Physical activity clusters among persons with type 2 diabetes: a secondary cross-sectional analysis

I.K. Thorsen[1], C.G. Durrer[1], J.C. Brønd[2], J.S. Nielsen[3], M. Ried-Larsen[1,2];

[1]Centre for Physical Activity Research, Copenhagen University Hospital - Rigshospitalet, Copenhagen, Denmark, [2]Department of Sports Sciences and Clinical Biomechanics, University of Southern Denmark, Odense, Denmark, [3]Steno Diabetes Center Odense, Odense University Hospital, Odense, Denmark.

Background and aims: Physical activity (PA) recommendations are only met by roughly 45% of persons with type 2 diabetes (T2D). Identifying and characterizing PA patterns of persons with T2D will help to target interventions according to individual needs. The aim of this study is to identify PA clusters based on data driven analyses of objectively measured PA, and to investigate differences in sociodemographic and health-related characteristics, PA motivation, and personality traits between clusters.

Materials and methods: This is a secondary cross-sectional analysis of previously published data. Persons with T2D who were referred to a public health center provided data on objectively measured PA; body weight and waist circumference; and completed a questionnaire survey covering: sociodemographic and health-related characteristics; the 12-item Short-Form Health Survey (SF-12); the Behavioral Regulation of Exercise Questionnaire (BREQ-2); the NEO-Five Factor Inventory (NEO-FFI); and the Sensation Seeking Scale (SSS). PA data were analyzed using k-means cluster analysis. Differences between clusters were tested using Fisher's exact test for proportions, and for continuous data, one-way ANOVA when normally distributed and Kruskal-Wallis one-way ANOVA when not. If indicative by the overall test ($p < 0.05$), pairwise comparisons were performed. All p-values are 2-sided.

Results: The cluster analysis separated participants (n=195) into four PA clusters: cluster 1 (C1), high moderate-and-vigorous PA (MVPA)/high light PA (LPA)/low sitting time; cluster 2 (C2), high MVPA/moderate LPA/high sitting time; cluster 3 (C3), moderate MVPA/moderate LPA/high sitting time; and cluster 4 (C4), low MVPA/low LPA/high sitting time. No differences in personality traits (NEO-FFI and SSS) were observed between clusters ($p > 0.05$). Table 1 presents body composition and questionnaire data, i.a., health-related quality of life (HR-QoL; SF-12 score) and PA motivation (BREQ-2 score). Specifically, C4 compared to C1 contained more men (p=0.001), were older (p=0.003), had a higher body weight (p=0.001) and waist circumference (p=0.001), and a lower PA motivation (p=0.001). Moreover, C1 had a shorter T2D duration compared to C3 (p=0.005). C2 were younger than C3 and C4 ($p < 0.01$) and had a higher physical HR-QoL than C4 (p=0.005).

Conclusion: This data driven approach offers a new method to identify PA clusters and characterize PA patterns and the persons that engage in them. This study suggests that the need for PA intervention is lower among relatively younger persons (C1 and C2), especially less obese women with short T2D duration (C1). In contrast, according to these data, PA treatment should be targeted older, more obese men with low PA motivation and low physical HR-QoL (C4).

	Cluster 1 (n=32)	Cluster 2 (n=39)	Cluster 3 (n=66)	Cluster 4 (n=58)	p-value
Sex: *Men, n (%)*	12 (37.5)[2,4]	25 (64.1)[1]	34 (51.5)[4]	43 (74.1)[1,3]	0.004
Sex: *Women, n (%)*	20 (62.5)[2,4]	14 (35.9)[1]	32 (48.5)[4]	15 (25.9)[1,3]	
Age (years)	55.5 (49.0; 61.5)[4]	55.0 (49.0; 62.0)[3,4]	62.0 (55.0; 69.0)[2]	65.5 (58.0; 71.0)[1,2]	0.001
Type 2 diabetes duration (years)	0.2 (0.1; 5.0)[3]	2.0 (0.2; 7.0)	5.7 (0.5; 11.4)[1]	4.1 (0.2; 10.0)	0.015
Civil status: *Living alone, n (%)*	15 (46.9)	22 (56.4)[3]	21 (31.8)[2,4]	30 (51.7)[3]	0.049
Civil status: *Cohabiting, n (%)*	17 (53.1)	17 (43.6)[3]	45 (68.2)[2,4]	28 (48.3)[3]	
Weight (kg)	88.7 (17.4)[2,4]	101.6 (16.1)[1]	97.3 (17.1)[4]	110.4 (21.8)[1,3]	0.001
Waist circumference (cm)	107.7 (10.5)[4]	113.6 (11.9)[4]	114.6 (12.8)[4]	123.8 (13.3)[1,2,3]	0.001
SF-12 physical component score (score 0-100)	40.3 (11.7)	46.0 (7.3)[4]	41.1 (9.4)	39.2 (10.5)[2]	0.008
SF-12 mental component score (score 0-100)	44.9 (10.8)	47.8 (10.8)	49.0 (10.4)	47.8 (13.3)	0.43
BREQ-2 relative autonomy index (score –24-20)	11.3 (6.4; 13.5)[4]	8.0 (5.5; 11.3)	7.4 (4.2; 10.7)	4.5 (1.4; 9.0)[1]	0.001

Table 1: Data are presented as mean (SD), median (25th; 75th quartile), or n (%). [1]Different from Cluster 1, p<0.05; [2]Different from Cluster 2, p<0.05; [3]Different from Cluster 3, p<0.05; and [4]Different from Cluster 4, p<0.05. SF-12, the 12-item Short-Form Health Survey; BREQ-2, the Behavioral Regulation of Exercise Questionnaire.