.001
Mediator: Perceived mastery (n=5,784)		
Total effect	0.166***	0.113, 0.219
Direct effect	0.167***	0.114, 0.220
Indirect effect	-0.001	-0.002, 0.001
Mediator: Neuroticism (n=5,768)		
Total effect	0.163***	0.109, 0.216
Direct effect	0.163***	0.109, 0.216
Indirect effect	0.000	-0.000, 0.001
Mediator: Extraversion (n=5,780)		
Total effect	0.161***	0.108, 0.214
Direct effect	0.162***	0.109, 0.216
Indirect effect	-0.001	-0.003, 0.001
Mediator: Conscientiousness (n=5,768)		
Total effect	0.164***	0.110, 0.217
Direct effect	0.163***	0.110, 0.217
Indirect effect	0.000	-0.001, 0.001
Mediator: Agreeableness (n=5,775)		
Total effect	0.163***	0.110, 0.216
Direct effect	0.165***	0.112, 0.218
Indirect effect	-0.002	-0.004, 0.001
Mediator: Openness (n=5,738)		
Total effect	0.161***	0.107, 0.214
Direct effect	0.161***	0.108, 0.214
Indirect effect	-0.000	-0.001, 0.001

*p<0.05; **p<0.01; ***p<0.001

Changes in or difference scores of psychological measures between baseline and follow-up were fitted, except for anxiety and cynical hostility which were only available at baseline.

All mediation models were adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, years in education, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Notes: Using inverse probability weighting, single mediation models fitting changes in or difference scores of psychological measures between baseline and follow-up were also developed for **obesity classes vs. normal weight**. Only mediation by changes in weight stigma for Class II & III obesity vs. normal weight was statistically significant (indirect effect point estimate= 0.041; 95%CI= 0.014-0.068; $p<0.01$) with an effect ratio of 15.5% (*other findings are not presented*).

Notes: Using inverse probability weighting, single mediation models fitting changes in or difference scores of psychological measures between baseline and follow-up were also developed for **obesity vs. overweight** and **obesity classes vs. overweight**. Only mediation by changes in weight stigma was statistically significant. Mediation by changes in weight stigma was 15.2% (effect ratio) for **obesity vs. overweight** (indirect effect point estimate= 0.021; 95%CI= 0.008-0.034; $p<0.01$), and 22.5% (effect ratio) for **Class II & III obesity vs. overweight** (indirect effect point estimate= 0.039; 95%CI= 0.013-0.066; $p<0.01$) (*other findings are not presented*).

Table C7. Associations between each psychological measure and physiological dysregulation using inverse probability weighting

Psychological measures	β	95% CI
Depressive symptoms (n=7,332)	0.003	-0.011, 0.017
Life satisfaction (n=6,395)	0.001	-0.003, 0.004
Loneliness (n=6,380)	-0.002	-0.019, 0.016
Social support (n=6,430)	0.010	-0.038, 0.058
Social strain (n=6,427)	0.026	-0.030, 0.081
Weight stigma (<i>yes vs. no</i>) (n=6,402)	0.025	-0.082, 0.133
Positive affect (n=6,370)	-0.001	-0.003, 0.002
Negative affect (n=6,378)	-0.000	-0.004, 0.003
Purpose in life (n=6,349)	-0.000	-0.005, 0.004
Anxiety (n=6,385)	0.001	-0.008, 0.011
Hopelessness (n=6,407)	0.005	-0.001, 0.010
Optimism (n=6,372)	0.004	-0.003, 0.012
Pessimism (n=6,371)	0.005	-0.003, 0.012
Cynical hostility (n=6,260)	0.007**	0.002, 0.012
Perceived constrain (n=6,392)	0.001	-0.004, 0.005
Perceived mastery (n=6,393)	0.003	-0.002, 0.007
Neuroticism (n=6,372)	-0.004	-0.014, 0.006
Extraversion (n=6,380)	-0.003	-0.012, 0.007
Conscientiousness (n=6,372)	-0.004	-0.015, 0.006
Agreeableness (n=6,377)	0.004	-0.007, 0.014
Openness (n=6,356)	0.004	-0.004, 0.011

*p<0.05; **p<0.01; ***p<0.001

Separate regression models were developed for each psychological measure.

All regression models were adjusted for obesity status, baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, years in education, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Table C8. Associations between all psychological measures together and physiological dysregulation using inverse probability weighting

Psychological measures (n=5,920)	β	95% CI
Depressive symptoms	0.000	-0.018, 0.019
Life satisfaction	-0.000	-0.005, 0.004
Loneliness	-0.011	-0.033, 0.011
Social support	0.028	-0.030, 0.085
Social strain	0.011	-0.055, 0.077
Weight stigma (<i>yes vs. no</i>)	0.015	-0.097, 0.127
Positive affect	-0.001	-0.005, 0.003
Negative affect	0.000	-0.006, 0.006
Purpose in life	-0.000	-0.006, 0.005
Anxiety	0.001	-0.011, 0.013
Hopelessness	0.002	-0.007, 0.011
Optimism	0.003	-0.006, 0.012
Pessimism	0.002	-0.009, 0.012
Cynical hostility	0.007*	0.001, 0.012
Perceived constrain	0.002	-0.004, 0.008
Perceived mastery	0.004	-0.001, 0.009
Neuroticism	-0.010	-0.024, 0.004
Extraversion	-0.009	-0.021, 0.003
Conscientiousness	-0.010	-0.023, 0.004
Agreeableness	0.010	-0.004, 0.023
Openness	0.005	-0.004, 0.014

*p<0.05; **p<0.01; ***p<0.001

The regression model was adjusted for obesity status, baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, years in education, and household wealth.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.

Table C9. Single mediation models testing changes in weight stigma as a mediator taking into account changes in BMI between baseline and follow-up waves using inverse probability weighting

Mediator: Weight stigma (n=5,647)	Point estimates	95% CI	Effect ratio
(Reference group: non-obesity [BMI < 30 kg/m²])			
Total effect	0.217***	0.164, 0.271	
Direct effect	0.201***	0.146, 0.256	
Indirect effect	0.016*	0.003, 0.030	7.5%
(Reference group: normal weight [BMI < 25 kg/m²])^a			
<i>Class I obesity</i>			
Total effect	0.239*	0.166, 0.311	
Direct effect	0.231*	0.159, 0.304	
Indirect effect	0.007	-0.002, 0.017	
<i>Class II & III obesity</i>			
Total effect	0.369***	0.282, 0.456	
Direct effect	0.343***	0.253, 0.433	
Indirect effect	0.036	-0.002, 0.055	7.1%

*p<0.05; **p<0.01; ***p<0.001

^aFor testing different obesity classes, mediation analyses for overweight vs. normal weight are not presented. The mediation model was adjusted for baseline physiological dysregulation, age, age2, sex, paid employment status, ethnicity, marital status, years in education, household wealth, and **changes in BMI between baseline and follow-up waves**.

Statistical-significance levels and 95% confidence intervals (CI) are based on models using robust standard errors.