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RESEARCH

Psychological Distress and Physical-Activity Levels among People Consulting a Healthy Life Centre for Lifestyle Change

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Aims: Healthy Life Centres were developed in Norway to support lifestyle-changes. Aims of the study were: First, to assess physical-activity levels and psychological distress among participants at one centre and compare them to representative samples. Second, to investigate associations of physical activity level and mental distress.
Methods: Participants between 18-71 years of age were included (N = 120). Accelerometer-based levels of physical activity (ActiGraph GT3X) and psychological distress (Hopkins Symptom Check List-10) were compared to national, representative samples of healthy Norwegians and overweight/obese nationals. Associations between indicators of physical activity levels and psychological distress were analysed.
Results: The participants were predominantly obese (77%) and had symptoms of psychological distress (77%). They engaged in 73% less light physical activity but performed 15% more moderate-vigorous physical activity compared to the representative samples. However, moderate-vigorous physical activity was not adequately sustained in our sample, so significantly fewer participants fulfilled physical-activity level recommendations (16% versus 32%), but not in comparison to the national obese sample (12% versus 19%). The prevalence of psychological distress was seven times higher compared to the national sample, and five times higher than the overweight/obese sample. Associations of physical activity and psychological distress were non-significant.
Conclusion: The prevalence of psychological distress was unexpectedly high, and in combination with obesity it indicates a challenging strive when aiming to increase physical activity levels. Therefore, the Healthy Life Centre participants may also benefit from psychological counselling, though more research from HLCs and similar services is needed to conclude on the subject.

Keywords: Health promotion; non-communicable disease

Background

The establishment of Healthy Life Centres (HLCs) in Norway came in response to the need for modifying unhealthy lifestyle behaviours. The purpose of HLCs are to promote physical and mental health through structured individual guidance and group-sessions related primarily to physical activity (PA), healthy diets and the cessation of tobacco use (Helsedirektoratet, 2016). Currently, there are two cross-sectional studies of HLC attendees. One found low levels of PA and significantly lower scores for health-related quality of life domains, including mental health, compared to the general population of Norway (Blom et al. 2019). In contrast, findings from the other study were high levels of PA, and 27% of the attendees reported mental challenges as one reason for contact (Samdal et al. 2018). In a qualitative study by Følling et al. (2015) psychological distress was found a barrier to behaviour change among 23 individuals entering an HLC. Similarly, Salemonsen et al. (2018) discovered that HLC participants experienced shame and

guilt that acted as obstacles to lifestyle changes, which points to the need to address emotional distress before enabling dietary and PA changes. These findings are supported by a previous study revealing that psychological distress may add an extra obstacle to participation in PA (Azar et al. 2010). Moreover, objectively measured PA patterns of individuals suffering depression and anxiety has been characterized by the low fulfilment of PA guidelines (Helgadóttir et al. 2015), which highlights the relationship between PA levels and mental health. Samdal et al. (2018) found being overweight was the most common reason people attended HLCs. Increased weight and obesity have been associated with lower PA levels and not meeting PA recommendations (Loyen et al. 2017). As both being overweight and experiencing psychological distress are potential barriers to PA, a better understanding of how these factors interact in the HLC setting is needed. To date, no studies have investigated level of psychological distress in an HLC-sample, nor the associations between psychological distress and PA-levels. In a systematic review of lifestyle interventions in community settings, only two of the included studies addressed mental health in addition to PA and dietary behaviours (Stoutenberg et al. 2015).

The current study has the following aims: (1) To describe and compare levels of PA and psychological distress among participants consulting one HLC to a representative sample in Norway and to an overweight/obese sample. (2) To investigate the association between psychological distress and PA levels in people entering a Healthy Life Centre. Furthering our understanding of PA levels and psychological distress in this population may serve as important contributors in the targeted development of HLCs in Norway, and similar services addressing lifestyle changes elsewhere.

Methods

Procedure and participants

This study was conducted at an HLC in a Norwegian municipality with 130,000 inhabitants. The HLC offers lifestyle-courses, training sessions, walking groups, food-classes, yoga, groups for exchanging experiences and individual guidance. All offers are provided by personnel with relevant competence and with various educational background (physiotherapist, dietitian, social-worker, nurse and sports educators).

The study participants were either referred to the HLC by their general practitioner or self-referred to the services. As there is a continuous inflow of participants to these centres, the period for recruitment was chosen randomly. Service inquiries regarding the HLC were made by participants before information about the study was given; hence, their interest was in the HLC services offered and not participation in the study. Criteria for inclusion in the study were participants ≥18 years, Norwegian speaking, and those whose goals were to be more active and have a healthier diet. Exclusion criteria included participants with severe and disabling psychiatric illnesses.

In total, 216 invitations to participate in the study were sent out and 120 people were recruited, a 55.5% response rate. The services offered by the HLC were not affected by declining to participate in the study. A letter of informed consent was sent to all eligible study participants before their first appointment at the HLC. Written, informed consent was obtained from all individuals who participated in the study. The study was approved by the Norwegian Data Protection Authority.

Collection of self-reported data

An on-line questionnaire using SurveyXact (Rambøll Management Consulting, Oslo, Norway) was used to collect self-reported data at the first HLC appointment. The participants confidentiality was respected whilst they completed the questionnaires, but counsellors were available if they had questions.

Representative samples

The HLC-group were compared with samples considered to represent the Norwegian population regarding PA-level and psychological distress (Hansen, 2015; Søgaard, 2003). Further, comparisons of PA-levels and psychological distress found in overweight and obese samples and the HLC-group were carried out (Hansen et al. 2013; Loyen et al. 2017; Rivenes et al. 2009). See **Table 1**.

Physical activity

Daily PA levels were assessed with ActiGraph GT3X (Pensacola, FL, USA) that were worn for seven consecutive days. The accelerometer provides a valid estimation of free-living physical activity by recording raw acceleration data, which is converted into objective activity (Plasqui and Westerterp, 2007). Oral and written information about its use were provided to the participants. The accelerometer was worn on the

Table 1: Representative studies used for physical activity and psychological distress comparisons.

Aim	Sample	Reference article
PA-level representative sample and percent meeting PA-recommendations	N = 3020 Mean age = 47.9 53% female 49% overweight or obese	Physical activity and sedentary time among adult and elderly in Norway – national mapping 2014–2015 (Hansen, 2015)
PA-level sample BMI ≥ 25	N = 3267 Mean age = 49 57% female 49% overweight or obese	Patterns of objectively measured physical activity in normal weight, overweight, and obese individuals (20–85 years): a cross-sectional study (Hansen et al. 2013)
Percent meeting PA recommendations BMI ≥ 25	N = 3267 Mean age = 49 57% female 49% overweight or obese	Sedentary time and physical activity surveillance through accelerometer pooling in four European countries (Loyen et al. 2017)
Psychological distress prevalence	N = 17 392 valid ratings Age-range 30–76 54.8% female	A comparison between the CONOR Mental Health Index and the SCL-10 and HADS (Søgaard, 2003)
Psychological distress prevalence in the overweight and obese	N = 60 704 Mean age = 47 51% female	The relationship between abdominal fat, obesity, and common mental disorders: results from the HUNT study (Rivenes et al. 2009)

right hip, removed at bedtime or during water-based activities. A log of water-based activities and cycling was recorded. The participants were requested to uphold normal PA and not to increase until after baseline data were recorded.

The accelerometer was set to record at a sampling rate of 30 Hz in 1-s epochs. Data were included if the participant had at least 10 hours of valid activity recordings per day for at least two days. There were no significant differences in the activity data for two versus four days, but the included number of participants with valid activity data increased to 117 by using two days and was therefore a preferred choice. Greater than 60 minutes of zero counts, allowing spikes for 2 minutes with counts above 100, was defined as non-wear time and excluded from analysis. Threshold cut-points values were set according to Troiano (Troiano et al. 2008): (1) sedentary 0–99 counts/min; (2) light PA 100–2019 counts/min; (3) moderate PA 2020–5998 counts/min: and (4) vigorous PA 5999 counts/min and above. The recommended level of PA is 150 min per/week of moderate to vigorous PA (MVPA) in bouts of 10 minutes, or 75 minutes of vigorous PA per/week (WHO, 2010).

Body Composition

One week following the first HLC appointment, body composition measurements were taken from all participants using direct segmental multi-frequency bioelectrical impedance (Inbody 720, Body Composition analyser; Biospace CO. Ltd, Seoul, South Korea) (Faria et al. 2014). The manufacturer's instructions for use were followed before and during the assessments (Ling et al. 2011).

Psychological distress

The Hopkins Symptom Check List-10 (SCL-10) was used to assess psychological distress (Strand et al. 2009). Each item has four response alternatives ranging from 'not bothered' to 'very bothered'. Examples of statements; *"sudden fear without reason", "depressed, sad",* and *"feelings of hopelessness regarding the future".* Mean values across the items were calculated and ranged from 1 to 4. For the Norwegian version, a mean value above 1.85 indicated symptoms of psychological distress (Strand et al. 2009; Søgaard, 2003). Cronbach`s alpha was 0.84.

Statistical analyses

All analyses were performed using SPSS version 24 (IBM Corp., Armonk, NY, USA). Descriptive analyses are reported as means (standard deviations) or percentages for continuous variables and frequencies for categorical data. Preliminary analyses were performed to ensure there were no violation of statistical assumption of included variables. Independent sample t-tests were used to test differences in physical-activity

levels between females and males, those with or without a medical diagnosis, low and high educational levels and between those who scored above and below the cut-off value on the SCL-10 indicating psychological distress. One-way analyses of variance (ANOVAs) were used to test for statistical differences between body-mass index (BMI) groups: normal weight, overweight and obese, and three age-groups: 18–39 years, 40–57 years and 58–71 years. One sample t-tests were used to compare mean differences in PA between the HLC-group and the representative and overweight/obese samples. We further investigated whether the proportion of participants with symptoms of psychological distress and those fulfilling PA guidelines were significantly different from the representative and overweight/obese samples (Hansen, 2015; Hansen et al. 2013; Loyen et al. 2017; Rivenes et al. 2009; Søgaard, 2003) by using a standardized z-score calculation for two population proportions (Stangroom, 2018). The relationship between psychological distress and PA levels was further analysed using Pearson's product-moment correlation and partial correlation to check for confounders. A *p*-value <.05 was regarded as statistically significant. G*Power (Faul et al. 2007) was used to test statistical power. Using $\alpha = 0.05$ and $\beta = 0.80$ results showed that it was possible to identify a percentage difference of about 20% between a normative sample and a sample of 120. Using the same error probabilities results revealed that it is possible to find a mean difference yielding a Cohen' *d* of 0.30 and Pearson r of 0.12 statistically significant at the .05 level. This implies that small to moderate differences will be statistically significant with the current sample size.

Results

Demographic information for the HLC sample is given in **Table 2**. The group was dominated by young to middle-aged Norwegian women, please see **Table 2** for further demographical information. A large proportion reported having one or several medical diagnoses, the three most common were high blood pressure, diabetes and depression. The mean BMI was 34.5 kg/m^2, and 77% had a BMI >30. Mean visceral fat was 156.5 cm^2, and 91% had a fat level greater than the recommended 100 cm^2 (**Table 2**).

Physical activity data

When the HLC-group was compared to the general Norwegian population sample significant differences were found. The HLC-group spent 73% less time performing light PA per day but spent 15% more minutes in MVPA. The HCL-group was also predominantly overweight or obese (93%). Therefore, the HLC-group was compared to the representative sample of overweight and obese people (Hansen et al. 2013). This comparison yielded the same pattern of significant differences. The HLC-group spent 73% fewer minutes performing light PA and 53% more minutes in MVPA (see **Table 3**; standard deviations for the BMI ≥ 25 population taken from previous studies were not specified).

Within the HLC-group, there were no statistically significant differences in the PA levels between males and females, between those with or without a medical diagnosis, between educational levels, or between those who were employed or unemployed. Neither did PA-levels differ between those with and without an SCL-10 score indicating psychological distress, and nor related to BMI-groups. The duration of light PA levels significantly increased with age, while MVPA levels significantly decreased with age.

Prevalence of physical inactivity

The percentage of HLC participants that met PA recommendation levels was approximately half of that found in the representative sample, except for those in the obese subsample (excluding overweight), where the difference was smaller (see **Table 4**).

Psychological distress

The mean score on the SCL-10 was 2.4 (SD = 0.6) in the HLC sample, 77% scored above the cut-off indicating psychological distress. There were no statistically significant differences in psychological distress scores between males and females, those with or without a medical diagnosis, educational levels or between those who were employed or unemployed. There were no significant BMI-related differences. However, a significant difference was found between older and younger participants, with the younger having higher scores ($p = 0.036$); but all age groups had a mean above the cut-off value of 1.85.

There was a markedly and significantly higher prevalence of psychological distress in the HLC sample (77%) compared to the national, representative sample (11%) and to the national overweight and obese samples (16%) (see **Table 5**). The numbers for the overweight and obese populations were estimated from the odds ratios (ORs) from The Health Study of Nord-Trøndelag (HUNT). We used the highest OR value for the analyses (Rivenes et al. 2009).

Table 2: Baseline characteristics of participants consulting the Healthy Life Centre (n = 120).

Age, mean years (SD)	**43.6 (14)**
Gender	*n* (%)
Male	35 (29)
Female	85 (71)
Ethnicity	
Norwegian, *n* (%)	102 (85)
Other, *n* (%)	18 (15)
Education, *n* (%)	
Primary school	20 (17)
High school	54 (45)
College or university	20 (17)
College or university < 3yrs	26 (22)
Employment status, *n* (%)	
Full employment	24 (20)
Reduced employment	20 (17)
Partial sick leave	6 (5)
Sick leave	30 (25)
Student	13 (11)
Partially disabled	1 (1)
100% disabled	22 (18)
Retired	4 (3)
Self-reported diagnosis, *n* (%)	
Yes	73 (61)
No	47 (39)
Living conditions, *n* (%)	
Alone	34 (28)
With others	86 (72)
Body Composition (*n* =119)	
BMI[1], mean (SD)	34.5 (6)
BMI < 25, *n* (%)	8 (7)
BMI 25–30, *n* (%)	19 (16)
BMI 30–35, *n* (%)	42 (35)
BMI > 35, *n* (%)	50 (42)
Visceral fat, mean (SD)	156.5 (45.7)
Percentage with visceral fat >100 cm^2	91

[1] BMI = Body Mass Index kg/m^2.

Associations between PA and psychological distress in the HLC-group

Differences in mean psychological distress scores among inactive versus active participants (i.e., those fulfilling recommendations or not) were non-significant. However, there was a weak association between high psychological distress scores and less light PA (r = –0.23, p = 0.05). When controlled for age, sex and BMI, this association was slightly reduced and no longer significant (partial r = –0.17, p = 0.067). There were no other significant correlations between psychological distress and PA levels.

Table 3: Physical-activity levels among Healthy Life Centre participants compared to a representative sample and an overweight/obese national sample.

Activity intensity	HLC[1]-sample (*n* = 117)	Representative sample[2] (N = 3020)		Sample with a BMI ≥ 25[3] (*n* = 1622)	
	Mean (SD)	Mean (SD)	t-score	Mean	t-score
Light physical activity, min/day	77 (26)	290 (55)**	–87.7	292**	–88.5
Moderate to vigorous physical activity, min/day	44 (23)	38 (30)*	2.7	28.5**	6.9

Notes:
[1]HLC = Healthy Life Centre.
[2]The data are from a report by the Norwegian Directorate of Health (Hansen, 2015).
[3]The data are from Norwegian national mapping, an article describing PA patterns in the overweight and obese (Hansen et al. 2013).
*$p < 0.05$.
**$p < 0.001$.

Table 4: Comparison of percent of groups meeting the recommended guidelines of moderate to vigorous physical activity in 10≥min bouts for at least 21.4 min/day.

HLC[1]-sample	Representative sample[2]	BMI 25–30[3]	BMI ≥ 30[3]	z-score	*p*-value
Whole sample (*n* = 117) 16%	32%			–3.8	<0.001
BMI = 25–30 (*n* = 17) 12%		28 %		n/a	n/a
BMI ≥ 30 (*n* = 91) 12%			19%	–1.6	0.12

Notes:
[1] HLC = Healthy Life Centre.
[2] The data come from a report by the Norwegian Directorate of Health (Hansen, 2015).
[3] The data are from an article based on population investigations in 4 European countries (Loyen et al. 2017).
n/a = not applicable due to n = 17.

Table 5: Prevalence of psychological distress among HLC participants compared to a national, representative sample and to an overweight/obese national sample.

Samples	Prevalence psychological distress (%)	z-score	*p*-value
Psychological distress in the HLC[1] sample	77%	–	–
Psychological distress in the representative sample[2]	11%	23.1	<0.001
Psychological distress in the overweight and obese sample[3]	16%	9.4	<0.001

Notes:
[1] HLC = Healthy Life Centre.
[2] The numbers for the representative selection of the general population are from The Oslo Health Study, N = 17392 (Søgaard, 2003).
[3] The numbers for the overweight and obese population are estimated using odds ratios (ORs) from The Health Study of Nord-Trøndelag (HUNT). To avoid underestimation, we used the highest OR values (Rivenes et al. 2009).

Discussion

The main findings from this investigation indicate that the HLC group had lower levels of light PA and higher levels of MVPA in comparison to national, representative samples. However, fewer HLC participants fulfilled PA recommendations, primarily due to short bouts of MVPA. Furthermore, the level of psychological distress was unexpectedly high and significantly higher than found in nationally representative samples. While the participants consulted an HLC to increase their PA level, the high

proportion of those struggling with psychological distress was substantially more evident than those struggling with inactivity. Moreover, the association between psychological distress and PA levels within the HLC sample were not significant.

The low numbers of participants who fulfilled the PA guidelines in this study was expected since one of the reasons they contacted the HLC was to increase their levels of physical activity. But the seemingly high levels of MVPA in bouts less than 10 minutes was unexpected. However, a similar study conducted in a HLC setting also found high levels of moderate activity, with 79% of subjects performing MVPA for 150 min per week (Samdal et al. 2018). Similarly, in our study, the percentage was 77.8%; although, it appeared that participants were active but struggled to sustain their activity levels for 10 continuous minutes. This might be related to high levels of psychological distress, which has previously been shown to deplete the energy required for continuous activity (Chapman et al. 2016), or it might be due to participants being overweight or obese. A study investigating cut-points for obese to severely obese individuals found lower limits for moderate and vigorous PA (Aadland and Anderssen, 2012), as opposed to the limits most frequently used by Troiano (Troiano et al. 2008). However, there is accumulating evidence indicating that no thresholds need to be exceeded to elicit health benefits from PA (Warburton and Bredin, 2017). This suggests that there may be advantages to increasing light PA and everyday activity, rather than solely focusing on MVPA levels in bouts. Moreover, such an approach might be beneficial when addressing inactivity in individuals with multiple challenges to PA.

While the reasons participants attended the HCL was a desire to achieve a more active, health-enhancing lifestyle, we found that 77 % of the participants struggled with psychological distress. This percentage is far higher than the 11% found in the representative, national sample (Søgaard, 2003) and the 16% among the overweight/obese sample (Rivenes et al. 2009). Compared with non-depressed individuals, depressed people have shown reduced intentions to engage in PA and experience more negative expectations. Additionally, the depressed who *had* high intentions regarding PA were found less able to fulfil their intentions than non-depressed (Krämer et al. 2014). Objectively measured PA patterns of individuals suffering from depression and anxiety have revealed a low fulfilment of PA guidelines (Helgadóttir et al. 2015). Hence, psychological distress can increase the challenges faced when trying to adapt to a more active lifestyle. However, the potential benefits of PA are extensive; thus, the effort to overcome these barriers should be prioritized in programs that aim to increase PA levels. Furthermore, increasing moderate to vigorous PA decreases the odds of depression, especially in overweight and obese people (Vallance et al. 2011).

A significant association between overall PA levels and psychological distress was not found, and the lack of associations could indicate that the participants' psychological distress was, at least partly, a separate issue from PA levels and that many of the participants may need psychological counselling. However, there is a tendency for people with mental health problems to avoid seeking help (Torvik et al. 2018). In addition, psychological help is not readily available, as the choices may be either long waiting lists or expensive therapists. Therefore, the preferable choice may often be to seek life-style changes with respect to PA and diet, even when the need for psychological intervention is present. Employing personnel with training in psychology may therefore be beneficial, as psychological mechanisms have shown to positively mediate successful lifestyle change (Teixeira et al. 2015). Furthermore, the lack of associations between psychological distress and PA levels, except for the weak association with light PA, could be due to a roof-effect caused by the high levels of psychological distress. The level of PA reflected a complicated picture as the participants had high levels of moderate activity, but not in continuous, 10-minute periods. This may be the results of participants increasing their PA prior to attending the centre, which could also reduce the correlation between the measurement of PA and psychological distress.

Strengths and limitations

The strengths of the current study consist of a broad and objective assessment for PA and body composition. In addition, the questionnaire for investigating psychological distress (SCL-10) has been validated and is widely used. The use of these validated tools makes it possible to compare the data to large representative samples. However, there were some limitations. In particular, the study participants from a single HLC may not be representative of the general population who consult these centres. Yet, the sample characteristics in this study were in line with samples from similar studies (Blom et al. 2019; Samdal et al. 2018). Therefore, we assume our sample did not significantly deviate from a typical HLC participants-sample. Educational levels were also in agreement with the Norwegian population in general (StatisticsNorway, 2019). The sample in the present study is small compared to the representative, national samples. Yet, the differences found in physical activity and psychological distress can, with some caution, be generalized to other people seeking

help to improve their physical-activity levels in HLCs. Finally, a last area that might weaken the study is related to analyzing the activity data; both the use of different cut-points and the questions around use of 10-minute bouts would reveal results different from the ones presented.

Conclusions

The present study showed that the HLC-group aiming to increase PA-levels were predominantly obese and struggled with psychological distress. In comparison to representative groups, participants from the present study had lower levels of light PA, but slightly higher levels of MVPA although fewer participants fulfilled PA recommendations due primarily to short bouts of MVPA. The prevalence of psychological distress was significantly higher than the representative samples, but PA-levels was not found to be significantly associated with psychological distress. Since both obesity and psychological distress are factors making it more challenging to initiate PA, the findings from the present study underscore that the Healthy Life Centre participants may also benefit from psychological counselling, to address emotional reactions and coping strategies likely to hamper change towards a healthy lifestyle. However, more studies in other HLCs, or similar services, are needed to verify these results before definitive conclusions can be made.

Data Accessibility Statements

The dataset generated and analysed during the current study are not publicly available, but are available, anonymised, from the corresponding author on reasonable request for as long as permission for data storage is applicable.

Abbreviations

HLC = Healthy Life Centre
BMI = Body Mass Index
PA = Physical activity
MVPA = Moderate and vigorous physical activity
SCL-10 = Hopkins Symptoms Check List 10

Ethics and Consent

Ethics approval was applied for at the Regional Committee for medical and health research ethics (Norway), they concluded that approval was unnecessary. The Data Protection Officer from the Municipality of Stavanger and the Norwegian Data Protection Authority granted permission for the study. All participants provided written, informed consent.

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Competing Interests

CHS was employed in the HLC until march 2015. There are no other competing interest.

Author Contributions

CHS contributed to the study design and applied for necessary approvals. CHS collaborated with the HLC personnel who collected the data. CHS imported, processed and analysed the data and drafted the manuscript. SMD and LEB contributed to the design of the study and to the data analysis. They provided critical comments and revised the text for intellectual content and approved the submission of the final version.

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