

Exploring Behaviour Correlates of Physical Inactivity across the Tees Valley

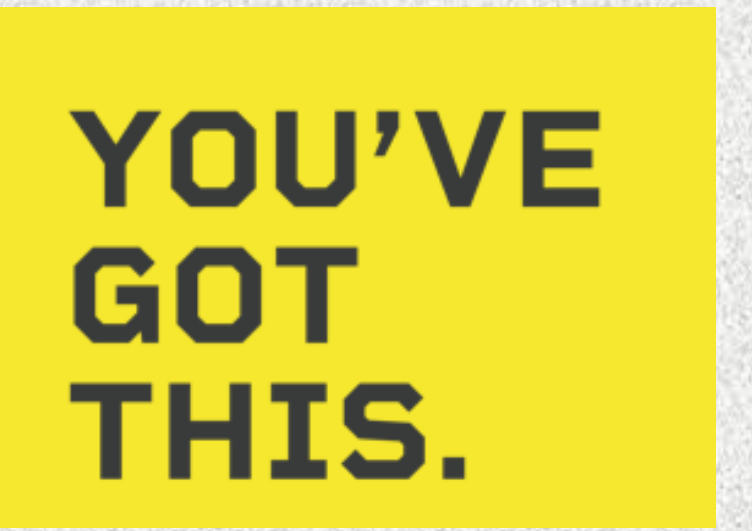


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Introduction and Background

Spending a considerable amount of time being inactive or not moving is engaging in sedentary behaviour (SB) (Pate, O'Neill & Lobelo, 2008: 174, Matthews, et al, 2008; Tremblay, et al, 2010 and Owen, et al, 2011) and has a negative impact on your health. Physical inactivity has been identified as the fourth leading risk factor for global mortality (6% of deaths globally) (World Health Organisation (WHO), 2010) but there is no agreed consensus on what time limit causes negative health effects when placed in SB activities (WHO, 2020a; Bull et al, 2020). Regardless, WHO does go on to say that all age groups and individuals should aim to reduce their SB time if and when possible. The Tees Valley Residents' results are explored to determine whether or not there is a significant level of physical inactivity. If so, how is this occurring at what significance by sex and council demographical variables.

The aim is to look for any significant differences revealed for the main outcome variable of categorical score which is made up of total physical activity (TPA) across the domains of physical activity (PA) in the International Physical Activity Questionnaire (IPAQ). This variable will be assessed across sex and council. In addition, considerations will be accounted for by participant characteristics such as employment and age.

Methodology & Data Cleaning and Screening

Here a general linear modelling approach will be used to reveal any significant main effects, wherein effects are present post hoc pairwise comparisons will be used to explore any underlying interactions for significance. Data collection began on October 1st, 2020 and ended on the 28th of February 2021. The initial target was to collect 500 participants for the Tees Valley Residents Questionnaire, and this was to commence from October 2020 to October 2021. An additional aim was to generate at least one response in each ward within the Tees Valley. In total, 1247 participants were recruited and there was at least one participant from all 99 wards in the Tees Valley. Further descriptive analysis show there was nearly a 60:40 split of Female (59.7%) to Male (40.3%) participation rates. By council it is broken down as Middlesbrough (31.7%), Stockton on Tees (27.2%), Redcar and Cleveland (22.0%), Darlington (10.5%) and Hartlepool (8.7%). Reviewing the breakdown by employment category shows that, employed full time (44.4%), employed part time (15.8%), self employed (3.4%), unemployed (6.4%), retired (17.1%), student (11.9%) and finally disabled (1.0%).

Table 1.0: Participant Characteristics (Means and Standard Deviations)

Council	Sample (n)	Age	Males		Females	
			(n)	Age	(n)	Age
Darlington	125	45.56 (± 14.18)	46	44.52 (± 12.56)	79	46.16 (± 15.01)
Hartlepool	103	49.46 (± 14.79)	35	46.63 (± 13.71)	68	50.91 (± 15.12)
Middlesbrough	377	37.73 (± 17.73)	173	34.16 (± 15.25)	204	40.76 (± 18.04)
Redcar & Cleveland	261	47.03 (± 17.15)	117	46.94 (± 17.61)	144	47.10 (± 16.76)
Stockton on Tees	323	42.68 (± 16.04)	108	41.99 (± 16.26)	215	43.02 (± 15.92)
Tees Valley Comb Auth	1189	42.95 (± 16.86)	479	40.95 (± 16.66)	710	44.30 (± 16.98)

Table 1.0 Breakdown by council and sex with sample sizes alongside mean ages and standard deviations. The eldest council population collected is Hartlepool with 49.46 mean age and the youngest is Middlesbrough with 37.73 mean age. By sex, the eldest males are those who live in Redcar & Cleveland at 46.94 mean age. The youngest males are those who live in Middlesbrough at 34.16 mean age. Finally, the eldest females are those who live in Hartlepool at 50.9 mean age. The youngest females are those who live in Middlesbrough with 40.76 mean age.

International Physical Activity Questionnaire (IPAQ): Category Scores

1. Low Activity

No activity is scored, or some activity is reported but not enough to meet the other two categories of Moderate and or High. Low Activity is < 600 metabolic equivalents (METs).

2. Moderate Activity

5 or more days of any combination of PA across walking, moderate-intensity, and vigorous activities achieving the at least 600 MET-min/week. Moderate activity can be scored up to 2999 Met-min/week.

3. High Activity

Lastly, there has to be 7 or more days of any combination of walking, moderate, or vigorous activity to achieve at least 3000 MET-minutes/week.

The long version of the IPAQ has been reported to have strong and acceptable levels of validity and reliability in the surveillance of population PA levels (Craig et al., 2003; Hagstromer, Oja and Sjostrom, 2006 and Frehlich, Blackstaffe and McCormack, 2019). It is recommended that the IPAQ is best used for large population sizes and comparing between groups, not for a person-to-person comparison.

Table 2.0: IPAQ PA Categorical Scores by Sex (Means and Standard Deviations)

IPAQ PA Category	Sample (n)	Mean	Males (n)	Mean	Females (n)	Mean
Low	541	291.22 (± 158.86)	97	321.75 (± 168.24)	444	284.55 (± 155.94)
Moderate	579	1367.32 (± 620.58)	323	1598.25 (± 638.74)	256	1075.96 (± 451.76)
High	69	4294.40 (± 1146.01)	59	4287.2 (± 1146.28)	10	4334.96 (± 1143.60)
Combined	1189	1047.55 (± 1094.11)	479	1671.0 (± 1287.70)	710	626.95 (± 668.49)

Table 2.0 above shows the differences across the sexes and combined group score when sorted by Low, Moderate and High PA scores. There is a clear distinction between the sexes in terms of PA scores by nearly a 1000 METS over a week. Males are significantly more active than females as a combined score and across both Low and Moderate Categories. There are more males within the High category than females and fewer males within the Low category compared to Females.

Results

With the multinomial logistic regression performed, the results for the overall model test are shown below.

- **The Chi-squared statistic result is a significant result ($\chi^2(30) = 327$; $p < .001$) for the overall model fit.**
- This indicates there is a significant interaction between the dependant variable (categorical score) and the independent variables for the Tees Valley residents.
- For the pseudo-R-Square scores McFadden (0.157) and Nagelkerke (0.198). This means the model accounts for 15.7% to 19.80% of the variance and represents a moderate to large-sized effect.
- For the likelihood ratio tests there were 5 significant results all below a p value of 0.05 with significant accompanying chi-squared scores. **They included the following results. Sitting times per day ($\chi^2(2) = 32.93$; $p < .001$), motor vehicle sitting times per day ($\chi^2(2) = 8.78$; $p = 0.012$), Gender ($\chi^2(2) = 243.71$; $p < .001$), Council ($\chi^2(8) 16.00$; $p = 0.042$) and Ward ($\chi^2(2) 6.04$; $p = 0.049$).**

Interpretation of the model coefficients for categorical score using the Low category score as a reference point. Among the residents of the Tees Valley, irrespective of what sex someone defines themselves as, there was a significant effect of categorical score upon a resident's sex within the Tees Valley (being $p < .001$ for the model score). Their odds ratios (OR) scores within the comparison of High to Low categories resulted in an OR result of 41.23. **This means, irrespective of sex, Tees Valley residents are 41 x more likely to have a categorically low physical activity score compared to being highly active.** Applying the same perspective again but for the odds ratios (OR) scores within the comparison of Moderate to Low categories. **The OR result was 7.18. This means, irrespective of sex, Tees Valley residents are 7 x more likely to have a categorically low physical activity score.** From both results, there is an increased likelihood that someone from the sample of Tees Valley residents will be in the Low category when compared against the other two categories of PA as part of the IPAQ analysis.

Table 3.0 IPAQ Predictive Probability Analysis by Sex

IPAQ Categorical Score	Sample (n)	Males (n)	Probability of Categorical Scores %	Females (n)	Probability of Categorical Scores %
Low	541	97	19.32	444	64.90
Moderate	579	323	67.47	256	33.90
High	69	59	13.21	10	1.24

Table 3.0 probability scores for females to be in the Low category is 0.6488 (64.90%), females to be in the Moderate category is 0.3388 (33.90%) and finally, females within the High category it is 0.0124 (1.24%). This means that a female in the Tees Valley has nearly a 65% probability of being in the Low category of PA. Meaning they are either inactive or do very little levels of PA. For the males their scores differ considerably. Probability scores for a male to be in the Low category is 0.1932 (19.32%). Males to score in the Moderate category have a probability score of 0.6747 (67.50%). Finally, for males to be considering having a High score, their probability value is 0.1321 (13.21%). This means that a male in the Tees Valley has a 19% probability of being in the Low category of PA. Meaning less than one fifth of all males in the Tees Valley are either inactive or do very little PA.

Analysis by council revealed the following results; For Middlesbrough, their Low category of PA scored at 0.3947 (39.50%), for Moderate category (0.5215 (52.15%) and for High category it was 0.0838 (8.40%). For Darlington their Low category of PA scored at 0.4301 (43.01%), Moderate category (0.5178 (51.80%), and for High category 0.0521 (5.21%). For Hartlepool residents their probability scores were; Low category score of 0.4695 (47%), for Moderate category 0.4106 (41.10%) and for High category it is 0.1199 (12%). For Redcar & Cleveland's Low category was scored at 0.4472 (44.72%), Moderate category 0.4976 (49.76%) and finally for the High category is 0.0552 (5.52%). Lastly, for the council of Stockton-on-Tees, their resident's probability for PA categorical scores is as follows. Low category 0.3633 (36.33%), Moderate category 0.5864 (58.64%) and finally for High category it is 0.0503 (5.03%).

Conclusions and Applications of the Work

It is evident that the TVR display a low level of PA and engage in significant periods of sedentary behaviour. Analysing their scores, it is likely they engage in some form of PA, but it is severely insufficient to either improve their own health and or reduce lifestyle related diseases. This means participants are inactive as they do not participate in any PA or they do some level of activity but is less than walking 30 minutes per day (or equivalent too). The sample analysed with the Tees Valley are not hitting WHO 2020 PA guidelines and are significantly inactive and sedentary. These findings have been communicated to my collaborators and stakeholders through various organisations across the Tees Valley (n = 53) to help them get more residents active as we are coming out of the pandemic. These findings will be used as part of their policy and strategy implementations or as supporting evidence for program creations and funding bids. Many stakeholders found the need to push for more PA programs for females was needed and justified by the significant levels of inactivity as recorded by the findings.

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