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# Positive Psychological Constructs and Lifestyle Behaviours in a Community-Based Sample

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**Abstract:** Previous studies have demonstrated an association between positive psychological constructs and health behaviours. However, there is evidence to suggest that these constructs might relate differently to different health behaviours, serving both as facilitators and barriers depending on the health behaviour that is selected. The current study taps into this association by examining the role of multiple positive constructs (psychological flexibility, optimism, mindfulness and trait happiness) in relation to multiple health behaviours and constructs (smoking, alcohol consumption, Body Mass Index (BMI), and physical activity levels) in a large community-based sample. A cross-sectional study was conducted among Dutch volunteers from the general population. A total of 859 participants completed questionnaires to assess positive constructs and health behaviours. Cox Regression was used to answer the research question. The sample had a mean age of 48.2 ± 16.8, and consisted of 447 (52%) female participants. The results showed that psychological flexibility was positively associated with physical activity levels in age- and sex-adjusted models. Optimism was associated with a higher BMI. After adjusting for covariates both associations became non-significant. While a trend was observed, current findings indicate that positive constructs are not strongly related to health behaviours in a healthy adult sample. More research is needed to disentangle these associations and to evaluate whether this information can inform future development of interventions. The findings are to some extent in line with previous studies showing that positive constructs might be a facilitator and barrier towards health behaviour change.

**Keywords:** Positive Psychology, Lifestyle, Health Behaviour, Optimism, Psychological Flexibility

## 1. Introduction

Lifestyle-related diseases (such as cardiovascular diseases and type 2 diabetes mellitus) contribute to 71% [1] of the global disease burden and are the leading cause of death worldwide [2]. The shared predisposing behavioural risk factors of lifestyle related diseases include insufficient physical activity, poor diet, smoking, excessive alcohol consumption, and impaired sleep [1]. By eliminating or attenuating these behavioural risk factors, 80-90% of cardiovascular disease, stroke, and type 2 diabetes mellitus could be prevented [3-5]. In addition, a recent report showed that 95% of all COVID-19 hospital admissions and/or mortality rates can largely be attributed to lifestyle related disorders such as obesity and type 2 diabetes mellitus [6]. Hence, it is important to determine which factors are related to a healthy lifestyle in order to inform lifestyle intervention development and prevent adverse outcomes.

Changing lifestyle behaviours is often easier said than done and only a minority of people succeed in sustainable

health behaviour change [7]. The barriers to engage in healthy lifestyle behaviours have been examined over the past years with for example lack of time, lack of knowledge, financial costs, lower socio-economic status, ethnic minority background in industrialized countries, and high distress being associated with poor lifestyle behaviour [8-10]. Only recently, the *facilitators* that could contribute to a healthier lifestyle have gained more attention [11, 12].

Theories emerging from the field of positive psychology have outlined the potential facilitating role of positive psychological constructs (e.g. optimism, positive affect, gratitude) in health behaviour [13]. For example, the *Upward Spiral Theory of Lifestyle Change* [14] proposes that unconscious motivation increases when positive affect is experienced during engagement in health behaviour, which contributes to sustainable behaviour change. The *Relational Frame Theory* based *Acceptance and Commitment Therapy* approach, aims to increase psychological flexibility and facilitate long-term health behaviour change through, committed, value oriented acts [15]. Within this approach the goal is not to address difficult thoughts and feelings directly but to cultivate mindfulness- and acceptance-based skills to increase behavioural regulation.

While informative, the majority of the studies tapping into positive psychological constructs and health behaviours have focused on the role of one of the constructs (mainly mindfulness, optimism, and positive affect) in relation to one lifestyle behaviour (mainly physical activity) [16-18]. In addition, previous studies have shown that positive constructs are not similarly associated with specific lifestyle behaviours [19]. Hence, this leaves an evidence gap regarding which positive constructs are related to which specific health behaviours.

The current study examines the role of multiple positive psychological constructs (psychological flexibility, optimism, mindfulness and trait happiness) in relation to multiple lifestyle behaviours (smoking, alcohol consumption, body mass index (BMI) and physical activity), in a large, cross-sectional study among adults from the general community. Analyses will be adjusted for age and sex as well as other potentially confounding variables.

# 2. Materials and Methods

### *2.1. Study Design and Participants*

Participants were recruited as part of an annually distributed cross-sectional survey using age- and sex-stratified non-random quota sampling methods. Data were collected between October and December 2020. Recruitment was performed by second-year students in the Psychology bachelor's program of Tilburg University. Participants from the general population were included establishing an equal distribution of sexes and an even distribution across age groups. The study was approved by the Ethics Review Board of the Tilburg School of Social and Behavioural Sciences of Tilburg University (#RP-055) and all participants signed consent prior to completing the questionnaires. *Inclusion criteria* were being aged 18-85 years, and proficient in the Dutch language. Details of the recruitment and methods have been described previously [20, 21].

After having indicated to be interested in participating in the study, potential participants received an e-mail, containing an online link to the informed consent form and the online questionnaires. The questionnaires were completed via the Qualtrics data acquisition program (www.qualtrics.com).

In total, 958 participants filled out the questionnaire. Participants with missing data for any psychological predictor ($N$=57), missing data for the lifestyle score outcome ($N$=30) and/or missing data for any covariate ($N$=12) were excluded. The final sample for analysis consisted therefore of $N$=859 participants.

### *2.2. Measures*

All variables were assessed using self-report questionnaires. For the demographic variables (age, sex, marital status, working status, and education level), and lifestyle related variables (smoking, alcohol consumption, BMI, and physical activity) questions design for the purposes of this project were assessed. For the positive psychological constructs, validated questionnaires were used.

#### *2.2.1. Positive Psychological Constructs*

***(i). Psychological Flexibility***

To assess psychological flexibility, the 20-item Psychological Flexibility Questionnaire (PFQ) [22] was used. Participants indicated on a 6-point Likert scale, ranging from 1 (not at all) to 6 (very much) to what extend they agreed with statements relevant to flexibility. An example of a statement is: *"I feel ready to accept future changes"*. The total score was used for analyses (range = 20 – 120) with a higher score indicating higher levels of psychological flexibility. The internal consistency of the PFQ is good (Cronbach's α in the current sample = 0.90).

***(ii). Optimism***

Optimism was assessed using the 10-item Life Orientation Test – Revised (LOT-R) [23, 24] questionnaire. Participants indicated through a 5-point Likert scale ranging from 0 (strongly disagree) to 4 (strongly agree) to what extent they agreed with the statements. An example statement for optimism is: *"In uncertain times, I usually expect the best"*. Of the 10 items, 3 assess optimism and 3 assess pessimism. The remaining 4 items are considered filler items and do not contribute to the total LOT-R score. The total score ranges between 0 and 12, with a higher score indicating higher levels of optimism. The LOT-R has good psychometric properties (Cronbach's α in the current sample = 0.79).

***(iii). Mindfulness***

Mindfulness was assessed with the 15-item Five-Facet Mindfulness Questionnaire (FFMQ-15). Participants indicated on a 5-point Likert scale ranging from 1 (never or

very rarely true) to 5 (very often or always true) [25] to what extent they agreed with statements related to mindfulness. An example statement is: *"I can calm down soon after experiencing distressing thoughts and impulses."* The total score on the scale ranges between 15 and 75 with a higher score indicating higher levels of mindfulness. The internal consistency of the FFMQ is good (Cronbach's α for the current sample = 0.78).

***(iv). Trait Happiness***

To assess happiness, the 4-item Subjective Happiness Scale (SHS) was used [26]. Participants indicated their response on a 7-point Likert scale ranging from 1 to 7. The meaning of the answers differs per question, but generally 1 indicates an unhappy statement and 7 indicates a happy statement (apart from the fourth question, which is reverse scored). An example statement is: *"In general I consider myself to be",* where the responses range from 1 (*not a very happy person)* to 7 *(a very happy person)* ". The total score of the scale ranges between 4 and 28 with a higher score indicating higher levels of trait happiness. The SHS is a measure with good psychometric properties (Cronbach's α = 0.83 in the current sample).

***2.2.2. Outcome Measures: Lifestyle Indicators***

As outcome measure, a composite lifestyle score was calculated based on smoking, alcohol consumption, BMI, and physical activity. One point was assigned for each healthy behaviour (non-smoking, low alcohol consumption (less than 1 alcoholic consumptions / month), BMI under 25 kg/m$^2$, sufficient physical activity (> 30 min per day; see below for a detailed description) and therefore the total composite score ranged from 0 to 4. In order to identify individuals with an overall healthy lifestyle, participants were categorized as having a low lifestyle score (score of < 2) or a high lifestyle score (≥ 2) with a higher score indicating a healthier lifestyle.

Smoking was categorized as never or former (1 point) and current (0 points). For alcohol consumption, frequency was assessed and categorized as never or less than once per month (1 point) and 2-4 times per month, 2-3 times per week or more than 4 times per week (0 points). BMI was calculated weight (kg) / height (m) squared and dichotomized into healthy weight (< 25 kg/m$^2$, 1 point) and overweight (≥ 25 kg/m$^2$, 0 points). Three questions were used for the physical activity component. Two open questions assessed minutes per week spent on all physical activities (e.g. walking, biking, gardening, housework and exercising) and hours per week spent on sports (e.g. soccer, basketball and running). Furthermore, the number of times per week spent on muscle or bone strengthening exercises was assessed. Dutch guidelines for physical activity recommend being moderately physically active for at least 2.5 hours/week and performing muscle- and bone enhancing activities twice per week [27]. Therefore, the physical activity component consisted of ≥ 150 minutes/week on total physical activity or ≥ 2.5 hours/week on sports, in combination with > 2 times/week muscle- and bone enhancing activities (1 point), either one of these or neither (0 points).

***2.2.3. Covariates***

*Demographic covariates:* Demographic covariates were age, sex, marital status (married vs. divorced, single or widowed), and level of education (in years).

*Psychological covariates:* Depressive symptoms were measured with the Patient Health Questionnaire (PHQ-9) [28]. Participants indicated on a 4-point Likert scale ranging from 0 (not at all) to 3 (nearly every day) to what extent they experience feelings pertaining to depressive symptoms. An example question is: *"(Are you) Feeling down, depressed, or hopeless?"* The total PHQ-9 score ranges between 0 and 27 with a higher score indicating higher depressive symptomatology (Cronbach's α in the current sample = 0.84).

Psychological distress levels in the past month were assessed using the 10-item Perceived Stress Scale (PSS). Items were rated using a 5-point Likert scale ranging from 0 (never) to 4 (very often) [29] (example item: *"In the last month, how often have you been upset because of something that happened unexpectedly?")*. Scores range from 0 to 40, with a higher score indicating a higher perceived level of perceived stress (Cronbach's α for the current sample = 0.85).

***2.3. Statistical Analysis***

Characteristics of the study sample are reported as mean and standard deviation (SD) for continuous variables and N (%) for categorical variables. To assess potential selection bias, we compared characteristics of the included sample and characteristics of the excluded sample (who had missing data on outcome variables) with Student's t-tests for normally distributed continuous variables, Mann-Whitney U tests for non-normally distributed continuous variables, and chi-square tests for categorical variables.

The association between the psychological constructs (continuous "predictor" variables) and the dichotomous composite score and the lifestyle constructs (dichotomous "outcome" variables) was examined using Cox regression with constant time at risk for dichotomous outcome variables. Specifically, this procedure reveals prevalence ratios (PRs) and 95% confidence intervals for the dichotomous outcomes and is superior to odds ratios based on standard logistic regression models because the latter overestimates the strength of the associations when the prevalence of outcomes is high [30] as is the case in the present study (see Results). Univariate PRs and 95% confidence intervals were computed for each association of positive psychological constructs with health behavior outcomes (crude and covariate-adjusted associations not shown for the overall lifestyle score, non-smoking, low use of alcohol, BMI below 25 kg/m$^2$ and sufficient physical activity). We first present unadjusted associations. The first multivariable model adjusted for age and sex. The second model further included level of education, job status and partner status in the model. Subsequently, the third model additionally adjusted for depressive symptoms and perceived level of stress.

# 3. Results

### *3.1. Participant Characteristics*

Characteristics of the 859 participants are presented in Table 1. The mean age was 48.2 ± 16.8 years and 52% were women. Most participants had a partner (*N*=650, 75.7%), had a high educational level (*N*=437, 50.9%) and were employed (*N*=595, 69.3%). More than half of the participants (*N*=519, 60.4%) had a high lifestyle score.

***Table 1.*** *Demographic and psychological characteristics of the total sample, and of the groups with a high and low lifestyle score.*

| | Total Sample (n = 859) ‡ | Low lifestyle score (n = 340, 39.6%) ‡ | High lifestyle score (n = 519, 60.4%) ‡ | *P* |
|---|---|---|---|---|
| Sex, women | 447 (52%) | 147 (32.9%) | 300 (67.1%) | <0.001 |
| Age in years | 48.2 ± 16.8 | 51 ± 15.8 | 46.3 ± 3.8 | <0.001 |
| Level of education | | | | 0.14 |
| Low | 119 (13.9%) | 46 (38.3%) | 73 (61.3%) | |
| Intermediate | 303 (35.3%) | 130 (42.9%) | 173 (57.1%) | |
| High | 437 (50.9%) | 164 (37.5%) | 273 (62.5%) | |
| Working | 595 (69.3%) | 101 (29.7%) | 163 (61.7%) | 0.28 |
| With partner | 650 (75.7%) | 269 (41.4%) | 381 (58.6%) | 0.57 |
| Perceived stress score† | 11 (7, 16) | 11 (7, 16) | 11 (8, 16) | 0.18 |
| Depressive symptoms score† | 3 (1, 5) | 2,5 (1, 5.75) | 3 (1, 5) | 0.43 |
| Psychological flexibility † | 90 (82, 96) | 90 (82.3, 96.5) | 90 (82, 96) | 0.42 |
| Subjective happiness † | 22 (19, 25) | 23 (19, 25) | 22 (19, 25) | 0.61 |
| Mindfulness † | 51.8 ± 7.4 | 52.1 ± 7.4 | 51.6 ± 7.4 | 0.40 |
| Optimism † | 8 (6, 9) | 8 (6, 9) | 8 (6, 9) | 0.51 |

†Maximum score on psychological flexibility (PFQ): 120, Maximum score on subjective happiness scale (SHS): 28, Maximum score on mindfulness (FFMQ-II): 75, Maximum score on optimism (LOT-R optimism subscale): 12, ‡N(%), Mean ± SD, Median (Q1, Q3).

Participants excluded from the analysis (*N*=99) had a significantly higher flexibility score ($M$ = 4.67, $SD$ = 5.14), as compared to included participants ($t(920) = 1.76$, $p$ <0.001), but other characteristics did not differ significantly compared to the sample included for the present analysis.

The overall lifestyle in this sample was healthy, with 60% having a high lifestyle score. Specifically, 88% were non-smoking, 29% had a low use of alcohol, 55% had a healthy BMI (< 25 kg/m$^2$) and 36% engaged in sufficient physical activity.

***Table 2.*** *The association between psychological constructs with lifestyle score.*

| | High lifestyle score (n = 340, 39.6%) ‡ | |
|---|---|---|
| | PR (95% CI) | *P* |
| Psychological flexibility | | |
| Model 0 | 0.95 (0.87; 1.04) | 0.27 |
| Model 1 | 0.94 (0.87; 1.03) | 0.19 |
| Model 2 | 0.93 (0.85; 1.02) | 0.12 |
| Model 3 | 0.92 (0.84; 1.01) | 0.08 |
| Optimism | | |
| Model 0 | 0.92 (0.83; 1.02) | 0.11 |
| Model 1 | 0.93 (0.84; 1.03) | 0.18 |
| Model 2 | 0.93 (0.84; 1.04) | 0.19 |
| Model 3 | 0.93 (0.83; 1.04) | 0.19 |
| Mindfulness | | |
| Model 0 | 0.98 (0.90; 1.07) | 0.60 |
| Model 1 | 1.02 (0.93; 1.11) | 0.69 |
| Model 2 | 1.02 (0.93; 1.12) | 0.67 |
| Model 3 | 1.00 (0.90; 1.12) | 0.97 |
| Subjective happiness | | |
| Model 0 | 0.98 (0.90; 1.07) | 0.72 |
| Model 1 | 1.02 (0.92; 1.10) | 0.85 |
| Model 2 | 1.01 (0.92; 1.11) | 0.82 |
| Model 3 | 0.98 (0.88; 1.09) | 0.68 |

Reference = Low lifestyle score N=519, (60.4%)

Model 0 unadjusted model. Model 1 adjusted for age and sex. Model 2 adjusted for age, sex, level of education, job status and partner status. Model 3 adjusted for age, sex, level of education, job status, partner status, depressive symptoms and stress. Abbreviation: PR; Prevalence ratios, CI: confidence intervals.

### *3.2. Associations Between Positive Psychological Constructs and Composite Lifestyle Score*

The associations between the psychological variables with the composite lifestyle score are shown in Table 2. Analysis revealed that psychological flexibility, optimism, mindfulness, and subjective happiness were not associated with the composite lifestyle score. Of the confounders,

female sex (PR 0.54, 95% CI 0.40-0.71, $p$ <0.001) and younger age (PR 0.98, 95% CI 0.97-0.99, $p$ <0.001) were significantly associated with the composite lifestyle score. None of the other covariates were significantly associated with the lifestyle score (data not shown).

### *3.3. Association Between Positive Psychological Constructs and Specific Lifestyle Components*

In Table 3 the associations between the four positive psychological constructs and the separate lifestyle components are displayed. Results showed that in the unadjusted models, higher psychological flexibility was associated with higher alcohol consumption and more physical activity, while optimism was associated with overweight. The sex- and age adjusted models showed that psychological flexibility was [marginally] associated with sufficient physical activity (PR 1.13, 95% CI 1.00-1.27, $p$ = 0.05) and that optimism was associated with more overweight in age and sex adjusted models (PR 0.90, 95% CI 0.81-0.99, p = 0.05). Both these associations were no longer significant after adjusting for additional confounders (see Table 3, Model 2 & 3). No other significant associations between positive constructs and lifestyle components were observed.

***Table 3.*** *The association between psychological constructs (scores, continuous) and the prevalence of being a non-smoker or a former smoker, not drinking or drinking < 1/week, having a healthy BMI and being sufficiently physically active (dichotomous scores).*

| | **Not or formerly smoking (reference: smoker)** | | **No drinking or < 1/week (reference: drinking ≥ 1/week)** | | **Healthy BMI (<25 kg/m$^2$) (reference BMI ≥ 15 kg/m$^2$)** | | **Sufficient physical activity (reference: exercising < 150 minutes/week and no muscle enhancing exercises)** | |
|---|---|---|---|---|---|---|---|---|
| | **PR (95% CI)** | ***P*** | **PR (95% CI)** | ***P*** | **PR (95% CI)** | ***P*** | **PR (95% CI)** | ***P*** |
| Psychological flexibility | | | | | | | | |
| Model 0 | 0.98 (0.92; 1.06) | 0.65 | 0.89 (0.79; 1.00) | 0.05 | 0.97 (0.91; 1.09) | 0.93 | 1.15 (1.02; 1.29) | 0.02 |
| Model 1 | 0.99 (0.92; 1.06) | 0.70 | 0.89 (0.79; 1.00) | 0.05 | 0.98 (0.89; 1.07) | 0.63 | 1.13 (1.00; 1.27) | 0.05 |
| Model 2 | 0.98 (0.91; 1.05) | 0.51 | 0.91 (0.81; 1.03) | 0.14 | 0.96 (0.87; 1.06) | 0.39 | 1.11 (0.98; 1.25) | 0.10 |
| Model 3 | 0.96 (0.89; 1.04) | 0.32 | 0.89 (0.78; 1.01) | 0.08 | 0.97 (0.87; 1.07) | 0.50 | 1.10 (0.96; 1.25) | 0.17 |
| Optimism | | | | | | | | |
| Model 0 | 1.01 (0.93; 1.10) | 0.77 | 0.89 (0.77; 1.02) | 0.10 | 0.89 (0.80; 0.98) | 0.02 | 1.01 (0.88; 1.15) | 0.93 |
| Model 1 | 1.10 (0.93; 1.10) | 0.78 | 0.91 (0.78; 1.05) | 0.17 | 0.90 (0.81; 1.00) | 0.05 | 1.00 (0.87; 1.14) | 0.96 |
| Model 2 | 1.01 (0.93; 1.08) | 0.82 | 0.91 (0.79; 1.05) | 0.20 | 0.90 (0.81; 1.00) | 0.07 | 1.00 (0.87; 1.14) | 0.99 |
| Model 3 | 1.00 (0.91; 1.09) | 0.96 | 0.89 (0.76; 1.04) | 0.13 | 0.91 (0.81; 1.02) | 0.10 | 0.98 (0.85; 1.14) | 0.83 |
| Mindfulness | | | | | | | | |
| Model 0 | 1.01 (0.94; 1.08) | 0.83 | 1.01 (0.90; 1.15) | 0.83 | 0.95 (0.87; 1.04) | 0.27 | 1.00 (0.90; 1.12) | 0.99 |
| Model 1 | 1.00 (0.93; 1.08) | 0.97 | 1.04 (0.92; 1.18) | 0.55 | 1.02 (0.93; 1.12) | 0.72 | 1.06 (0.94; 1.19) | 0.32 |
| Model 2 | 1.00 (0.93; 1.08) | 0.97 | 1.05 (0.92; 1.20) | 0.45 | 1.02 (0.92; 1.12) | 0.76 | 1.06 (0.94; 1.19) | 0.35 |
| Model 3 | 0.97 (0.88; 1.06) | 0.50 | 1.06 (0.90; 1.24) | 0.50 | 1.02 (0.91; 1.15) | 0.70 | 1.02 (0.88; 1.17) | 0.80 |
| Subjective happiness | | | | | | | | |
| Model 0 | 1.02 (0.95; 1.10) | 0.59 | 0.92 (0.82; 1.03) | 0.16 | 0.98 (0.90; 1.07) | 0.64 | 1.00 (0.89; 1.11) | 0.93 |
| Model 1 | 1.01 (0.94; 1.09) | 0.73 | 0.91 (0.80; 1.03) | 0.12 | 1.03 (0.94; 1.13) | 0.50 | 1.08 (0.96; 1.21) | 0.21 |
| Model 2 | 1.01 (0.94; 1.09) | 0.82 | 0.91 (0.81; 1.03) | 0.15 | 1.04 (0.94; 1.14) | 0.45 | 1.08 (0.96; 1.21) | 0.22 |
| Model 3 | 0.98 (0.90; 1.08) | 0.71 | 0.86 (0.74; 1.01) | 0.06 | 1.03 (0.92; 1.16) | 0.58 | 1.04 (0.90; 1.20) | 0.61 |

Model 0 unadjusted model. Model 1 adjusted for age and sex. Model 2 adjusted for age, sex, level of education, job status and partner status. Model 3 adjusted for age, sex, level of education, job status, partner status, depressive symptoms and stress. Abbreviations: PR; Prevalence ratios, CI: confidence interval.

## 4. Discussion

In the current study positive psychology constructs were not strongly associated with lifestyle behaviours. The unadjusted models showed an association between psychological flexibility and higher alcohol intake and sufficient physical activity. Optimism was associated with overweight. After adjusting for age and sex, psychological flexibility was only associated with sufficient levels of physical activity, consistent with the hypothesized health-beneficial correlates of positive psychological factors. Optimism remained associated with a higher prevalence of overweight. Adjusting for additional covariates resulted in non-significant associations between positive constructs and health behaviours. As both psychological factors and health behaviors were based on self-report, it is not likely that these observations reflect an underestimate of the association between positive psychological constructs with beneficial health behaviours.

The strongest signal in the data indicates the beneficial role of psychological flexibility on physical activity levels which is in line with previous findings. Previous studies showed that being more psychologically flexible is associated with higher physical activity levels, acceptance of physical activity, and increased enjoyment of physical activity [31-34]. Being psychologically flexible supports choosing behaviours that are in line with long-term values (such as being healthy) despite existing barriers (e.g. distress, pain).

Our findings are in line with some [16, 35-38] but not all [15, 39] studies that have focused on the association between positive psychological constructs and health behaviours. Several previous studies showed that positive constructs are positively associated with healthy behaviours. There are multiple explanations possible why the current findings are not in line with the previous positive studies.

Studies show that the association between optimism and health behaviours is non-linear. Optimism is positively associated with health behaviours up until a certain level. When optimism is too high, it is referred to as 'unrealistic optimism' which has been shown to be negatively associated with health behaviours [40, 41]. In the current sample, optimism scores were relatively high (M=8; while 12 is the maximum score on the LOT-R) and may reflect the presence of unrealistic optimism. People who display this trait tend to underestimate the risk of their unhealthy behaviours on health outcomes and therefore engage less in healthy behaviours [42]. Second, studies show that positive constructs are probably more related to 'adopting' new health behaviours and less to 'maintaining' health behaviour [38]. Given that the current sample was relatively healthy and displayed multiple beneficial health behaviours, it could be speculated that positive constructs in this case had less impact on the outcome measures as these did not reflect engagement in new health behaviours. Third, evidence shows that the strength of the association between positive constructs and health behaviours is often lower than the association between negative constructs (e.g. distress, pessimism) and health behaviour [43] making it more difficult to observe significant associations in healthy samples.

The current findings should be interpreted in light of the study limitations. First, to assess the outcome variables self-report measures were used which may have resulted in recall- and social desirability bias. Second, the study used cross-sectional data to answer the research questions, hence, causality between constructs could not be determined. Third, the current sample was relatively healthy, showed high optimism scores, and consisted of higher educated participants. It is therefore difficult to generalize the present findings to the general population. Nevertheless, this is the first study to examine multiple positive constructs in relation to multiple lifestyle factors in a large sample (with equal distribution of men and women). Due to the large sample, we were able to include multiple variables in the statistical models and account for their possible impact.

For future studies it would be recommended to further examine the association between positive psychological constructs and lifestyle behaviours as our findings demonstrated a trend towards various associations. Current findings could be replicated in a longitudinal sample that is more representative of the general population and where bidirectional association between predictor and outcome variables could be examined. In addition, more accurate assessment of positive constructs and lifestyle behaviour using objective measures (e.g. smart watch, mobile app) would be advocated as this could prevent recall- and social desirability bias. Finally, it is worthwhile to examine the distribution of the optimism scale and determine when it reflects 'unrealistic optimism' with possible negative health outcomes. This approach could be used to indicate which people are at risk of displaying risky health behaviours. It will be valuable as the clinical practice could benefit from identifying facilitators of health behaviour in these vulnerable populations who are prone to adverse health outcomes.

# 5. Conclusion

Current findings did not find a strong association between positive constructs and health behaviours after adjusting for relevant covariates. While unadjusted and sex- and age- adjusted models showed an association between psychological flexibility and sufficient physical activity and optimism and overweight, the results became insignificant after further adjustment of the models. However, current findings show a trend that is in line with previous studies, indicating that positive constructs related differently to different health behaviours. While psychological flexibility might be a facilitator, (unrealistic) optimism might be a barrier to health behaviour. More research is needed to disentangle this relationship and the underlying mechanism and possibly inform intervention development.

# Declaration of Interest

The authors report no conflict of interest.

# Data Availability Statement

The data that support the findings of this study are available from the corresponding author, [MH], upon reasonable request.

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