Physical activity, sedentary behaviour, physical fitness, and cognitive performance in women with fibromyalgia who engage in reproductive and productive work: The al-Ándalus project

Running head: Fibromyalgia, work status and health

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ABSTRACT

Introduction/objectives: Reproductive labour refers to activities and tasks directed at caregiving and domestic roles, such as cleaning, cooking, and childcare. Productive labour refers to activities that involve economic remuneration. The aim of the present study was to analyse physical activity, sedentary behaviour, physical fitness, and cognitive performance in women with fibromyalgia who engaged, or did not engage in productive work.

Method: This cross-sectional study comprised 276 women with fibromyalgia from Andalusia (southern of Spain). Levels of physical activity (light, moderate, and vigorous) and sedentary behaviour were measured by accelerometry. Physical fitness and cognitive performance were measured with a battery of performance-based tests.

Results: More hours/week of homemaker-related tasks was associated with higher time spend in light physical activity and lower sedentary behaviour ($P<0.001$ and $P<0.05$, respectively). Furthermore, in comparison with those who only engaged in reproductive labour, women with fibromyalgia who engaged in productive work showed lower levels of sedentary behaviour and higher levels of light and moderate physical activity, physical fitness (except muscular strength), and cognitive performance (all, $P<0.05$).

Conclusions: Altogether, our findings suggest that productive work is consistently related to better physical and cognitive functioning in women with fibromyalgia. If future research corroborates causality of our findings, then to maintain women with

fibromyalgia engaging in productive work may be strived for not only because of societal or economic reasons but also for better health. However, we should keep in mind that people with fibromyalgia have a chronic condition and, therefore, adaptations at the workplace are imperative.

Keywords: Chronic pain, housework, domestic work, household chores, household tasks, reproductive labour.

Key-points:

- Women with fibromyalgia, who spend more time in reproductive labour have higher levels of light physical activity and lower sedentary behaviour, however, it is associated with poorer general health (as lower physical fitness or cognitive performance).
- Household tasks are often seen as a responsibility associated with the gender roles that women with fibromyalgia perform, despite the feelings of incapacity they cause. Policies focused on reducing reproductive labour demands for fibromyalgia patients (i.e. social help on housework or childcare) might facilitate the inclusion of daily active behaviours.
- People with fibromyalgia who engage in productive work seems to have better health outcomes than those who have not, however, we cannot forget that adaptations and flexibility at the workplace are imperative.

1

1. Introduction

Fibromyalgia is a disorder characterized by chronic pain [1], in addition to fatigue, stiffness, sleep disturbance and cognitive dysfunction [2]. There is widespread acceptance that health problems are related to social and economic conditions [3], and it may be the case that further research on the potential social and cultural determinants of health in the case of fibromyalgia, may contribute to better management of the disease.

Reproductive labour refers to activities and tasks directed at caregiving and domestic roles, which are confined to the family-private space [4]. Examples of reproductive labour are washing, cooking, and caring of other people [5]. Reproductive labour has been associated with poorer health [6], however, reproductive labour might increase physical activity and reduce sedentary behaviour, which in turn may lead to improvement in physical fitness and other health-related outcomes [7]. Reproductive labour is unpaid conversely 'productive work' refers to economic activities that involve the production of goods and services [8], which involves economic remuneration.

Fibromyalgia has a profound impact on activities of daily living and significantly impacts on work ability [9]. Fibromyalgia usually imposes limitations on an individual's ability to perform productive work [10]. Some of the factors reported to be associated with temporary work disability in people with fibromyalgia include: jobs; worse functional capacity; and more severe clinical symptoms [11]. Being under pressure to meet time demands and more extreme mental activity required on the job have been associated with worse physical symptoms in people with fibromyalgia [12]. The impact on employment and changes in the family dynamics that occur in people with this condition result in substantial economic losses [13].

Doing reproductive and productive work is related to gender which may play a role in health inequalities [14]. It is important to note that many women have both reproductive and productive working roles, resulting in a large volume of invisible work which can lead to excessive of work burden.

There has been limited investigation of the extent to which women with fibromyalgia engage in both reproductive and productive work, and if working roles are associated with parameters related to health in this condition. Studying the working roles and environment of those with fibromyalgia, and examining how these activities influence the condition could help design intervention strategies to improve health outcomes for those with fibromyalgia.

Therefore, the aim of the present study was to analyse physical activity, sedentary behaviour, physical fitness, and cognitive performance in women with fibromyalgia who engaged, or did not engage in productive work. We hypothesized that women with fibromyalgia would have high demands of reproductive labour, even if they were also engaged in paid employment, and that engage in productive work would be related to lower sedentary behaviour and higher levels of physical activity, physical fitness, and cognitive performance.

2. Methods

2.1. Design and participants

The present study is part of the al-Ándalus project, where a geographically representative sample of people with fibromyalgia (n=300) from Andalucía (southern Spain) was studied. The aim of the al-Ándalus project (cross-sectional study) was to study physical activity, sedentary behaviour, physical function, body composition, pain, general

health and quality of life of people with fibromyalgia and provide reference values. The study assessments were carried out between November 2011 and January 2013. The study protocol was approved by the Ethics Committee of the Hospital Virgen de las Nieves (Granada, Spain). A total of 616 people with fibromyalgia gave their written consent.

The inclusion criteria for the present study were (i) to be an adult woman (aged 18 to 65 years old); (ii) to have been diagnosed with fibromyalgia by a rheumatologist and to meet the 1990 criteria of the American College of Rheumatology (ACR) [15], (iii) not to have an acute or terminal illness or severe cognitive impairment (Mini Mental State Examination score (MMSE) <10) [16]; (iv) to be able to walk and communicate; (v) to have been classified in occupational status as a homemaker or as working outside the home (i.e., those participants reporting to be retired, unemployed, students, in sick leave or disability were excluded). People that did not meet the abovementioned inclusion criteria were excluded. The final sample consisted of 276 women with fibromyalgia.

2.2. Measures

Working status was classified as (i) homemaker (i.e. those that only performed reproductive labour) or (ii) work outside the home with a paid employment (i.e. those that performed productive work). In Spanish culture, women commonly engage in reproductive labour, for this reason, women classified in the productive work group could engage in reproductive labour at the same time. The participants reported the number of hours/week that they spent on reproductive labour.

Physical activity and sedentary behaviour were objectively measured for 9 consecutive days with GT3X + triaxial accelerometer (Actigraph, Pensacola, Florida, USA). Patients wore the device on the hip for 9 days during 24 hours except for water-

based activities. Accelerometer wearing time was obtained by subtracting the sleeping time and non-wear periods from each day. A total of 7 continuous days with a minimum of 10 valid hours per day was the criteria for being included in the study analysis. The sedentary time-cut points for light, moderate, and vigorous physical activity were calculated based on the vector magnitude recommended for each level [17, 18]: 0-199, 200-2689, 2690-6166 and ≥6167, respectively, expressed in minutes per day. Data was downloaded, cleaned and analysed using the manufacturer's software (Actilife 6 desktop).

Physical fitness was measured by means of standardized performance-based tests. Lower and upper body flexibility were assessed with the 'Chair sit-and-reach' and 'Back scratch' tests, respectively. The '30-s chair stand test' was used to measure lower body muscular strength. Upper body muscular strength was assessed with the 'Arm curl test'. The handgrip test was performed using a digital dynamometer (TKK 5110 Grip-D; Takey, Tokyo, Japan) as described by Ruiz-Ruiz et al. [19]. Speed-agility was measured with the '8-foot up and go test' and cardiorespiratory fitness with the '6-minute walk test'. Detailed information is available elsewhere [19, 20].

Cognitive performance was measured by the Paced Auditory Serial Addition Task (PASAT) [21, 22]. The PASAT measures sustained and delayed attention and working memory, i.e. the ability to continuously update and effectively hold information in working memory over short time intervals [23]. Participants were presented a series of single-digit numbers (presentation rate: 2.4 s), where the two most recent digits were to be summed. For example, if the digits '2', '4' and '1' were presented, the correct sums the participant should respond would be '6' and then '5'. Prior to the beginning of the test, a series of practice trials were performed. The percentage of correct responses, omissions and errors over 60 trials were recorded [22].

96 *2.3. Statistical analyses*

97 Differences in sociodemographic between women that engaged in reproductive
98 labour exclusively and those that engaged in productive work were tested using Chi-
99 square test for categorical variables, and one-way analysis of variance (ANOVA) was
100 employed for continuous variables.

101 Before conducting the main analyses, the scores from the performance-based physical
102 fitness tests were standardized (z-score, [value-mean]/standard deviation) to compute
103 composite scores for each physical fitness component (i.e., flexibility, muscular strength,
104 speed-agility, and cardiorespiratory fitness) and a 'global fitness profile' as the average
105 of the flexibility, muscle strength, speed-agility and aerobic fitness composite z-scores.

106 Linear regression analyses were done to examine the association between number of
107 hours/week spent on reproductive labour (independent variable) and physical activity,
108 sedentary behaviour, physical fitness, and cognitive performance (dependent variables,
109 each one analysed in a separate model), controlling for age, body mass index (BMI), level
110 of education, marital status, and time since diagnosis (potential confounders). All women
111 who performed homemaker-related tasks were included regardless of whether they also
112 engaged in productive work or not.

113 The same dependent variables and confounders were defined in analysis of covariance
114 (ANCOVA) to compare women who engaged in productive work with those who did not.
115 Productive work was the independent variable.

116 The level of error considered to accept the significance of the tests was 5%. The
117 Statistical Package for Social Sciences software (IBM SPSS for Mac, version 20.0;
118 Armonk, NY, USA) was used.

3. Results

Table 1 shows the characteristics of the sample. Participants were predominantly married, with low education, and with more than five years from diagnosis. There were significantly more unmarried, as well as, they were younger and with higher levels of education between those women who engaged in productive work compared with those women who engaged in reproductive labour. The average hours of work on homemaker-related chores were 25.5 hours a week in women who engaged in productive work and 35.3 hours in women who engaged in reproductive labour exclusively.

Table 2 shows that more weekly hours spent on reproductive labour were associated with higher levels of light physical activity ($P<0.001$) and lower sedentary behaviour ($P<0.05$), while a lack of association emerged for the remaining variables: moderate and vigorous physical activity (table 2), physical fitness, and cognitive performance (data not shown).

Figures 1, 2 and 3 show comparisons of physical activity, physical fitness and cognitive performance between women who engages in reproductive labour exclusively and those who engaged in productive work. Women with fibromyalgia who engaged in productive work spent more time in light and moderate physical activity and less time in sedentary behaviour (all $P<0.05$), as well as they had a better physical fitness ($P<0.05$) and cognitive function ($P<0.05$) than those women who engaged in reproductive labour. Only three exceptions emerged indicating a lack of differences between groups in vigorous physical activity, muscular strength and incorrect answers of PASAT.

4. Discussion

The present study showed that, in women with fibromyalgia that, first, more time spent in reproductive labour was associated with higher levels of light physical activity and lower sedentary behaviour but not with better physical fitness or cognitive performance. Second, in comparison with women with fibromyalgia who only engaged in reproductive labour, those who engaged in productive work had less time in sedentary behaviour, higher levels of light and moderate physical activity, higher physical fitness, and better cognitive performance.

In the current study, time spent on reproductive labour was related to higher levels of light physical activity and lower levels of sedentary behaviour in women with fibromyalgia, which were previously shown to be associated with less unfavourable symptoms in this population [7]. However, time spent on reproductive labour was not associated with greater moderate or vigorous physical activity, physical fitness, and cognitive performance, which is strived for in fibromyalgia [24–26]. The findings of the present study may tentatively suggest that the characteristics and intensity of activities performed during housework are not enough or suitable to promote improvements in physical fitness or cognitive performance in women with fibromyalgia.

Another finding was that women who engaged in productive work had more favourable scores of physical activity, sedentary behaviour, physical fitness, and cognitive performance than women who only engaged in reproductive labour, which is in line with the available literature [6, 27–29]. People with fibromyalgia who are employed seems to have better health outcome that those who are not. This may, first, suggest that a reduction of physical fitness hampers doing productive work [30]. However, it is also possible that productive work promotes physical and cognitive performance. This may be due to the fact that productive work is usually performed

outside the home, where active displacement could lead to an increase in physical activity. Also, productive work could be linked to activities with greater physical and cognitive stimulation. Future observational longitudinal and experimental research is needed to examine this notion.

It is interesting to note that in results of associations of sedentary behaviour and physical activity with reproductive labour was found a very small adjusted R^2, specially for moderate and vigorous physical activity. These results are likely to be explained by productive work, since we included in analysis all women who performed housework, regardless of whether they also performed productive work or not. Reproductive labour could explain light physical activity, but moderate and vigorous physical activity levels could be explained by productive work. Women who engaged in productive work spend less time doing housework and showed higher levels of physical activity, therefore an inverse association was found.

In women with fibromyalgia, several observations have been made. First, they are often homemakers [26]. Second, they engage less in physical activity [31], and have deteriorated levels of physical fitness [20]. Third, higher levels of physical activity and physical fitness and lower levels of sedentary behaviour are markers of health in fibromyalgia [32–34]. Fourth, they experience impairments in cognitive function [35], which is a major worry for them. The causality between these factors is unclear but likely there is mutual influence between these factors.

Altogether, our findings suggest that productive work but not reproductive labour is related to better physical and cognitive functioning in women with fibromyalgia. Future research should examine the causality of this relationship, more specifically whether maintaining women with fibromyalgia at work improves their physical and cognitive

functioning. To be able to keep them working, adaptations at the workplace such as recovery opportunities, the pacing and load of the work, and work agreements are imperative [10, 36, 37]. Unfortunately, when people with fibromyalgia report the existence of the disease in their workplace, most of them do not have work adaptations [13].

Although gender inequality is being reduced in the last years [38], further improvement is needed [39]. Therefore, as a society, we should be aware that, because of gender roles, women with fibromyalgia who engage productive work may have a double labour journey; i.e., one at home and another at the (productive) workplace, which can lead to an excess of working demands [40]. Policies focused on reducing reproductive labour demands for fibromyalgia patients (i.e. social help on housework or childcare) might facilitate the inclusion of daily active behaviours. For instance, a previous study indicated that family demands were inversely related to less active commuting patterns [41], which is associated with lower health. More comprehensive knowledge about both productive and reproductive work may be also informative.

4.1. Limitations

The cross-sectional design of the current study does not allow establishing causal relationships. Moreover, men were excluded due to the small sample. The main strengths of the present study were: (i) the large sample size and (ii) the objective measurement of physical activity, sedentary behaviour, physical activity, physical fitness, and cognitive performance.

5. Conclusions

To conclude, the present study showed that, in women with fibromyalgia, to engage in productive work is related to better both physical and cognitive functioning. This may suggest that maintaining women with fibromyalgia engaging in productive work may improve their health. However, we should keep in mind that people with fibromyalgia have a chronic condition that makes adaptations in the workplace imperative.

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Competing interests

The authors declare that they have no competing interests.

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377 **Table 1.** Socio-demographic characteristics of the participants

	All (*n*=276)	**Women engaged in reproductive labour (*n*=155)**	**Women engaged in productive work (*n*=121)**	**P**
Age, mean years (SD)	51.7 (8.0)	53.9 (8.3)	48.9 (6.8)	**<0.001**
Marital status, n(%)				**<0.001**
With partner (married)	214 (77.5%)	134 (86.5%)	80 (66.1%)	
Unmarried (single, separated, divorced and widowed)	62 (22.5%)	21 (13.5%)	41 (33.9%)	
Education level, n(%)				**<0.001**
No studies/primary school	170 (61.6%)	118 (76.1%)	52 (43%)	
Secondary school, professional training and university degree	106 (38.4%)	37 (23.9%)	69 (57%)	
Years since diagnosis, n(%)				0.328
≤ 5 years	123 (44.6%)	66 (43.1%)	57 (49.1%)	
More than 5 years	146 (52.9%)	87 (56.9%)	59 (50.9%)	
Unanswered	7 (2.5%)			
Hours of homemaker-related tasks per week, mean (SD)	31.0 (15.6)	35.3 (15.7)	25.5 (13.8)	**<0.001**

378 *Note.* SD, standard deviation

379

380 **Table 2.** Associations of sedentary behaviour and of physical activity intensity levels

381 with reproductive labour (hours/week) (*n*=276)

Sedentary behaviour		***β***	***95% CI***		***P***	***Adj. R^2***	***P (model)***
Step 1						0.052	0.003
Age	0.387	0.030	-1.389	2.162	0.668		
Body mass index	4.224	0.204	1.513	6.934	0.002		
Educational level	42.818	0.201	14.375	71.262	0.003		
Marital status	15.513	0.061	-16.911	47.937	0.347		
Time since diagnosis	-11.981	-0.057	-39.071	15.109	0.384		
Step 2						0.072	0.015
Reproductive labour (hours/week)	-1.079	-0.163	-1.948	-0.21	**0.015**		
Light physical activity	***B***	***β***	***95% CI***		***P***	***Adj. R^2***	***P (model)***
Step 1						0.012	0.168
Age	0.422	0.038	-1.122	1.966	0.591		
Body mass index	-2.734	-0.155	-5.091	-0.377	0.023		
Educational level	-15.964	-0.088	-40.697	8.77	0.205		
Marital status	-14.777	-0.068	-42.971	13.418	0.303		
Time since diagnosis	7.217	0.041	-16.34	30.773	0.547		
Step 2						0.072	<0.001
Reproductive labour (hours/week)	1.515	0.268	0.775	2.255	**<0.001**		

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Moderate physical activity	***B***	***β***	***95% CI***		***P***	***Adj. R^2***	***P (model)***
Step 1						0.042	0.010
Age	-0.510	-0.138	-1.015	-0.004	0.048		
Body mass index	-1.042	-0.177	-1.814	-0.27	0.008		
Educational level	-3.347	-0.055	-11.45	4.756	0.417		
Marital status	3.262	0.045	-5.974	12.499	0.487		
Time since diagnosis	-0.098	-0.002	-7.815	7.619	0.980		
Step 2						0.049	0.093
Reproductive work (hours/week)	0.213	0.114	-0.036	0.463	0.093		

Vigorous physical activity	***B***	***β***	***95% CI***		***P***	***Adj. R^2***	***P (model)***
Step 1						0.014	0.141
Age	-0.031	-0.099	-0.074	0.012	0.162		
Body mass index	-0.038	-0.076	-0.104	0.028	0.261		
Educational level	0.095	0.019	-0.600	0.789	0.788		
Marital status	0.039	0.006	-0.753	0.83	0.923		
Time since diagnosis	-0.485	-0.097	-1.147	0.176	0.150		
Step 2						0.014	0.308
Reproductive work (hours/week)	0.011	0.070	-0.010	0.033	0.308		

β, standardized regression coefficient; B, unstandardized regression coefficient; CI, confidence interval; Adj. R^2, adjusted coefficient of determination, expressing the adjusted percent variability of the dependent variable explained by each model.