

Dissertation

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Contents

Introduction	2
Mention the context of the research topic and why it is important.	2
Mention what is the research gap and why it matters.	3
Discuss how you will answer the research question.	3
Literature Review	3
Data and Methods	3
Data	3
Adult Dataset	4
Youths Dataset	4
Multigroup Structural Equation Modeling (SEM)	4
Latent Profile Analysis (LCA)	6
Results	6
SEM	6
LCA	7
Youths	7
Adults	8
Conclusions	10
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Introduction

Mention the context of the research topic and why it is important.

Physical activity (PA) levels are decreasing or insufficient worldwide, contributing to significant physical and mental health challenges across the lifespan. Understanding the factors that influence engagement in PA is critical, as regular activity supports cardiovascular health, metabolic function, mental well-being, and overall quality of life. Identifying the underlying determinants of PA can inform interventions, policies, and educational strategies aimed at improving health outcomes in both youths and adults.

Mention what is the research gap and why it matters.

Most existing studies focus on either youths or adults in isolation. Directly comparing these groups allows for examination of whether motivational influences on PA operate consistently across life stages. While motivational theories such as Self-Determination Theory suggest mechanisms that should be broadly applicable, it remains unclear whether the strength or relative importance of different motives varies with age. Addressing this gap is important because it can clarify whether age-specific approaches are necessary for promoting PA and improve the precision of interventions targeting different populations.

Discuss how you will answer the research question.

The research question will be addressed by examining the strength of the relationships between individual exercise motives and physical activity across youths and adults. Comparisons between the two groups will identify whether the associations differ in magnitude or pattern. Within each age group, profiles of motives will be characterized to capture how different motivations cluster together and contribute to activity levels. All analyses will be based on participants' self-reported perceptions of their motives, ensuring that the study reflects subjective motivational experiences rather than externally imposed classifications.

Literature Review

- Discuss the main papers in your research area.
- Try to summarise the current knowledge but also be critical of the limitations that you see and highlight gaps.

Data and Methods

Data

The study uses survey responses from datasets collected by Ipsos on behalf of Sport England (2024, 2025). These datasets were selected because the youth and adult surveys share a parallel structure, and several items are worded identically, providing a strong baseline for direct comparison between age groups. All motivational measures were captured using single-item survey questions. A list of relevant survey questions is provided in Appendix A. For motive variables, descriptive statistics, bivariate correlations, and variance inflation factors (VIF) were calculated to assess distributional properties, relationships among variables.

- Enjoyment – whether the individual finds exercise satisfying.
- Social engagement – exercising for fun with friends.
- Health and fitness – exercising to maintain physical well-being.
- Opportunity – having the chance to exercise.
- Guilt – sense of personal obligation to exercise.
- Importance – value placed on maintaining a regular exercise routine.
- Challenge – exercising to push oneself or compete with others.
- Relaxation – exercising to reduce stress and worry.

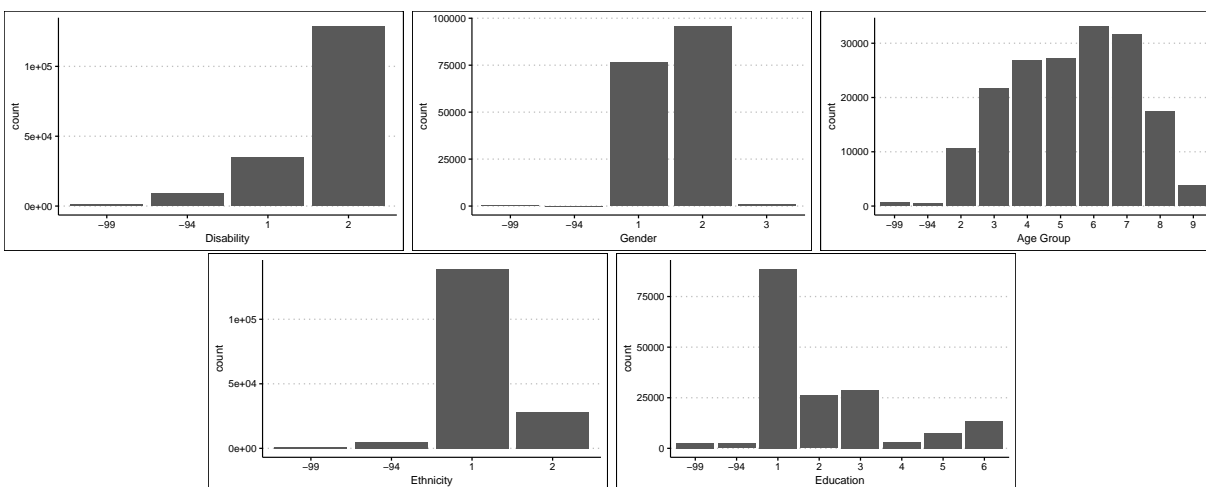
Adult Dataset

The adult dataset was drawn from households sampled via the Postcode Address File (PAF), with up to two residents aged 16 or older invited to participate through either an online survey or a paper questionnaire. Data were gathered in successive waves, aiming for approximately 500 responses per local authority, and were distributed as evenly as possible across the period from November 2022 to November 2023 to reduce seasonal bias. In total, 173,950 surveys were completed.

Each item was rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher values reflecting stronger endorsement of the statement.

Item Importance was removed for adults due to its high correlation with enjoyment and fitness (>0.5).
cor.imp

Variable	Mean	Median	SD	PercentNA
Enjoyment	2.125675	2.0	1.0248819	4.344232
Social	2.886690	3.0	1.1603390	6.383262
Fitness	1.862708	2.0	0.8631442	3.942348
Guilt	2.553219	2.0	1.1044993	5.035701
Opportunity	2.010306	2.0	0.9913168	4.017506
Importance	1.979520	2.0	0.9118422	4.214147
Challenge	2.757458	3.0	1.1511982	6.142755
Relaxation	2.262504	2.0	1.0124889	5.331622
Minutes.Exercised	493.496059	337.5	475.1089002	0.000000



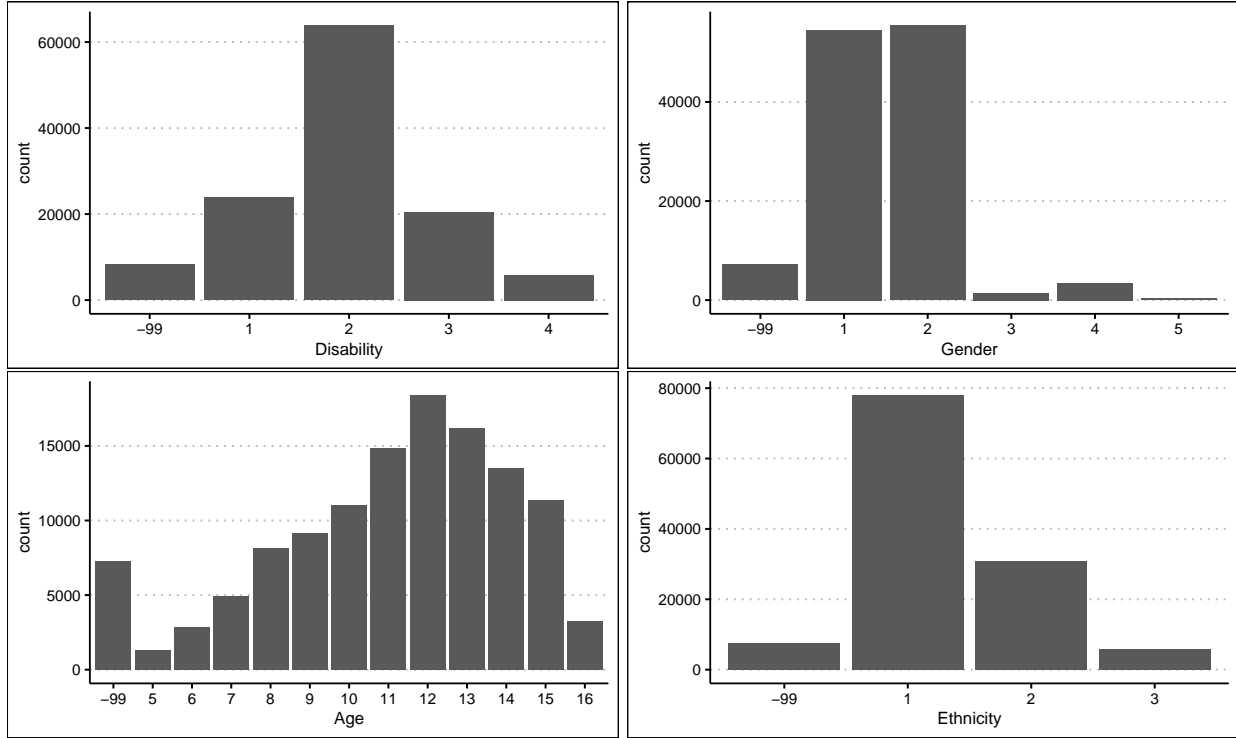
Youths Dataset

- Discuss what variables you will use, how they are coded, the amount of missing data they have and present descriptive statistics.
- Discuss the statistical models that you will use. Explain how the models will answer your research questions. Discuss what sequence of models you will run.

Multigroup Structural Equation Modeling (SEM)

Differences in the relationships between self-reported motives and PA levels across youths and adults were examined while controlling for demographic factors. Shared survey questions and responses were selected

Variable	Mean	Median	SD	PercentNA
Enjoyment	1.653111	2	0.7188537	9.817977
Social	2.185073	2	0.8672623	42.211906
Fitness	1.780182	2	0.7032159	40.949921
Opportunity	1.612999	2	0.6290499	39.725535
Guilt	2.520805	3	0.9114734	42.623031
Importance	1.413660	1	0.5802182	6.787253
Challenge	1.870674	2	0.7527904	16.347765
Relaxation	2.223833	2	0.9051345	42.034541
Minutes.Exercised	426.587188	290	427.9877225	1.043753



from both datasets.

CHUNK FOR DESCRIPTIVE!

Motivation variables included enjoyment, social, fitness, guilt, and opportunity. To account for differences in Likert scales between adults and youths, all motivation variables were dichotomized into “strongly agree” and “not strongly agree.” Demographic covariates included gender, age, and ethnicity. Gender was limited to female and male due to small sample sizes of other categories. Ethnicity was collapsed into White British and Non-White British for similar reasons. Youth participants included only those aged 11 and older who responded to the relevant items. Adult participants were grouped by age ranges (16–34, 35–44, 45–54, 55–64, 65–74, 75+) because exact ages were unavailable. The youngest and oldest two groups were further collapsed to reduce skew and ensure balanced distributions. A cap of 1680 minutes per week was applied to reported PA to minimize the impact of potential data entry errors and extreme values.

CHUNK FOR DESCRIPTIVE!

The response variable was weekly minutes of moderate-to-vigorous PA. Multigroup SEM was used to assess how each motive predicts PA levels, allowing direct comparison of pathway strengths between youths and adults. A freely estimated model was compared to constrained models in which individual or all motive

pathways were fixed to equality, enabling evaluation of whether the effects of motives differ across age groups. Differences in the predictive strength of each motive on physical activity minutes were also calculated.

Latent Profile Analysis (LCA)

Latent class analysis (LCA) was conducted separately within the youths and adults groups to explore age-related differences in motivational profiles.

CHUNK FOR DESCRIPTIVE

The original Likert-scale responses were retained. Additional predictors capturing similar motivational constructs but worded differently were included (see Appendix B). Motives served as predictors, while ethnicity, gender, age, and education (for adults only) were included as covariates. Ten random starts were used per class model to ensure stable solutions.

The optimal number of classes was determined by evaluating BIC elbow plots, relative entropy, bootstrap Vuong-Lo-Mendell-Rubin likelihood ratio tests (BLRT), class proportions, and substantive interpretability. Class-specific statistics were calculated, and multinomial logistic regression was performed with age predicting class membership. Odds ratios and 95% confidence intervals were derived by exponentiating the estimated coefficients and their standard errors (

$$OR = \exp(\hat{\beta}), \quad 95\% CI = \exp(\hat{\beta} \pm 1.96 \times SE)$$

)

This procedure allows assessment of both the magnitude and statistical significance of age effects on class membership and, consequently, on PA-related motivational profiles.

Results

- Present the results of the analysis.
- Try to focus on how the results answer your research questions and hypotheses.
- Try to focus on substantive interpretation of the results (and not just if something is significant or not). Are the effects large? Are they substantively important?

SEM

There are minor yet significant differences in the impact of every motive.

var	est.youth	est.adult	diff
enjoyb	144.740986	121.689184	23.051801
guiltb	40.697682	17.917790	22.779893
oppb	38.888023	97.339970	-58.451947
fitb	79.114739	106.118565	-27.003825
socialb	43.155354	66.484899	-23.329545
age	-2.305814	-9.475518	7.169704

Summary and spec of model in appendix. Motivational mediators contribute meaningfully to activity levels in both groups, with enjoyment and fitness motives being the strongest predictors.

Youth show stronger effects of enjoyment and guilt on exercise minutes, with slopes about 23 minutes higher than adults. Adults show stronger effects of opportunity, fitness, and social motives, with differences ranging from 23 to 58 minutes. Age shows a smaller difference (~7 minutes), with exercise minutes decreasing slightly more with age among adults.

Opportunity has a bigger effect on adults, this makes sense since children have more free time and more access to facilities like parks school gym etc.

Youths are more likely to feel guilty, also makes sense as adults (especially older) do not exercise as much for social recognition and appearance goals. consistent with H1a. However, while social motive has a positive effect, it has a bigger impact on adults. Not sure why. fitness makes sense to matter more to adults.

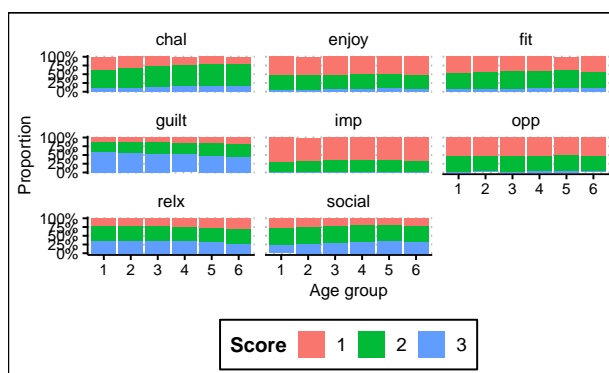
Age has a small but significant negative total effect on activity, more pronounced in adults than youths.

LCA

Median mins per class, rather than mean due to skew in distribution of minutes exercised (right skew), is calculated.

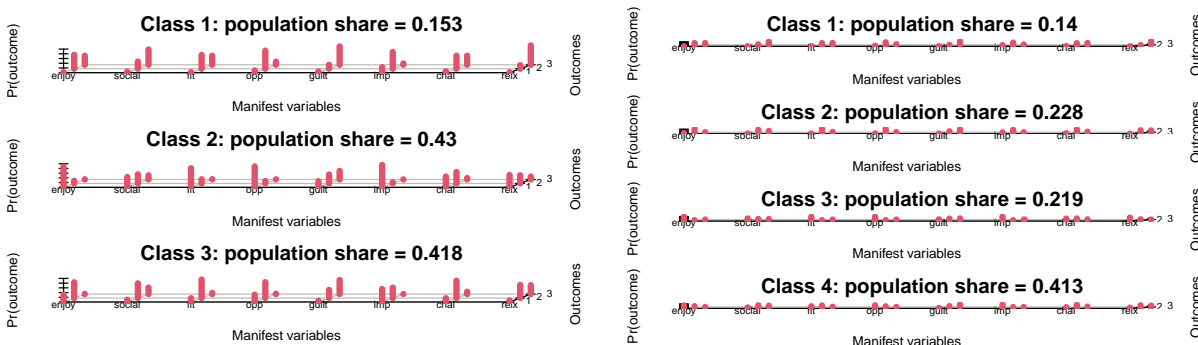
Youths

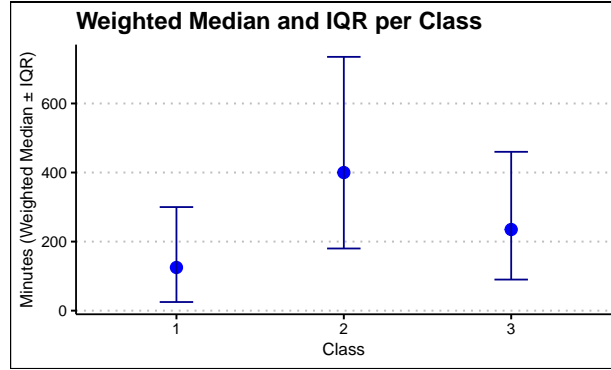
BIC plot indicates 3 or four 4 to reduce BIC the most. BLRT preferred 4 classes. Relative entropy values are 0.7427249 and 0.6989149 for 3 and 4 classes, respectively, which shows 3 to have slightly better separation between classes. The likelihood is similar between 3 and 4 classes. Average posterior probabilities are better in the 3-class model, as all classes have a $>.80$ pp.



See appendix for elbow plot average pp etc Both 3 and 4- class models show promise. BIC does not show a typical elbow shape, as adding more classes beyond 4 actually diminished the fit. This is possibly due to the log-likelihood not increasing significantly with more classes, and BIC's penalty for higher complexity outweighs the improvement

However, the 4-class model contains 2 very similar classes. Hence the 3-class model was chosen.

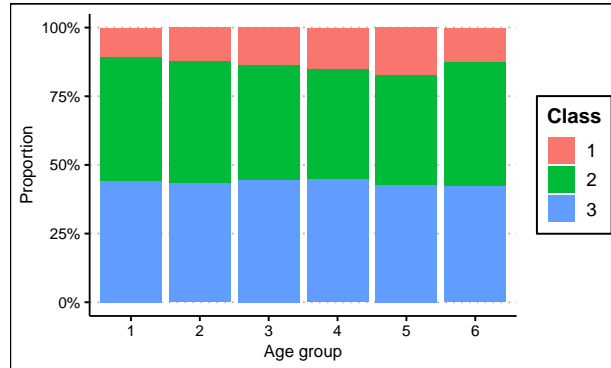




Interpretation Class 1: A highly engaged group exercising for intrinsic (enjoyment, competence) and extrinsic (importance, fitness, social) reasons. (High across core motives: enjoyment, fitness, importance, ability \rightarrow strong positive orientation to exercise. Moderate-to-high secondary motives: social, challenge, relaxation. Mixed guilt: not central.)

Class 2: they agree exercise is valuable, but don't strongly enjoy it. Low guilt and relaxation. They see exercise as important and somewhat social, but motivation is not driven by strong enjoyment or self-competence. This group might exercise out of social reinforcement or external values rather than intrinsic enjoyment. (Moderate enjoyment, social, fitness, opportunity, challenge, ability.)

Class 3: They believe exercise is important (cognitive endorsement), but lack enjoyment, confidence, or social drive. Likely lower actual participation; motivation here is more abstract belief than emotional or social engagement. (Low enjoyment, fitness, challenge, social, guilt, ability, relaxation. Moderate opportunity and high importance.)

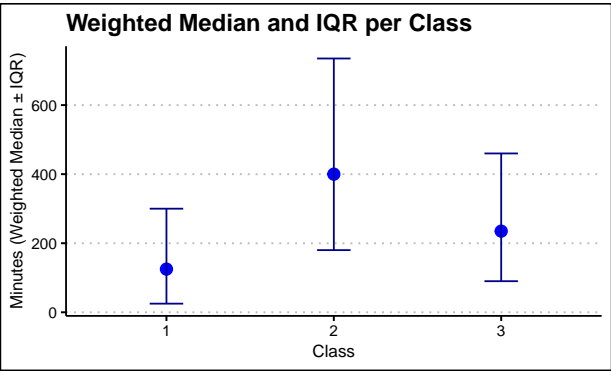
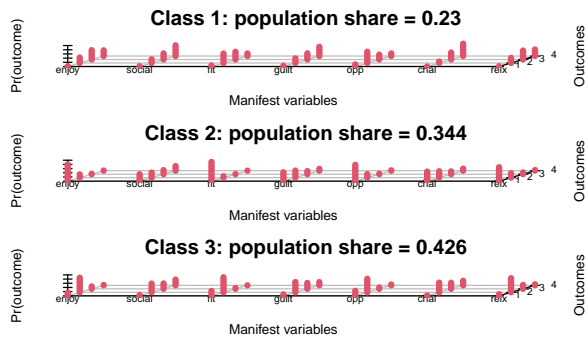
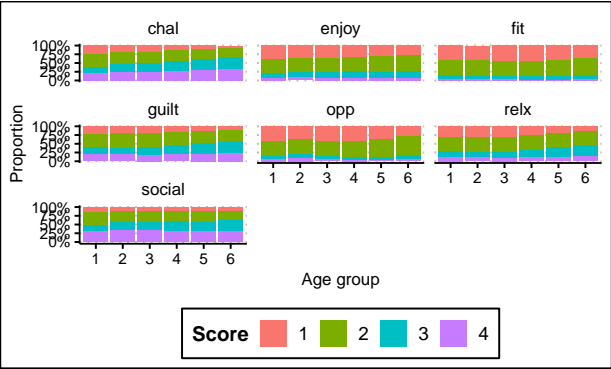


Age: The youngest group is most likely to be in class 1. However, class 2 have only minor ($<20\%$) deviations in each age group, indicating that age has little systematic effect. However, the youngest age group is only 20% as likely to belong in class 3, and the trend increases as age goes up. I.e. the older the youths are the more likely they are to be in class 3. This makes sense as youths become more e.g. self-conscious, entangled with other responsibilities, more autonomy and more ways to entertain themselves.

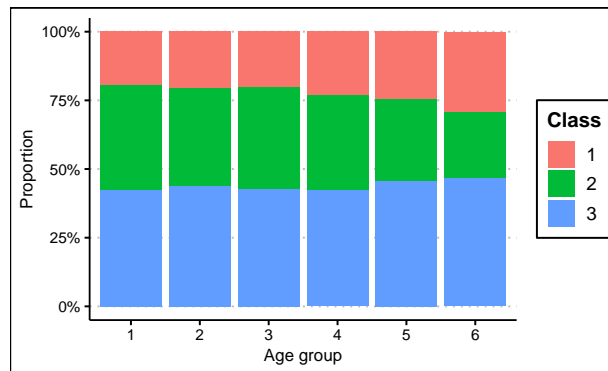
This supports hypothesis 2b, that younger youths are more likely to belong to enjoyment-dominant profiles.

Adults

3, 4, and 5 classes all seem ok at first glance, with similar relative entropy, BIC, and max posterior entropy per class. While BLRT recommends the 4-class model, upon closer inspection, 3 classes has the best substantive interpretation, 4- and 5- class models contain very similar classes with minor distribution differences in their responses.



- Class 1: this class strongly endorses intrinsic motives (enjoyment, ability, importance) and is confident in their capability. They are highly consistent in responses across items. With low levels of guilt
- Class 2: Most items have higher probabilities on 3–4 (neutral to disagree) except moderate on opportunity and ability. Low on guilt and eagerness for challenges. They do not exercise to relax.
- Class 3: This class displays consistently moderately positive attitudes toward PA, with the exception of social.
- Age: odds of being in the low motivation class increase with age, especially in the oldest group. odds of being in the moderate motivation class also increase with age, but not as strongly as the low motivation class.



Multinomial logistic regression examined the association between age and motivation profile, with the highly motivated class (Class 1) as the reference. Compared with the youngest adults (age1), older age groups had higher odds of being in the moderate (Class 3) or low motivation (Class 2) classes. The effect was strongest in the oldest group (age6), who were about twice as likely to belong to the low motivation class ($OR = 2.06$) and 1.84 times more likely to belong to the moderate motivation class, relative to the highly motivated class. These results indicate that motivation tends to decline with age, with fewer older adults exhibiting the highly positive/intrinsic profile.

Conclusions

- Summarise what you have found. Restate your questions and hypotheses and show how you answer them.
- Discuss possible limitations and implications they might have for the results.
- Discuss implications for theory and/or policy based on what you found.

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{r graph, out.width='49%',fig.show='hold',fig.align='center',
fig.cap=''} # # plot_glmnet(lasso.mod.tr, label = 4, #
= 'Trace Plot by Lasso') # # plot_glmnet(ridge.mod.tr, label
= 3, # main = 'Trace Plot by
Ridge') # #
```