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# Factors associated with the occupational balance in caregivers of people with dementia: A cross-sectional study from the ATENEA project

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## Abstract

**Background** Occupational balance (OB) has been associated with health indicators in informal caregivers (CGs) such as well-being and subjective health. Consequently, maintaining an adequate OB could be crucial to providing adequate care without becoming overwhelmed, converting the condition of caregivers into an important aspect of public health as the ageing population increases. However, little is known about the factors influencing OB in CGs. Thus, this study aimed to explore the associated factors with the OB in CGs of persons with dementia.

**Methods** We cross-sectionally analysed data from 134 CGs and the individuals with dementia. We assessed CGs' OB using the Occupational Balance Questionnaire (OBQ). Simultaneously, several sociodemographic, clinical, and caregiving-related variables including CGs' burden and psychological distress were assessed. The association between the CGs' OB and those factors was explored through robust multiple linear regression.

**Results** Firstly, CGs that presented secondary education exhibited a decrement of 5.41 (CI95% = -10.62, -0.41; p-value = 0.03) OB points. Moreover, CGs with higher education experienced a more pronounced OB reduction ( $\beta$  = -7.74; 95%CI = -12.19, -3.29; p-value = < 0.001). Secondly, those CGs that were retired showed an OB increment of 5.52 (CI95% = 1.14, 9.38; p-value = 0.01). Thirdly, receiving assistance with household chores was associated with an OB increase of 5.80 (CI95% = 2.21, 9.38; p-value = 0.001). Fourthly, and regarding clinical measures, CGs experiencing overload or psychological distress were associated with an OB points decrement of 7.87 (CI95% = -12.51, -3.23; p-value = 0.001) and 9.17 (CI95% = -13.51, -4.84; p-value < 0.001), respectively. Finally, 1% increment in the Disability Assessment for Dementia obtained from the individuals with dementia was associated with an increment of 0.11 (CI95% = 0.04, 0.18; p-value = 0.002) OB points.

**Conclusions** This study identified several associated factors with the OB of CGs of persons with dementia. Specifically, we remarked that the CGs' education, employment status, household chores assistance, overload

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presence, psychological distress symptoms and the functional level of the person with dementia who cared for were important variables that should be considered when evaluating OB or creating OB-related interventions in CGs.

**Keywords** Occupational balance, Caregivers, Dementia, Informal caregivers, Health relation

## Background

The global population is currently experiencing a significant demographic transformation marked by a notable increase in the older people [1]. This shift is evident across all nations and, according to the World Health Organization (WHO), predictions indicate that by 2030, approximately one out of six individuals globally will have reached the age of 60 or more [1]. This growing proportion of older people has led to a higher prevalence of age-related chronic diseases that have significant implications for public health and society, such as dementia [2, 3].

Dementia is defined as a progressive neurological condition characterized by a gradual and persistent deterioration in cognitive and memory functions [4]. Dementia is also considered one of the principal causes of disability and dependency among older people [5, 6]. In fact, it is estimated that 47 million people worldwide are affected by this condition and, due to the increasing numbers of the ageing population, this number is expected to increase to 139 million by the year 2050 [7]. The clinical manifestations of dementia show considerable variability, including cognitive, psychological, and behavioural alterations [4, 8, 9]. These notable changes result in a decline in the individual's functionality to perform activities of daily living (ADLs), leading to increased dependence [10, 11]. As a consequence of this functional loss, a high number of people diagnosed with dementia rely on the assistance of either formal (professionals) or informal (family members) caregivers [12, 13].

Informal caregivers (CGs) play a crucial role in assisting individuals with dementia in performing their ADLs. In approximately 80% of Spanish cases, CGs take on this responsibility, assuming nearly 87% of the economic burden related to the disease [14]. However, CGs of persons with dementia are constantly exposed to physical and mental burdens [15–19]. The shifts in the CGs' daily routines driven by their caregiving responsibilities and concerns, often result in notable social isolation, depression, anxiety, disrupted sleep patterns, reduced engagement in recreational activities, leisure pursuits, and hobbies, as well as alterations in their occupational roles [15–22]. In addition, these factors are strongly incremented along the dementia course [17, 22, 23]. Consequently, these alterations could have a significant impact on the CGs' occupational balance (OB).

The OB is described as the subjective experience of having the right combination in quantity and variation of occupations in a particular occupational pattern [24]. Interestingly, OB has been associated with the subjective

health and well-being of CGs [24–28]. Specifically, regarding older people, a recent study has shown that OB was correlated to the subjective health and well-being of CGs of older people [29]. This study evidence the critical importance of maintaining OB in CGs as it contributes to both the CGs and the individual receiving care well-being [24–28]. Nonetheless, scientific research on OB and CGs remains limited, with significant gaps in exploring this concept within vital populations such as CGs of individuals with dementia.

In addition, it is important to highlight the role of older adults in informal caregiving. In Europe, most CGs are between 50 and 75 years old [30]. It should be considered that older CGs, by their condition, face a double vulnerability: they must cope with the demands of caregiving while at the same time managing their health. This double burden can have a significant negative impact on their quality of life [31], which further underscores the relevance of studying OB in this population.

Based on the literature review, sociodemographic factors, such as gender, age, education, and employment status, can influence CGs burden [32, 33]. Additionally, clinical factors, including anxiety and depression, are also associated with increased caregiver stress [34]; and care-related factors, such as the severity of dementia and time spent caregiving, contribute to caregiver overload [32]. All these factors are related to different variables such as burnout or stress, and may also be related to OB. In CGs of persons with dementia, a sufficient OB is essential in order to provide high-quality care while maintaining their own health, roles and life satisfaction [24–28]. For this reason, this study aimed to explore the associated factors with the OB in CGs of persons with dementia; specifically to investigate the sociodemographic, clinical, and caregiving-related factors associated with OB in CGs of people with dementia participating in the ATENEA (ATENción plena en Enfermedad de Alzheimer) project [35].

## Methods

### Study design

This cross-sectional study employed data from the ATENEA project, a randomized clinical trial designed to investigate the potential beneficial effects of a mindfulness-based program on CGs of people with AD and the individuals who cared for [35]. Specifically, participants were Spanish CGs of persons diagnosed with dementia according to their neurology department of reference and living in the community. The results of this study were

reported according to the STROBE recommendations [36].

### Data collection

From February 2019 to March 2023 CGs were personally recruited from health institutions in the Alicante province: the Neurology Unit of the San Vicente Hospital, the General University Hospital of Alicante, the Clinical University Hospital of San Juan and the primary health care centres of Santa Pola, San Juan and Muchamiel. In addition, CGs from four Alzheimer's Disease associations within the Alicante area were also recruited. Details of the recruitment campaign have been published elsewhere [35]. The CGs inclusion criteria were (I) being the primary CG for an individual diagnosed with dementia; and (II) obtaining a Mini-Mental State Examination score equal to or greater than 26. Both CGs and the individual with dementia were excluded if presented (I) a history of neurological disease (e.g., stroke, epilepsy, meningitis, etc.); (II) alcohol or drug abuse (excluding tobacco) during the 24 months before the start of the study; (III) systemic diseases linked to cognitive impairment; (IV) severe psychiatric illnesses (major depression, schizophrenia, etc.) or (V) visual and/or auditory disorders that could affect test performance. A total of 210 CGs were personally evaluated by the research team before randomization and 134 (64%) who provided complete OB and main associated factors data accounted for the population of this study.

### Sociodemographic data

An Ad Hoc questionnaire was developed to obtain the CGs' age, sex (male, female), academic studies (primary education or below, secondary studies, higher education), marital status (married or living with a partner, without a partner, separated, divorced, widowed) employment status (active, unemployed, retired) and the age, gender, academic studies, and marital status of the persons with dementia that cared for.

### Aspects related to caregiving

The CGs were asked for several aspects related to their caregiving activity using an Ad Hoc questionnaire. In particular, they were asked if they resided with the person affected with dementia (yes, no), if they received assistance with household chores (yes, no), the presence of a caregiver substitute (family member, paid caregiver/institution, or none), family relationship before dementia (good, very good, fair or not good), the belief in whether someone else should help in the caregiving (yes, no) and job abandonment due to caregiving (yes, no).

### Clinical measures

Based on previous studies [15–19], several crucial clinical measures were collected from the CGs and the people with dementia. In particular, anxiety and depression symptoms in CGs were self-reported using the Spanish version of the Hospital Anxiety and Depression (HAD) scale [37]. The HAD scale comprises 14 items divided into two 7-item subscales. Each item is rated on a 3-point Likert scale with 4 response options, ranging from 0 to 3. The total score, combining both subscales, can reach a maximum of 42. A cutoff point of >13 points was applied to identify cases with symptoms of psychological distress [37]. This version presents good internal consistency indices for its two subscales ( $\alpha$ -Cronbach>0.70) [37]. Additionally, CGs burden was assessed utilizing the Spanish version of the Zarit Burden Interview (ZBI) [38, 39]. The ZBI offers an assessment of the caregiving burden, comprising 22 items rated on a 5-point Likert scale from 0 to 4. Higher scores indicate a higher burden, with the maximum achievable score being 88. A cut-off point of  $\geq 47$  was employed to identify the presence of significant overload [40]. This instrument has good internal consistency ( $\alpha$ -Cronbach=0.92) [39].

Regarding individuals with dementia, the severity of dementia-induced impairment was evaluated through the Global Deterioration Scale (GDS) [41]. In this study the GDS scores were categorized into stages 3–4, representing mild to moderate cognitive decline, and stages 5–7, indicating from moderately severe to very severe cognitive decline. In addition, the functional capacity of participants with dementia was assessed using the Spanish version of the Disability Assessment for Dementia (DAD-E) scale [42, 43]. Comprising 40 items, the DAD-E scale assesses ADLs, instrumental ADLs, and leisure activities. The relative scores in percentages were used, with higher percentages indicating higher competence in performing ADLs. The Spanish version has good internal consistency ( $\alpha$ -Cronbach=0.96) [42]. Finally, the presence and severity of neuropsychiatric symptoms (NPS) of the individuals with dementia were assessed using the abbreviated Spanish version of the Neuropsychiatric Inventory Questionnaire (NPI-Q) [44]. CGs were asked whether the NPS was present and to rate the severity of the symptoms on a scale of 0 to 3 (0=not present; 1=mild; 2=moderate; and 3=severe). The NPI-Q severity score, ranging from 0 to 36, was obtained by summing the respective points. Furthermore, CGs were also asked to assess the impact of the NPS on themselves on a scale of 0 to 5 (0=no distress; 1=low distress; 2=mild distress; 3=moderate distress; 4=severe distress; and 5=extreme distress). The CGs distress score was obtained by adding up all the points, which ranged from 0 to 60. This version shows good internal consistency for the overall instrument ( $\alpha$ -Cronbach=0.85) [45].

### Occupational balance

The CGs' OB was evaluated using the Spanish version of The Occupational Balance Questionnaire (OBQ-E) [46]. This tool assesses occupational performance based on the individual's satisfaction with the quantity and diversity of their occupations. The questionnaire consists of 13 items, each one scored on a scale ranging from 0 (completely disagree) to 5 (completely agree). The total score, ranging from 0 to 65 points, was obtained by summing the values of each item. Higher scores reflect a better OB. The OBQ-E showed good internal consistency ( $\alpha$ -Cronbach=0.87), intraclass reliability (ICC=0.87), and test-retest reliability ( $\rho$ =0.83) [47].

### Statistical analysis

Statistical analyses were conducted using R software version 4.2.2. (R Foundation for Statistical Computing, Vienna, Austria; [www.R-project.org](http://www.R-project.org)). All statistical tests were bilateral, with the significance level set at 0.05. Firstly, the sociodemographic characteristics, clinical data and aspects related to caregiving were described as frequencies and percentages (categorical variables) and as a mean and standard deviation or a median and interquartile range based on their distribution (quantitative variables). The distribution of the quantitative variables was explored by applying the Lilliefors-corrected Kolmogorov–Smirnov test. Secondly, to explore possible

differences regarding OB, a bivariate analysis between the above-mentioned variables groups and the CGs' OB was performed using the Student's t-test and ANOVA test. Age variables were categorized based on their median value. Thirdly, a robust multiple linear regression model was conducted to explore the sociodemographic, clinical and caregiving aspects associated with the CGs OB using the “robustbase” R package [48]. The potential associated factors were selected among those sociodemographic, clinical and caregiving aspects with a  $p$ -value<0.2 in the bivariate analysis [49]. Moreover, those variables that changed the magnitude of the main effects by more than 10% after a backward–forward elimination procedure were also included [49].

### Results

#### Characteristics of the study population

The main CGs' characteristics are shown in Table 1. We observed that the vast majority of CGs were female (83.58%), with a median (IQR) age of 56.00 (51.00–64.75). When examining CGs' OB in relation to these main characteristics, those CGs with primary education or below tended to present higher OB. Furthermore, retired CGs exhibited higher OB compared to those who were unemployed or actively employed. Regarding the sociodemographic characteristics of the people with dementia, these are presented in Table 2. Their median age was

**Table 1** Caregivers' occupational balance in relation to their sociodemographic and clinical characteristics ( $n = 134$ )

Caregivers' characteristics	<i>n</i> (%)	Caregivers OBQ-E mean (SD)	<i>p</i> -value <sup>a</sup>
<b>Age<sup>b</sup></b>			0.243
< 56 years	62 (46.27)	35.47 (12.76)	
≥ 56 years	72 (53.73)	38.17 (13.91)	
<b>Sex</b>			0.328
Female	112 (83.58)	36.40 (13.37)	
Male	22 (16.42)	39.55 (13.61)	
<b>Academic studies</b>			0.126
Primary education or below	34 (25.37)	40.71 (14.95)	
Secondary education	45 (33.58)	34.58 (13.01)	
Higher education	55 (41.05)	36.49 (12.43)	
<b>Marital Status</b>			0.436
Married or living with a partner	85 (63.43)	37.61 (13.29)	
Others <sup>c</sup>	49 (36.57)	35.71 (13.66)	
<b>Employment status</b>			0.159
Active	52 (38.81)	36.15 (13.91)	
Unemployed or work incapacity	47 (35.07)	35.04 (12.85)	
Retired	35 (26.12)	40.57 (13.05)	
<b>Zarit Burden Inventory</b>			< 0.001
Absence of overload	100 (74.62)	39.98 (12.86)	
Overload	34 (25.38)	27.91 (10.77)	
<b>HAD total score</b>			< 0.001
Absence of psychological distress	72 (53.73)	41.83 (11.96)	
Psychological distress	62 (46.27)	31.21 (12.80)	

Abbreviations: OBQ-E, Spanish version of the Occupational Balance Questionnaire; HAD, Hospital Anxiety and Depression Scale; SD, Standard deviation. <sup>a</sup> $p$  value obtained from Student's t and ANOVA tests. <sup>b</sup>Cut-point based on the median value. <sup>c</sup>Without a partner, separated, divorced, or widowed.

**Table 2** Caregivers' occupational balance in relation to the sociodemographic and clinical characteristics of the people with dementia they cared for (n = 134).

Characteristics of the people with dementia	n (%)	Caregivers OBQ-E mean (SD)	p-value <sup>a</sup>
<b>Age<sup>b,c</sup></b>			0.962
< 82 years	62 (47.69)	36.68 (13.14)	
≥ 82 years	68 (52.31)	36.79 (14.03)	
<b>Sex<sup>d</sup></b>			0.668
Female	80 (65.04)	37.10 (14.42)	
Male	43 (34.96)	36.02 (12.58)	
<b>Academic studies<sup>d</sup></b>			0.968
Uneducated or able to read and write	59 (47.96)	36.92 (14.25)	
Primary education	34 (27.64)	36.88 (12.58)	
Secondary or higher education	30 (24.40)	36.17 (14.48)	
<b>Marital Status<sup>e</sup></b>			0.936
Married or living with a partner	61 (50.00)	36.87 (13.64)	
Without a partner or widowed	61 (50.00)	37.07 (13.56)	
<b>GDS</b>			0.267
3–4	48 (35.82)	38.79 (15.78)	
5–7	86 (64.18)	35.87 (11.86)	
<b>DAD-E %, median (IQR)</b>	30.39 (12.50–57.50)		0.03
<b>NPI-Q severity, median (IQR)</b>	8.00 (4.00–16.00)		< 0.001
<b>NPI-Q distress, median (IQR)</b>	11.00 (5.00–20.00)		0.001

Abbreviations: OBQ-E, Spanish version of the Occupational Balance Questionnaire; GDS, Global Deterioration Scale; DAD-E, Spanish version of the Disability Assessment for Dementia; NPI, Neuropsychiatric Inventory Questionnaire; SD, Standard deviation; IQR, interquartile range. <sup>a</sup>p value obtained from Student's t, ANOVA and Spearman Correlation tests. <sup>b</sup>Cut-point based on the median value. <sup>c</sup>n = 130. <sup>d</sup>n = 123. <sup>e</sup>n = 122.

82.00 (77.00–86.75). It should be highlighted that a higher proportion of individuals with dementia were women (65.04%). In the bivariate analysis between the main characteristics of individuals with dementia and their OB, no clear differences emerged. However, there was a correlation between OB and the severity of neuropsychological symptoms ( $\rho = -0.28$ ,  $p < 0.001$ ), the distress caused by these symptoms ( $\rho = -0.27$ ,  $p = 0.001$ ), and the DAD-E score ( $\rho = 0.19$ ,  $p = 0.03$ ).

### Clinical measures and aspects related to caregiving

CGs experiencing overload (25.38%) and those suffering from psychological distress (46.27%) showed a statistically significant ( $p$ -value < 0.001) decrement in their OB when compared to those CGs who did not present these conditions (Table 1). Furthermore, in relation to the CGs activity (Table 3), a difference emerges when comparing CGs who received help with their household chores and those who did not. Specifically, CGs who received such assistance (57.46%) presented a 4-point higher mean in OB compared to those who did not. Nevertheless, no other aspects of the caregiving activity appeared to be related to the CGs' OB (Table 3).

The clinical measures of the people with dementia are shown in Table 2. Particularly, a higher proportion of moderately severe to very severe cognitive decline (GDS 5–7) was observed (64.18%). In addition, the median (interquartile range, IQR) percentage of functional capacity identified by the DAD-E was 30.39 (12.50–57.50)

while the median (IQR) of the NPI-Q severity score was 8.00 (4.00–16.00). Regarding the median (IQR) NPI-Q distress score obtained from the CGs, it was 11.00 (5.00–20.00).

### Factors associated with the caregivers' occupational balance

The sociodemographic, clinical and caregiving factors associated with the CGs' OB are presented in Table 4. Firstly, in comparison to CGs that showed primary education or below, those with secondary education exhibited a decrement of 5.41 (95%CI = -10.62, -0.41;  $p$ -value = 0.03) OB points. Particularly, CGs with higher education experienced a more pronounced OB reduction ( $\beta = -7.74$ ; 95%CI = -12.19, -3.29;  $p$ -value < 0.001). Secondly, those CGs that were retired showed an OB increment of 5.52 (CI95% = 1.14, 9.38;  $p$ -value = 0.01) points compared to the actively employed counterparts. The estimate for unemployed CGs did not reach statistical significance. Thirdly, in contrast to CGs who did not receive help with their household chores, receiving such assistance was associated with an OB increase of 5.80 (CI95% = 2.21, 9.38;  $p$ -value = 0.001) points. Fourthly, and regarding clinical measures, CGs experiencing overload or psychological distress were associated with a substantial OB decrement of 7.87 (CI95% = -12.51, -3.23;  $p$ -value = 0.001) and 9.17 (CI95% = -13.51, -4.84;  $p$ -value < 0.001) points, respectively. Finally, 1% increment in the DAD-E obtained from the individuals



**Table 3** Caregiver's occupational balance in relation to the main aspects of their caregiving activity ( $n = 134$ )

Aspects of the Caregiver Activity	<i>n</i> (%)	Caregivers OBQ-E mean (SD)	<i>p</i> -value <sup>a</sup>
<b>Cohabitation with the person with dementia</b>			0.508
Yes	77 (57.46)	36.25 (12.91)	
No	57 (42.54)	37.82 (14.13)	
<b>Receive help with household chores</b>			0.092
Yes	77 (57.46)	38.58 (13.63)	
No	57 (42.54)	34.67 (12.88)	
<b>Presence of a caregiver substitute</b>			0.517
Family member	74 (55.63)	38.12 (12.69)	
Paid caregiver or institution	39 (28.57)	35.41 (12.09)	
None or I don't know	21 (15.80)	35.48 (17.84)	
<b>Family relationships before dementia</b>			0.987
Good or very good	111 (82.83)	36.91 (13.55)	
Fair or not good	23 (17.17)	36.96 (13.02)	
<b>Belief in whether someone else should help</b>			0.542
Yes	62 (46.26)	36.15 (14.03)	
No	72 (53.74)	37.58 (12.91)	
<b>Job abandonment<sup>b</sup></b>			0.983
Yes, totally, or partially	35 (28.22)	36.51 (12.02)	
No	89 (71.78)	36.46 (14.23)	

Abbreviations: OBQ-E, Spanish version of the Occupational Balance Questionnaire; SD, Standard deviation. <sup>a</sup>*p* value obtained from Student's *t* and ANOVA tests. <sup>b</sup> $n = 124$ .

**Table 4** Sociodemographic, clinical and caregiving factors associated with the caregiver's occupational balance ( $n = 134$ )

Associated factors	$\beta$ (95% CI)	<i>p</i> -value <sup>a</sup>
<b>Academic studies</b>		
Primary education or below	Ref	
Secondary education	-5.51 (-10.62; -0.41)	0.03
Higher education	-7.74 (-12.19; -3.29)	< 0.001
<b>Employment status</b>		
Active	Ref	
Unemployed or work incapacity	1.80 (-2.71; 6.31)	0.4
Retired	5.52 (1.14; 9.89)	0.01
<b>Receive help with household chores</b>		
No	Ref	
Yes	5.80 (2.21; 9.38)	0.001
<b>Zarit Burden Inventory</b>		
Absence of overload	Ref	
Overload	-7.87 (-12.51; -3.23)	0.001
<b>HAD total score</b>		
Absence of psychological distress	Ref	
Psychological distress	-9.17 (-13.51; -4.84)	< 0.001
<b>DAD-E, 1% increase</b>	0.11 (0.04; 0.18)	0.002

Abbreviations: CI, Confidence Interval; HAD, Hospital Anxiety and Depression Scale; DAD-E, the Spanish version of the Disability Assessment for Dementia. *P*-value obtained from a robust multiple linear regression between the caregiver's occupational balance and the identified associated factors.

with dementia was associated with an increment of 0.11 (CI95% = 0.04, 0.18; *p*-value = 0.002) OB points.

## Discussion

To the authors' knowledge, this is the first study that explored the potential associated factors to the OB in CGs of people with dementia. Given the evidence of the relationship between OB and important CGs' health indicators such as subjective health or well-being, evaluating

OB could be crucial to set interventions that prevent CGs from getting overburdened [15, 29]. However, it should be highlighted that the rationale of this study stems from a lack of studies exploring the possible underlying factors of OB in CGs that could have an essential role in developing those interventions. In this context, our results reveal that CGs with higher academic levels, overload or psychological distress were associated with lower OB. Conversely, CGs who were retired, received assistance with

household chores, or cared for individuals with dementia with a better functional level were associated with an increase in their OB.

As mentioned above, most European CGs are between 50 and 75 years of age [30]. More than half of the CGs participating in this research were aged 56 years or older. These data are very similar to those presented in the study by Garcia-Martin and colleagues in 2023, whose sample of CGs had a mean age of 60 years [50]. This invites the thought that strategies aimed at the care of CGs of people with dementia can be focused on older adults.

In alignment with the actual literature, CGs participating in this study showed lower OB in comparison to the general population [47]. In fact, this decline is particularly evident when comparing our results with the Spanish normative data from the OBQ-E published by Peral-Gómez and colleagues in 2022 [47]. In contrast to the normative data, this study revealed that CGs with higher academic education tend to present lower OB. It could be theorized that higher education careers are often linked with increased responsibilities and obligations [51]. Thus, these additional demands could clash with the caregiving activities, potentially resulting in reduced OB [51]. In fact, there is evidence to support that CGs with higher levels of education are more likely to experience mental burden related to fear of loss of autonomy in comparison to CGs with a lower educational background [51, 52].

Interestingly, we found a positive association between retirement and OB. This effect could be elucidated using the opposite rationale as for CGs with higher education. Specifically, retirement potentially implies that work-related demands that may impact the caregiving activity disappear. This positive effect of retirement can be also supported when examining the normative data from the OBQ-E [47]. For this reason, retired CGs could have more time to care and the possibility to maintain significant occupations previously affected by working. It is also important to highlight that receiving assistance with household chores, as observed in this study, can also contribute to better OB due to the impact on reducing CGs' burden and allowing them to focus more effectively on other caregiving activities or significant occupations [53]. In fact, a study published by Arlotto and colleagues exploring the effect of social support services primarily centered on household chores assistance to CGs of older people revealed a reduction in the CGs' burden [54]. These findings show the crucial role of the CGs' sociodemographic variables on their OB.

Regarding clinical measurements, a positive association between the DAD-E percentage score and CGs' OB was observed. CGs are often implied to cover ADLs of individuals with dementia due to their functional decline. Consequently, better functional autonomy could imply

better OB due to the decrease of the CGs' burden. Furthermore, impaired functional autonomy has been identified as a predictor of CGs burden of people with dementia [55].

On the other hand, our results showed that the presence of overload was associated with a pronounced decline in the CGs' OB. It can be theorized that the shifts in the CGs' daily routines and the caregiving demands can disrupt their engagement in meaningful activities, leading to an occupational imbalance [15–22]. Although this relationship needs to be more investigated, a study published by Röschel and colleagues in 2022 with CGs of older persons found that OB was inversely correlated to the CGs' burden [29]. Similarly, we observed that CGs that presented psychological distress tend to exhibit an OB decrease. The association between caregiving activity and stress symptoms is well-known in the actual literature [53]. The presence of depression symptoms could exacerbate the CGs' disruptions due to caregiving, subsequently affecting their OB [29, 56].

Finally, it is worth mentioning that in this study, an adequate sample size was achieved to detect robust associations for some variables, but it is possible that the statistical power was not sufficient for others. Aspects such as heterogeneity of CGs characteristics, or variations in the conditions of people with dementia, may have diluted the strength of associations. In addition, some variables that did not reach significance may be influenced by complex interactions or act as mediators, which may not have been detected under the current approach to analysis. All things considered, future research should include larger samples or methodological approaches that address possible mediations and interactions, to explore more precisely the variables that did not show significance in this study. This could also include a more detailed analysis of how certain factors, such as social support or level of cognitive impairment, interact with other conditions to influence CGs' OB.

### Strengths and limitations

This study should not be interpreted without establishing its limitations. Firstly, this study followed a cross-sectional design, and the causality of the associations could not be elucidated. Secondly, almost 84% of CGs were female. Nevertheless, the caregiving activity is mainly provided by women as it has been evidenced in previous studies [29]. Regarding strengths, this study used previously protocolized validated assessment tools to measure OB and clinical variables. In this sense, the OB and several clinical variables were self-reported. However, although a potential misclassification may occur, it should be nondifferential.

## Conclusions

This study observed several associated factors with the OB of CGs of persons with dementia. Specifically, CGs with higher academic levels, overload or psychological distress were associated with lower OB. Conversely, CGs who were retired, received assistance with household chores, or cared for individuals with dementia with a better functional level were associated with higher OB. As OB is essential to providing high-quality care while maintaining life satisfaction, we highlighted important sociodemographic and clinical variables that should be considered when evaluating OB and creating OB-related interventions in CGs.

## Abbreviations

ADLs	Activities of daily living
ATENEA	Mindfulness in Alzheimer's Disease
CGs	Informal caregivers
DAD-E	Spanish version of the Disability Assessment for Dementia
GDS	Global Deterioration Scale
HAD	Hospital Anxiety and Depression
NPI-Q	Neuropsychiatric Inventory Questionnaire
NPS	Neuropsychiatric symptoms
OB	Occupational balance
OBQ-E	Occupational Balance Questionnaire
WHO	World Health Organization
ZBI	Zarit Burden Interview

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## Author contributions

ASP, PPG and CES: conceptualization. ASP, PPG, DPB, PFP and IZM: methodology. ASP and DPB: formal analysis. ASP and DPB: writing—original draft preparation. All authors: writing—review and editing. ASP: supervision. PPG, PFP and CES: project administration. All authors agree to be accountable for all aspects of the work.

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## Data availability

The data used in this study is not publicly available due to ethical approval constraints, as it involves patient information. However, anonymized data is available from the corresponding author upon reasonable email request.

## Declarations

### Ethical approval and consent to participate

This study used data from a registered clinical trial (NCT03858283) that obtained the approval of the Research Ethics Committee of the Hospital Universitario San Juan de Alicante (18/317), the Universidad Miguel Hernández (2017.413.E.OEP; 2017.470.E.OEP), and the Hospital General Universitario de Elche (44/2019). In addition, this study was carried out following the Declaration of Helsinki and written informed consent was obtained from all the study participants.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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