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DAILY TIME USE AMONG INDIVIDUALS WITH SCHIZOPHRENIA SPECTRUM DISORDERS AND UNAFFECTED CONTROLS: RESULTS FROM THE DIAPASON MULTICENTRIC PROJECT

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RUNNING HEAD: Time use of individuals with Schizophrenia Spectrum Disorders

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ABSTRACT

Objective: In the framework of DiAPAson project, we aimed to investigate: (1) within and between-group differences in daily time use of individuals with schizophrenia spectrum disorders (SSD) and unaffected controls, stratifying them by age, sex, and employment status; (2) the associations between daily time use, the severity of psychiatric symptoms and psychosocial functioning amongst those with SSD.

Methods: From October 2020 to October 2021, 306 outpatients and 312 individuals living in Residential Facilities (RF) with SSD were recruited from 37 centers across Italy and compared on a measure of daily time use with 113 people unaffected by mental health problems. Statistical analyses included chi-squared tests, ANOVA tests, t-tests, Pearson's correlations, and non-parametric corresponding tests.

Results: Persons with SSD spent significantly more time in sedentary activities, leisure, and religious activities than unaffected controls, independent of age, sex, and employment status. Unaffected controls and individuals with SSD spent more time engaged in productive activities than patients in RFs. Among the latter group, time spent in productive activities decreased significantly after 45 years of age, while time spent in self-care activities increased. Spending time engaged in sedentary activities was associated with greater severity of psychiatric symptoms and lower levels of functioning.

Conclusions and Implications for Practice: This study provides a deep understanding of how individuals with SSD spend their time and how this is associated with the severity of their mental health problems. These findings highlight the need for proactive rehabilitation programs to promote productive occupation and social inclusion of people with SSD.

Keywords: psychosis, time use, activities, psychopathology, doing nothing.

IMPACT AND IMPLICATIONS

Individuals with Schizophrenia Spectrum Disorders spend a lot of time during their daily life engaged in sedentary activities (i.e., doing nothing, relaxing, resting), more than unaffected controls and independent of their age, sex, or employment status. Moreover, the amount of time engaged in sedentary activities is associated with the severity of their psychiatric symptoms and their levels of functioning. These findings are crucial for developing specific rehabilitation programs for these individuals that would focus on promoting engagement in productive activities in order to help them gain or regain the skills and confidence to live as independently as possible.

1. INTRODUCTION

Individual lives and behaviors are profoundly shaped by time. The study of time use is a widely used method for investigating how people organize their activities during daily life (Backman, 2004). Specifically, time use refers to the amount of time an individual spends on daily activities, such as working, eating, leisure, travel, shopping, housework, and personal care (McGrath & Tschan, 2004). The investigation of time use is particularly important since daily occupation has been found to be positively associated with the achievement of goals and self-reported health and well-being (Christiansen et al., 2014). Several studies have shown how time-use surveys are essential for evaluating well-being in a population (Stewart & Stewart, 1999; Stiglitz et al., 2009).

Over recent decades, many governments have begun to map the way people spend their time through "*Time Use Surveys*" (TUS). In the last report of the Italian Statistical Institute, time use has shown variation according to gender and age (e.g., gender differences in the amount of unpaid work people do and significant age differences in the amount of free time people have, as well as a positive correlation between time spent watching TV and age and a negative correlation between time spent in social activity and age) (Istat, 2019).

Several studies have found that people with Schizophrenia Spectrum Disorder (SSD) are less active than the general population, spending significantly less time engaged in structured, functional, and social activities and more time resting, watching TV or "doing nothing" compared to non-clinical populations (Bejerholm & Eklund, 2004; Cella et al., 2016; Crist et al., 2000; Shimitras et al., 2003). This has been attributed to a variety of factors, including intrinsic features of SSD such as negative symptoms(Azorin et al., 2014; Boutros et al., 2014), side effects of medications (Lally & MacCabe, 2015; Leucht et al., 2013), and physical co-morbidities (Lasebikan & Azegbeobor, 2017).

Differences in daily time use profile in SSD are also associated with a sedentary lifestyle (Vancampfort et al., 2017). Since high rates of inactivity in individuals with SSD, whatever the cause, have been associated with poor prognosis, physical comorbidities, and increased mortality rates (Ringen et al., 2014; Stubbs et al., 2018; Vancampfort et al., 2012; Wildgust et al., 2010), there is clear clinical relevance in studying daily time use in this population. Moreover, the study of time use may provide useful suggestions for personalized treatment programs especially for patients who live in Residential Facilities

(RFs) (Rössler et al., 1998). In Italy, since the closure of all mental hospitals, individuals living with a more severe mental disorder, in particular SSD, are offered intensive rehabilitation in RFs. These facilities generally host less than 20 individuals, have a 24-hour staff cover and attempt to offer a domestic-like environment to people requiring long-term care (de Girolamo et al., 2002). It can therefore be hypothesized that the treatment setting (outpatient versus residential) may influence daily time use. Previous studies on daily time use in people with SSD show that this disorder is negatively associated with engagement in structured daytime activities (Bejerholm & Eklund, 2004) and that individuals with SSD spend more time resting and "doing nothing" than being engaged in functional activities compared to non-clinical populations (Cella et al., 2016).

Although their importance, many studies of daily time use among people with SSD conducted to date have had many limitations, including small sample sizes (Cichocki et al., 2015), the use of retrospective questionnaires, which are subject to recall bias (Cella et al., 2016) and a lack of healthy controls. Moreover, previous studies have not accounted for key environmental factors, such as the treatment setting (for example, living in a RF may provide more opportunities for specific daily activities due to the availability of continuous staff support compared to living at home). Hence, we may hypothesize that people with SSD living in RFs spend more time engaged in productive activities compared to outpatients living independently or with family members.

In this paper, we investigated: (1) the differences in daily time use of two groups of people with SSD (outpatients and people living in RFs) and unaffected healthy controls, stratifying them by age group, sex, and employment status; and (2) the associations between daily time use, the severity of psychiatric symptoms and levels of functioning amongst those with SSD.

2. MATERIALS AND METHODS

2.1 Study setting

Community care in Italy is organized through 127 Departments of Mental Health (DMHs) that provide outpatient and hospital care, and residential care for those with the most complex needs. Many RFs are managed by private (both non-profit and for-profit) organisations. All persons treated in private RFs are fully covered by the National Health

Service for their stay and care. Previous studies have thoroughly assessed the residential care system (de Girolamo et al., 2002, 2005; Martinelli et al., 2019, 2022; Picardi et al., 2014). This multisite project (DiAPAson project) included 20 Departments of Mental Health (DMHs) and 17 RFs centres (which in turn include different RFs) located in different Italian regions. In total, 98 RFs with a mean 12.8 (±5.7) residents (range 1-12) were involved in this study, and they recruited on average 3.3 (± 2.6) persons (roughly 25% of the facility residents) each.

Local Ethical Committees approved the study (see below). All participants provided written informed consent for their participation.

2.2 Participants

We included persons with a DSM-5 diagnosis of SSD (American Psychiatric Association, n.d.) who were 20-55 years old, able to speak and write in Italian, and receiving treatment at RFs or as outpatients at a DMH. We excluded persons unable to provide informed consent or with severe cognitive deficits (i.e., a Mini-Mental State Examination corrected score lower than 24), a recent (over the last 6 months) DSM-5 diagnosis (recorded in medical records) of substance use disorder, a history of clinically significant head injury, or cerebrovascular/neurological disease.

Eligibility criteria for the control group were as follows: aged 20-55; able to speak and write in Italian; no known history of previous or current mental disorders, severe medical conditions, or severe cognitive deficits.

Firstly, 673 eligible individuals (340 RF residents, 333 outpatients) and 115 unaffected controls were recruited. Among the 673 individuals with SSD initially selected, 17 (2.5%) were subsequently excluded due to cognitive impairment as ascertained with MMSE (i.e., MMSE <24), 37 (26 outpatients and 10 RF residents, 5.3%) dropped out of the study and one individual did not complete the daily time survey tool (Time Use Survey, TUS). Two healthy controls also failed to complete the TUS. Therefore, the final sample comprised 618 individuals with a diagnosis of SSD (312 RF residents, 306 outpatients) and 113 controls. Sample size with a power of 0.8 and a conservative effect size of 0.15, adjusting for design effect (25 recruitment centres) was estimated at N=570 (the study has 312 RF residents, 306 outpatients and 113 controls). Further details can be found in the published calculation that was thoroughly described in the study protocol (de Girolamo et al., 2020).

Regarding sampling, although the number of healthy controls is lower compared to the two individual groups, the three groups can be considered balanced. In fact, using the Shannon entropy index (Balance=H/ln(k); where k: # classes, ci: size of each class (306; 312; 113, Table 1); H is the Shannon entropy index: H=-sum i[(ci/n)*ln(ci/n)]), we obtain a Balance index of 0.93, i.e. very close to 1, indicating good balance between the three groups.

2.3 Procedures

From October 2020 to October 2021, in each study centre, treating clinicians invited eligible participants under their care to enter the study. Outpatients were recruited consecutively according to their treatment appointments (i.e., each subject meeting inclusion criteria was selected until the required sample size in each site was achieved). Similarly, based on an alphabetical list of eligible persons living in each RF on an index date, the first four residents listed in each RF with a diagnosis of SSD were consecutively invited to participate in the study until the required sample size was achieved. Participants were provided with detailed information about the study and had an opportunity to ask questions. Unaffected controls were recruited through public advertisements and snowball sampling procedures.

2.4 Instruments

2.4.1 Assessment of clinical outcomes

For each recruited person, we collected sociodemographic and clinical details and carried out standardized assessments (for details see the study protocol; (de Girolamo et al., 2020). Some of the assessment tools were completed by the treating clinician, while Research Assistants (RA) supported participants, if needed, to complete self-reported questionnaires.

In this manuscript, we focus on the staff rated measures of disorder severity, negative symptoms, and levels of functioning assessed with the 24-item Brief Psychiatric Rating Scale (BPRS) (Morosini & Casacchia, 1995; Overall & Gorham, 1962), the 13-item Brief Negative Symptom Scale (BNSS) (Mucci et al., 2015; Strauss et al., 2012), and the 43-item Specific Levels of Functioning Scale (SLOF) (Montemagni et al., 2015).

2.4.2 Assessment of daily time use

We used the 146 EUROSTAT and ISTAT categories of daily activities as a reference document; we then collapsed these 146 detailed activities into 15 broad TUS categories (Table 1S shows all activities listed in the TUS questionnaire and the sub-categories they

include), and subsequently collated them into the following 7 macro-categories: sedentary activities ("sleeping", "staying sick in bed" and "resting, doing nothing" categories); working activities ("paid working", "studying", "doing household", "taking care of someone or something" and "voluntary working" categories); leisure activities ("doing leisure activities" and "watching TV or listening to the radio" categories); Physical Activity (PA) (e.g. doing sports, dancing or walking); self-care ("eating" and "self-caring" categories); religious activities (e.g. participating in religious meetings/services or praying) and "getting around" (e.g. walking or using transport). The TUS paper-and-pencil questionnaire was completed by each participant twice a week; on a working day (Monday-Friday) and on Sunday. In the TUS questionnaire, each column indicated the daily hour (from 12 a.m. to 12 p.m.); for any daily hour, each participant had to answer the question "*What are you doing right now?*", selecting one or more of the 15 possible activity categories. The TUS was completed by both persons with SSD and unaffected control groups.

In this study, we aimed to analyze daily time use for working days between 7 a.m. and 11 p.m. Each selection in the TUS corresponded to a "count" of about 60 minutes. For greater clarity, we provide the form as supplementary material.

2.5 Statistical analyses

Frequencies and percentages for categorical variables and means and standard deviations for continuous variables were computed. Chi-squared or Fisher's exact tests were used according to the nature of the data to compare categorical variables between groups. The distribution of continuous variables was established using histogram plots inspection and normality tests. ANOVA tests, *t*-tests, or the non-parametric Kruskal-Wallis and Mann−Whitney tests were used for continuous variables as appropriate. After comparing the three groups, we assessed specific differences using Bonferroni post hoc comparisons. Correlations between daily activities and clinical assessment scales were expressed as Pearson's coefficients (or for non-parametric distributions, Spearman coefficients). To control any confounding effects by the covariates we tested the differences in the activities carried out in the three groups stratifying by age class (20-34, 35-44, 45-55), sex and employment status (students were considered unemployed). All analyses were carried out using SPSS software (IBM, Version 27.0) and SAS Studio (SAS Institute Inc. 2015) with the statistical significance level set at 0.05.

3. RESULTS

3.1 Sociodemographic and clinical characteristics of participants

Most participants were male. There was a significant difference in civil status (p < .001), educational level (p < .001), and employment status (p < .001) between the three groups. Among the control group, 92% reported that they were employed, compared to 29% of the outpatients with SSD and 12% of those living in RFs. Unsurprisingly, residents of RFs reported greater lengths of time in hospital (p < .001), higher BPRS and BNSS scores (p < .001), and lower SLOF scores (p < .001) compared to outpatients (Table 1).

Table 1

3.2 Between-group differences in daily time use

The three groups (outpatients, RF residents, healthy controls) differed in the amount of time spent in sedentary, productive, leisure, self-care, religious, and getting-around activities (Figure 1, Table 2S). We also found between-group differences for almost all daily life activities between different age groups (20-34; 35-44; 45-55; Table 2), sex (Table 3), and employment status (Table 4).

Figure 1

Table 2

Table 3

Table 4

About sedentary activities, both outpatients (mean=4.5, SD=3.1) and those living in RFs (mean=4.9, SD=2.6) spent more time in sedentary activities than controls (mean=1.1, SD=1.2; p <.001), independently of their age, sex and employment status. Both outpatients and RF residents spent a similar amount of time in sedentary activities, independently of their age, sex, and occupational status (p >.05).

Residents of RFs (mean=2.4, SD=2.6) spent the least amount of time in productive activities when compared to both outpatients (mean=4.5, SD=3.3) and controls (mean=11.0, SD=3.9; p <.001), independently of age, sex, and employment status.

The amount of time spent in leisure activities was higher among individuals with SSD (RF residents: mean=4.7, SD=3.0; outpatients: mean=4.3, SD=2.8) than controls

(mean=2.7, SD=2.2; p <.001), independently of age and sex. However, it did not differ across the three groups when the comparison was restricted to those who were unemployed.

We found no between-group differences in terms of engagement in PA, neither in the whole sample nor in subgroups.

Individuals with SSD spent more time on both self-care activities and religious activities than controls. Outpatients (mean=0.2, SD=0.9) spent more time on religious activities compared to the other two groups (RF residents: mean=0.1, SD=0.5; unaffected controls: mean=0, SD=0.2; p =.016), especially if male, in the age group 45-55 and employed.

Finally, RF residents spent the least amount of time getting around, even taking age and sex into account.

3.3 Within-group differences in daily time use

We found few within-group differences in daily time use by age among the three groups (see Table 2). Among the control group, time spent in sedentary activities was significantly higher in the 20–34-year age group (mean=1.8, SD=1.5) when compared to older age groups 35-44 (mean=0.8, SD=0.8) and 45-55 (mean=0.8, SD=0.9; p <.001). Moreover, among RF residents, time spent in self-care activities significantly increased with age (20-34: mean=5.4, SD=1.7. 35-44: mean=5.3, SD=2.0. 45-55: mean=6.4, SD=1.9. p <.001), while time spent in productive activities significantly decreased with age (20-34: mean=2.7, SD=2.4. 35-44: mean=2.8, SD=2.6. 45-55: mean=1.9, SD=2.1. p .007).

Regarding sex (see Table 3), both female outpatients (mean=3.8, SD=2.6) and female RF residents (mean=4.0, SD=2.4) reported spending less time engaged in leisure activities compared to males (outpatients: mean=4.5, SD=2.9, p =.025; residents: mean=5.0, SD=3.2, p =.017). Moreover, females of both the outpatient (mean=5.4, SD=3.5) and the control groups (mean=11.7, SD=4.0) spent more time performing productive activities compared to males (outpatients: mean=3.9, SD=2.4; p <.001; general population: mean=10.5, SD=4.0; p =.019). Finally, among unaffected controls, males (mean=0.6, SD=1.0) reported more time spent in PA than females (mean=0.3, SD=0.7; p =.012).

Finally, we found few within-group differences in daily time use by **e**mployment status among the three groups (see Table 4). Among all the three groups (except for productive activities of unaffected controls), employed individuals reported less time spent

in sedentary activities and more time spent in productive activities than unemployed individuals.

3.4 Correlations between daily time use, psychiatric severity and levels of functioning

We found significant positive correlations between the amount of time spent in sedentary activities and BNSS (r= .016; p <.001) and BPRS (r =.017; p <.001; Figure 2) ratings. A significant negative correlation was also found between time spent in sedentary activities and SLOF ratings (r=-.27; p <.001). On the contrary, the amount of time spent in productive activities was significantly negatively correlated with BNSS and BPRS ratings and positively correlated with SLOF ratings.

Figure 2

4. DISCUSSION

4.1 How do individuals with SSD spend their time compared to the unaffected controls?

Our study shows that the time spent in sedentary (i.e., doing nothing, relaxing, resting), leisure, self-care, and religious activities seems to be much greater in individuals with SSD than in unaffected controls, independently of their age, sex, or employment status. Moreover, individuals living in RFs spent the smallest amount of time engaged in productive activities. Individuals living in RFs are in general more severely ill than outpatients, as also shown by BPRS, BNSS and SLOF ratings in our study, and require more support than outpatients: for this reason, it may be unsurprising that this group spent less time on productive activities. On the other hand, outpatients and residents of RFs spent a similar amount of time engaged in sedentary activities during the day. If we consider that residents of RFs are continuously supported and potentially stimulated by RF staff, in contrast to outpatients who live independently at home, it seems that rehabilitation programs conducted in RFs largely fail to achieve their objectives of increasing patients' functional activities and reducing the time spent doing nothing.

The marked differences in daily time use between persons with SSD and unaffected controls are likely to be at least partly due to consequences of the disorder, including the severity and nature of psychiatric symptoms, particularly those that affect motivation, concentration, organizational and interpersonal skills. These findings are consistent with the assumption that motivation and reduced commitment to goal-directed activities are

important consequences of severe SSD (Foussias & Remington, 2010; Messinger et al., 2011). Negative symptoms, such as anhedonia, apathy, and avolition are extremely difficult to treat and they can profoundly compromise the daily functioning of persons with SSD (Bottlender et al., 2010; Fusar-Poli et al., 2015; Möller et al., 2011), and can lead to a large amount of time spent doing nothing. Indeed, we found that more time spent in sedentary activities was associated with higher severity of both positive and negative symptoms and lower daily functioning. These results are in line with previous studies which found an association between specific daily activities (i.e., work activities) and clinical outcomes (i.e., positive and negative symptoms, self-rated health, mastery, and quality of life) (Delespaul et al., 2002; Leufstadius et al., 2006). However, it should be noted that despite the recognition of the importance of reducing sedentary behavior and increasing PAvity levels to improve the health and well-being of individuals with SSD, several important questions remain unanswered. For example, certain activities, including rest and sleep, may facilitate the recovery of individuals with mental disorders (Yates 2016). In fact, in many people with mental disorders sleep may be disturbed, and an improvement in sleep patterns may be associated with a general improvement in psychotic symptomatology (Freeman et al., 2020). More in general, it has been highlighted the importance of activities that give life meaning and purpose and of self-care strategies, and these do not necessarily include ordinary productive activities; for instance, a remarkable, lived example of this approach is the CommonGround Programme, developed by Patricia Deegan (Deegan, 1988).

Interestingly, we found no difference in the amount of time that patients and healthy controls spent engaged in PA. However, this may be due to the self-report nature of the TUS, which is strictly related to a subjective interpretation of PA. Studies that employed accelerometer-based biosensors seem to be more sensitive in showing significant differences in PA (or movement) levels between persons with SSD and unaffected controls. Indeed, a recent systematic review (Wee et al., 2019) involving 38 studies with 2,700 participants found that persons with SSD generally have lower motor activity levels compared with healthy controls. Due to its impact on physical health (Lin et al., 2011) and quality of life (Schmitz et al., 2004), it is extremely important to correctly assess and monitor PA and promote this in persons with SSD.

4.2 Does age impact on daily activities?

Our study found that age seems to weakly impact on the amount of time spent in different daily activities among both person and control groups. Interestingly, among RF residents, older age was associated with spending less time on productive activities and more time on self-care activities. This result may be due to the chronic course of many mental disorders, including SSD, and related comorbidities that lead to an increased focus on basic daily living skills (e.g., washing, dressing, etc) and less ability to perform more 'productive' activities such as working, studying, doing housework, etc. Among RF residents, we found that higher age was associated with more time spent in self-care activities. A possible explanation for this finding is that RF daily structured programs involve many self-care activities related to daily living skills (i.e., learning how to wash or get dressed), especially for more impaired individuals with SSD, who are often of older age (Gerretsen et al., 2014). Another possible reason is that the expectations of RF staff may be less ambitious for older individuals, while they may focus more rehabilitative activities on younger residents.

4.3 Does sex impact on daily activities?

We found significant sex differences in the use of time across the three groups. Women seem to spend more time than men in productive activities (e.g., household tasks, working/studying, taking care of someone/something) regardless of their mental health status. Conversely, males with SSD spent more time in leisure and sedentary activities than females with SSD. This may be due to several reasons. Firstly, in the patient sample, the prognosis for SSD tends to be worse for men than women, especially when the illness starts at a younger age. As a result, men tend to have longer hospitalizations and are more likely to require higher levels of support; indeed, around two-thirds of those living in RFs are male (Grossman et al., 2008). Similarly, women tend to have a later onset of SSD than men and their symptoms seem to respond better to treatment (Brand et al., 2022; Seeman, 2018). Finally, although over recent decades men have gradually increased the amount of time that they dedicate to housework and to childcare in society in general, sex equality has not yet been achieved (Jacobs & Gershuny, 2002), and these time-consuming activities are still often handled by women.

4.4 How do our data compare with the ISTAT survey data?

In Italy (as well as in all European countries), the daily time use of citizens is periodically monitored by the National Institute of Statistics (ISTAT). A quantitative and standardized comparison of our data with those collected by ISTAT might have been particularly interesting, but this was not possible due to differences in timing and in the overall socio-cultural scenario characterizing the two surveys (i.e., the last available ISTAT survey data refer to 2013/2014, while our survey took place in 2020/2021; this was also the time of the COVID-19 pandemic). Nevertheless, it is meaningful to look at the findings of the two surveys in general terms. The ISTAT survey involved approximately 20,000 Italian families and 50,000 individuals. Using an average working day as an indicator, the survey revealed that the time dedicated to productive activities (understood as paid work) involved 41.7% of daily time of males and 24% of females, while the time devoted to 'unpaid work' (i.e., work done free of charge, whether carried out at home or through voluntary organizations), corresponded to about 3.46 hours a day and involved 83.8% of the general population. In the ISTAT survey, "pure" free time (i.e. social, entertainment and cultural activities; rest, doing nothing; sports and outdoor activities; recreational activities, such as arts and pastimes, computing, e-mail and chat, games; use of media, including readings, TV and videos, music and radio; social and religious participation) accounted for an average of 4.47 hours a day for 97.9% of the general population, while passive free time was spent for an average of 2.10 hours a day by 79.1% of the general population. Finally, 86.9% of the general population spent an average of 1.16 hours a day for travel.

Although it is not possible to make a direct comparison between the two populations (general population surveyed by ISTAT and individuals with SSD) for the reasons described above, some general considerations are possible. From the ISTAT survey, it emerged that in a typical weekly day people dedicate just under 12 hours to personal care: the remaining time is spent above all in activities related to one's professional condition. The work (paid and unpaid) takes up about a quarter of the day of people employed (5h23 ') and housewives (6h27'). People who are employed are therefore the population group that uses the smallest amount of free time (3h43 '), with even more time devoted to paid work for men. On the contrary, our data on persons with SSD do show an opposite trend: indeed, the amount of free time is much greater than the time spent on work activities. Since most theoretical

models of quality of life closely link subjective well-being to the time of life, mental health services should carefully consider the reorganization of people's daytime as a priority and should look at the daily time use of the general population as a benchmark indicator. In this regard, it is also necessary to consider gender-related social expectations as a factor relevant to psychiatric rehabilitation programs (Dubreucq et al., 2021).

4.5 Daily activities and the COVID-19 pandemic

Our study took place during the pandemic, which in Italy officially started in February 2020. During the second wave of the pandemic in Italy, in autumn 2020, a survey on daily activities was conducted by the National Institute of Statistics and completed in early 2021: this survey showed clear signs of a transition to a daily routine closer to pre-COVID in Italy (ISTAT, 2021). In particular, ISTAT data shows that the most significant change between the first (during the national lockdown in Italy, March-June 2020) and the second (autumn 2020) wave of COVID-19 was represented by an increase in the number of people who spent part of their time during the day working or moving locally, and by a decrease in those who engaged in leisure activities, such as reading or PA. Similarly, in the same periods of time the number of people leaving home for any reason increased and, compared to the first wave, more than half of the Italian population devoted the same amount of time to various activities of daily living as happened prior to the pandemic. Some studies have investigated the potential impact of the second wave of the COVID-19 pandemic in Italy on daily time use in samples of the general population (Guazzini et al., 2022; Manica et al., 2021). Manica et al. (2021) studied the impact of the three-tiered regional restriction system on human activities during the second wave of COVID-19 in Italy. They found a progressive reduction in time spent away from home and an increase in time spent at home, which was greater where more restrictive levels were adopted, but this change was lower than during the national blockade against the first wave of COVID-19, underscoring a gradual return to the pre-pandemic situation; moreover, changes in daily activities were especially related to recreational and retail activities, rather than to working activities. In line with these findings, Guazzini et al (2022), in a cross-sectional survey (N=501), studied changes in the transition from the first to the second wave of COVID-19. Their results show that, in terms of social dimensions, people returned to increasingly social daily life;

however, the use of social media and digital communications was greater as compared to the past.

4.5 Limitations

This study has a number of limitations. First, the time of data acquisition: as mentioned above, recruitment and assessment were performed during the COVID-19 pandemic, which led to containment measures, including prolonged lock-down and changes in daily activities. However, the assessment of such patients during the COVID-19 pandemic may also be seen as a strength of this study since we were able to collect data during an unusually vulnerable time, at the beginning of a general change in the overall health care system (Groom et al., 2021). Moreover, the recruitment of healthy controls has ensured the possibility to compare daily time use in individuals with SSD with healthy controls.

Several changes in the daily rules for both RFs and outpatient services, adopted early during the pandemic, are still active (Li et al., 2022), and the behavior of the general population itself, especially for social activities, also changed (Ventriglio et al., 2021). Overall, our results are generalizable only to the period of the COVID-19 pandemic. Caution is therefore needed in interpreting our results until future studies allow replication in a broader perspective.

Another limitation was the lack of detailed time frames (i.e., minutes) for each specific daily activity. Indeed, since the TUS questionnaire developed for the DiAPAson project included 23 columns (one for each hour of the day, covering 24 hours) and during each hour the participant may have performed and selected more than one activity, each activity selection might not be considered as lasting one entire hour. Therefore, the reported mean and SD for each daily activity corresponds to a "count" round of 60 minutes, hence, does not consider activities lasting fractions of an hour.

Finally, the cross-sectional nature of the study limits the possibility to draw conclusions about the direction of the relationship between time use and clinical outcomes.

5. CONCLUSIONS

The study of daily time use in people affected by severe mental disorders has relevance if we consider how much individuals diagnosed with mental disorders, in

particular SSD, can potentially gain structure and balance in their days through activities that increase their skills and sense of self-efficacy (Arns & Linney, 1993). People suffering from SSD often have neurocognitive deficits which make it difficult for them to have equal opportunities compared to the general population (Fioravanti et al., 2005), and stigma and discrimination also play a crucial role in this. People with SSD need to be supported to engage in activities that can help them gain or regain the skills and confidence to live as independently as possible. Mental health services should be equipped to promote treatment plans aimed at fostering persons' inclusion in productive activities, able to meet the specific needs of each person.

DATA AVAILABILITY

Dataset referring to this manuscript is published with restricted access on Zenodo platform and accessible at this link: https://doi.org/10.5281/zenodo.7137486.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study has been approved by the Ethical Committees (ECcs) of the three main participating centres (EC of IRCCS Istituto Centro San Giovanni di Dio Fatebenefratelli, 31/07/2019; no. 211/2019; EC of Area Vasta Emilia Nord, 25/ 09/2019; no. 0025975/19), and EC of ASST of Pavia, 02/09/2019, no. 20190075685) and by the ECs of all participating sites.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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Table 1.
Sociodemographic features of the sample

	Outpatients (N=306)	**Residents (N=312)**	**Unaffected controls (N=113)**	*p value*	**Post-hoc comparisons**
Sex, N (%)					
Males	201 (65.7%)	219 (70.2%)	67 (59.3%)	.098	--
Age, *Mean (SD)*	41.8 (9.1)	41.0 (9.7)	41.5 (10.2)	.648	--
Civil status, N (%)					
Single	276 (90.2%)	299 (95.8%)	35 (31.0%)	**<.001**	£ & $
In a relationship	30 (9.8%)	13 (4.2%)	78 (69.0%)		
Education, *Mean (SD)*	11.9 (3.0)	11.5 (3.2)	16.5 (4.9)	**<.001**	& $
Education, N (%)					
Primary school	5 (1.6%)	7 (2.3%)	0	**<.001**	& $
Secondary school	110 (36.0%)	125 (40.2%)	10 (8.9%)		
≥ High school	191 (62.4%)	179 (57.6%)	103 (91.2%)		
Employed					
No	216 (70.6)	274 (87.8%)	9 (8.0%)	**<.001**	£ & $
Yes	90 (29.4)	38 (12.2%)	104 (92.0%)		
Illness duration, *Mean (SD)*	18.2 (9.4)	18.3 (9.6)	NA	.913	NA
Lifetime hospital stay (years), n (%)			NA	**<.001**	NA
<1 years	239 (78.1%)	53 (17.0%)			
1-5 years	42 (13.7%)	122 (39.1%)			
>5 years	25 (8.2%)	137 (43.9%)			
BPRS, *Mean (SD)*	42.8 (12.2)	51.0 (16.2)	NA	**<.001**	NA
BNSS, *Mean (SD)*	19.3 (14.0)	26.3 (16.6)	NA	**<.001**	NA
SLOF, *Mean (SD)*	182.7 (19.2)	174.4 (22.6)	NA	**<.001**	NA

£= Outpatients vs Residents; &= Outpatients vs Unaffected controls; $= Residents vs Unaffected controls.

Table 2.
Within- and between-group differences in daily time use by age

		Outpatients (N=306)	Residents (N=312)	Unaffected controls (N=113)	*p-value*	Post-hoc comparisons
Sedentary activities, *Mean (SD)*	**[a]20-34**	4.7 (3.1)	4.5 (2.5)	1.8 (1.5)	**<.001**	**& $**
	[b]35-44	4.1 (2.9)	4.8 (2.7)	0.8 (0.8)	**<.001**	**& $**
	[c]45-55	4.7 (3.3)	5.3 (2.6)	0.8 (0.9)	**<.001**	**& $**
	p-value	.165	.058	**<.001**		
	Post-hoc comparisons	--	--	**[b]/[c]<[a]**		
Productive activities, *Mean (SD)*	**[a]20-34**	4.4 (3.6)	2.7 (2.4)	9.8 (4.5)	**<.001**	**£ & $**
	[b]35-44	4.5 (3.1)	2.8 (2.6)	12.5 (4.0)	**<.001**	**£ & $**
	[c]45-55	4.4 (3.3)	1.9 (2.1)	11.0 (3.2)	**<.001**	**£ & $**
	p-value	.850	**.007**	.167		
	Post-hoc comparisons	--	**[c]<[a]/[b]**	--		
Leisure Activities, *Mean (SD)*	**[a]20-34**	4.0 (3.0)	5.4 (3.6)	3.1 (2.9)	**<.001**	**£ $**
	[b]35-44	4.2 (2.9)	4.1 (2.5)	2.4 (1.3)	**.003**	**& $**
	[c]45-55	4.5 (2.7)	4.6 (2.8)	2.6 (2.1)	**<.001**	**& $**
	p-value	.307	.078	.899		
	Post-hoc comparisons	--	--	**--**		
Physical Activity, *Mean (SD)*	**[a]20-34**	0.6 (1.2)	0.6 (1.1)	0.4 (0.8)	.623	--
	[b]35-44	0.4 (1.1)	0.4 (0.8)	0.3 (0.8)	.964	--
	[c]45-55	0.6 (1.1)	0.4 (1.0)	0.6 (1.0)	.114	--
	p-value	.133	.294	.338		

	Post-hoc comparisons	--	--	**--**		
Self-Care, *Mean (SD)*	**[a]20-34**	4.8 (2.1)	5.4 (1.7)	4.5 (2.1)	**.007**	**$**
	[b]35-44	5.0 (2.0)	5.3 (2.0)	4.1 (1.4)	**.010**	**$**
	[c]45-55	5.0 (2.2)	6.4 (1.9)	4.3 (2.3)	**<.001**	**£ $**
	p-value	.612	**<.001**	.827		
	Post-hoc comparisons	--	**[a]/[b]<[c]**	**--**		
Religious activities, *Mean (SD)*	**[a]20-34**	0.2 (0.9)	0.1 (0.3)	0.0 (0.2)	.314	**--**
	[b]35-44	0.2 (0.7)	0.2 (0.6)	0.1 (0.4)	.688	**--**
	[c]45-55	0.3 (0.9)	0.1 (0.4)	0.0 (0.1)	**.034**	**&**
	p-value	.488	.392	.846		
	Post-hoc comparisons	--	--	--		
Getting around, *Mean (SD)*	**[a]20-34**	1.3 (1.4)	0.7 (1.3)	1.7 (1.4)	**<.001**	**£ $**
	[b]35-44	1.6 (1.7)	0.6 (1.2)	1.8 (1.5)	**<.001**	**£ $**
	[c]45-55	1.7 (1.8)	0.5 (1.2)	1.6 (1.5)	**<.001**	**£ $**
	p-value	.327	.361	.925		
	Post-hoc comparisons	--	--	**--**		

£= Outpatients vs Residents; &= Outpatients vs Unaffected controls; $= Residents vs Unaffected controls.

Table 3.
Within- and between- group differences in daily time use by sex

		Outpatients (N=306)	Residents (N=312)	Unaffected controls (N=113)	*p-value*	Post-hoc comparisons
Sedentary activities, *Mean (SD)*	**Males**	4.8 (3.3)	4.9 (2.6)	1.1 (1.3)	**<.001**	**& $**
	Females	4.0 (2.6)	4.9 (2.5)	1.0 (1.1)	**<.001**	**& $**
	p-value	**.036**	.969	.603		
Productive activities, *Mean (SD)*	**Males**	3.9 (3.1)	2.2 (2.2)	10.5 (4.0)	**<.001**	**£ & $**
	Females	5.4 (3.5)	2.8 (2.7)	11.7 (3.7)	**<.001**	**£ & $**
	p-value	**<.001**	.084	**.019**		
Leisure Activities, *Mean (SD)*	**Males**	4.5 (2.9)	5.0 (3.2)	2.8 (2.3)	**<.001**	**& $**
	Females	3.8 (2.6)	4.0 (2.4)	2.4 (2.1)	**<.001**	**& $**
	p-value	**.025**	**.017**	.337		
PA, *Mean (SD)*	**Males**	0.6 (1.2)	0.5 (1.1)	0.6 (1.0)	.413	--
	Females	0.5 (1.0)	0.3 (0.6)	0.3 (0.7)	.189	--
	p-value	.689	.221	**.012**		
Self-Care, *Mean (SD)*	**Males**	4.8 (2.1)	5.7 (1.9)	4.4 (1.9)	**<.001**	**£ $**
	Females	5.3 (2.0)	6.1 (2.0)	4.3 (2.3)	**<.001**	**£ & $**
	p-value	**.046**	.107	.898		
Religious activities, *Mean (SD)*	**Males**	0.2 (0.9)	0.1 (0.4)	0.0 (0.1)	**.047**	**£ &**
	Females	0.2 (0.7)	0.2 (0.5)	0.1 (0.3)	.254	**--**
	p-value	.325	.099	.350		
Getting around, *Mean (SD)*	**Males**	1.5 (1.6)	0.5 (1.2)	1.6 (1.5)	**<.001**	**£ $**
	Females	1.7 (1.9)	0.7 (1.3)	1.7 (1.4)	**<.001**	**£ $**

	p-value	.958	.147	.548		

£= Outpatients vs Residents; &= Outpatients vs Unaffected controls; $= Residents vs Unaffected controls.

Table 4.
Within- and between-group differences in daily time use by employment status

		Outpatients (N=306)	Residents (N=312)	Unaffected controls (N=113)	*p-value*	Post-hoc comparisons
Sedentary activities, *Mean (SD)*	**Unemployed**	4.9 (3.3)	5.1 (2.6)	2.3 (2.2)	**.003**	**& $**
	Employed	3.5 (2.5)	3.7 (2.0)	1.0 (1.0)	**<.001**	**& $**
	p-value	**<.001**	**.002**	**.040**		
Productive activities, *Mean (SD)*	**Unemployed**	3.7 (3.0)	2.1 (2.3)	9.1 (5.0)	**<.001**	**£ & $**
	Employed	6.2 (3.2)	4.0 (2.4)	11.1 (3.8)	**<.001**	**£ & $**
	p-value	**<.001**	**<.001**	.340		
Leisure Activities, *Mean (SD)*	**Unemployed**	4.4 (2.8)	4.6 (2.9)	3.6 (2.9)	.374	**--**
	Employed	3.9 (2.9)	5.6 (3.9)	2.6 (2.2)	**<.001**	**£ & $**
	p-value	.161	.178	.264		
Physical Activity, *Mean (SD)*	**Unemployed**	0.6 (1.2)	0.5 (1.0)	0.2 (0.4)	.553	--
	Employed	0.5 (1.1)	0.5 (1.0)	0.5 (1.0)	.917	--
	p-value	.543	.939	.575		
Self-Care, *Mean (SD)*	**Unemployed**	5.1 (2.2)	5.9 (2.0)	4.6 (1.7)	**<.001**	**$**
	Employed	4.8 (1.9)	5.5 (1.5)	4.3 (2.1)	**<.001**	**$**
	p-value	.654	.249	.545		
Religious activities, *Mean (SD)*	**Unemployed**	0.2 (0.7)	0.1 (0.5)	0.1 (0.3)	.433	**--**
	Employed	0.3 (1.1)	0.1 (0.3)	0.0 (0.2)	**.017**	**&**
	p-value	.558	.890	.106		
Getting around, *Mean (SD)*	**Unemployed**	1.6 (1.7)	0.5 (1.2)	2.1 (1.8)	**<.001**	**£ $**
	Employed	1.6 (1.8)	1.1 (1.4)	1.6 (1.4)	.094	**--**

	p-value	.917	**<.001**	.479		

£= Outpatients vs Residents; &= Outpatients vs Unaffected controls; $= Residents vs Unaffected controls.

Figure 1.
Between groups differences in daily time activities

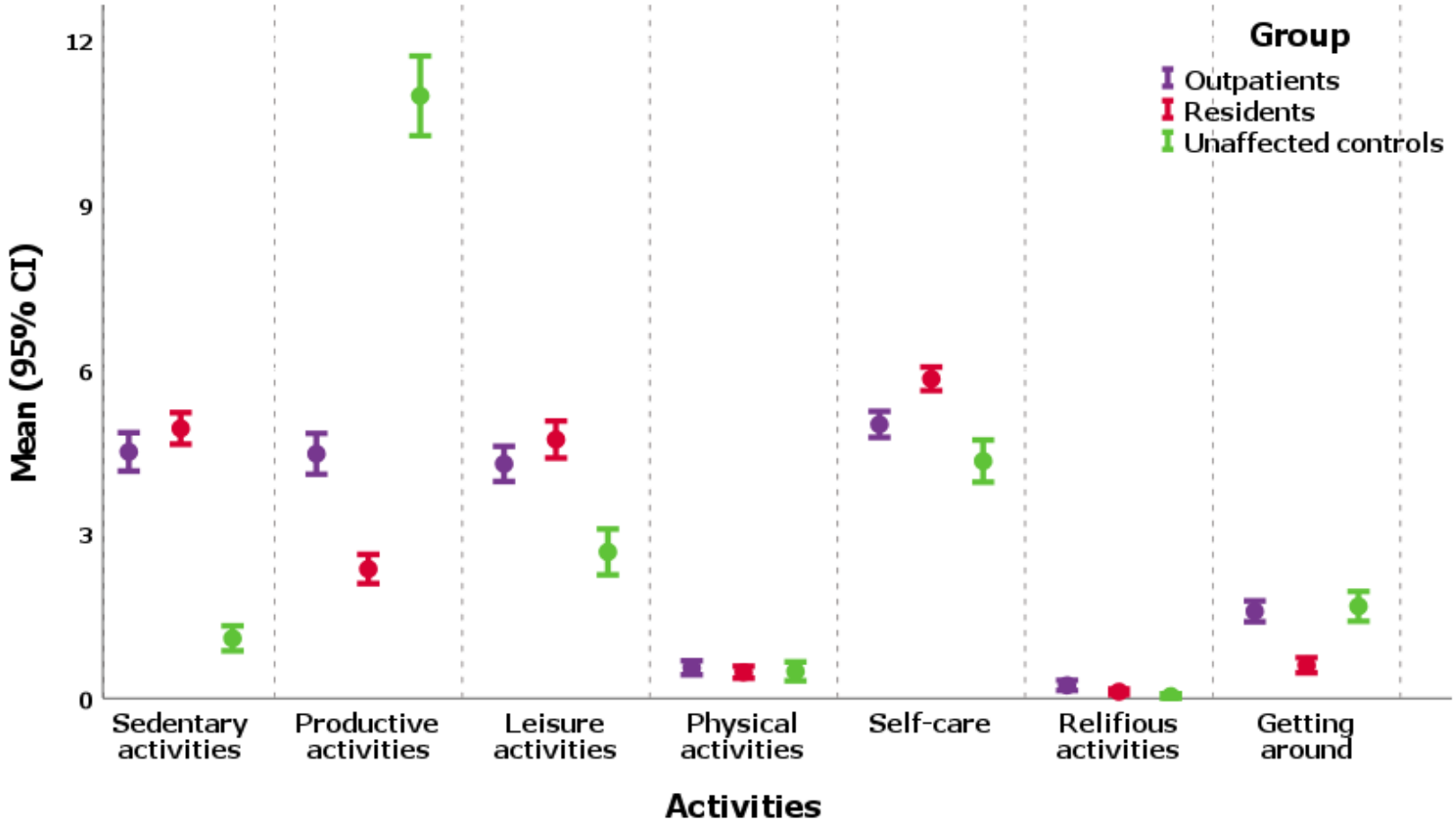
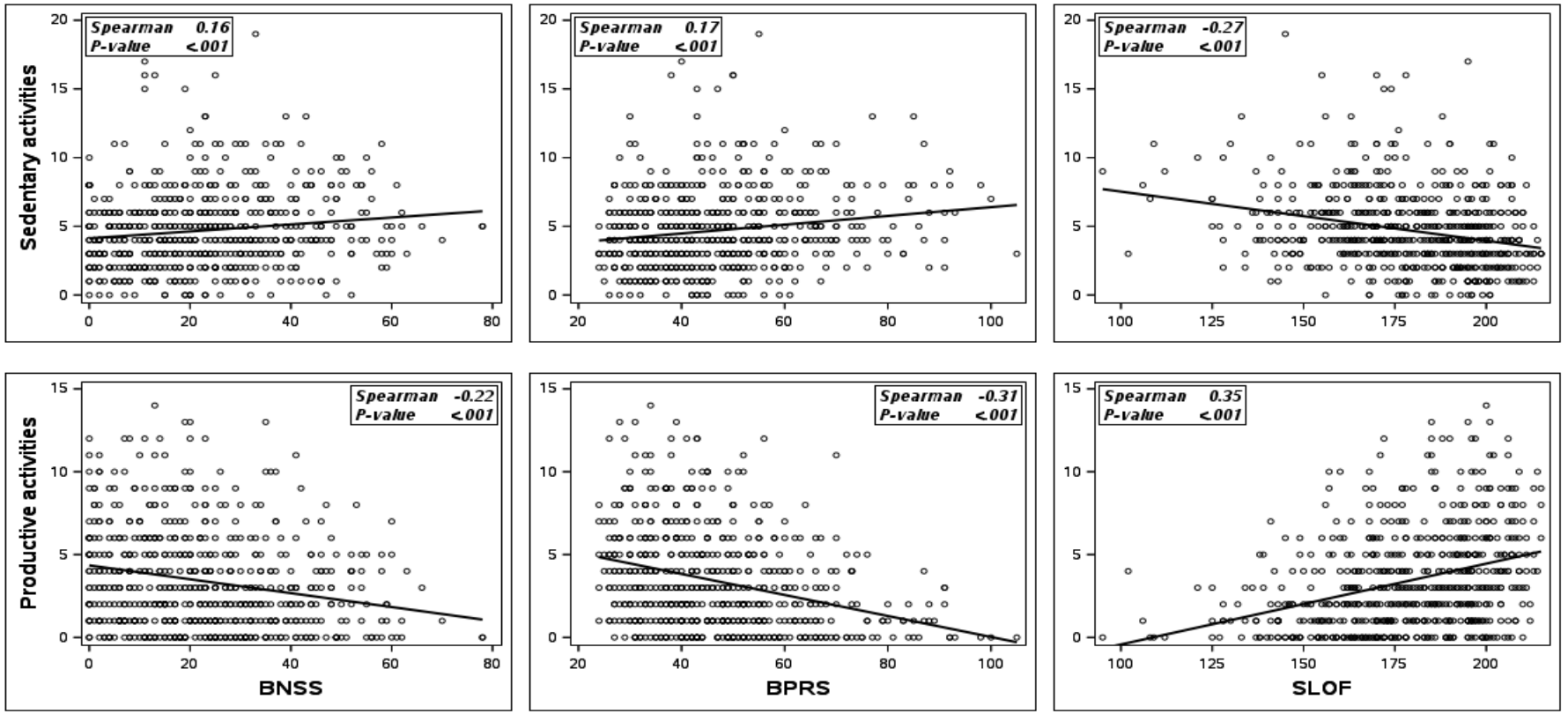


Figure 2.
Correlations between psychiatric severity/functioning levels and daily time use among patients with SSD



SUPPLEMENTARY MATERIALS

Table 1S.
Guideline list of activities for TUS

Activity	Activity description
Sleeping	*Sleeping, light or deep sleep.*
Staying in bed due to feeling unwell	*Awake but in bed due to feeling unwell.*
Eating	*Meal-related activities, such as eating, drinking, having lunch, dinner, snacking, drinking.*
Self-caring	*Self-care activities, such as washing, dressing, shaving, taking medical care (e.g., having a medical examination, taking medicine).*
Working	*Work-related activities (and lunch breaks or breaks during work) or looking for work.*
Studying	*Activities related to school or training, such as taking courses or lessons, taking exams, studying, doing homework.*
Doing houseworks	*Activities related to the management of your home or personal property (such as a car), such as: cooking, washing dishes, laundry, tidying up, cleaning, sewing, ironing, building and renovating the house (e.g. painting the walls, repairing something in the house), shopping, buying services (e.g. electricity, gas), going to the hairdresser / barber, managing family life.*
Taking care of someone or something	*Activities related to the care of one's family (adults or children), animals or plants: for example, helping or playing with children, providing physical care, or keeping company); gardening (care of plants, vegetable garden, flowers); taking care of animals (feeding, walking).*
Voluntary work	*Voluntary work carried out within a group / association, or aid given free of charge to people from other families (including children not living together).*
Doing leisure activities	*Leisure activities, such as going to the cinema, theatre, concert, exhibition or museum, taking cultural trips, painting, photographing, making videos, playing an instrument, writing poetry, making collections, using e-mail (not for work), search for information on the internet, playing (even on the PC or with video games, or with animals), reading (newspapers, books, magazines), socializing, making and receiving visits, sending text messages, conversing on the phone, celebrating, chatting with someone.*
Resting, doing nothing	*Activities of relaxation, resting, thinking or meditating, doing nothing (without sleeping), smoking.*
Doing physical activity	*Leisure activities that require physical exercise such as sports, dancing, walking, strolling, running, playing with the ball, fitness, hunting, fishing, mushroom / plant picking, and all outdoor sports activities.*

Getting around	*Time spent travelling on or in transport or by feet.*
Watching TV or listening to the radio	*Leisure activities such as watching television, videos, TV series, movies, or listening to the radio / music.*
Participating to religious activities	*Activities of participation in religious activities, such as religious meetings / gatherings or religious ceremonies, praying, going to a place of worship, going to the cemetery.*

Table 2S.
Differences in daily time use between outpatients with SSD, residents with SSD and unaffected controls

	Outpatients (N=306)	**Residents (N=312)**	**Unaffected controls (N=113)**	***p-value***	**Post-hoc comparisons**
Sedentary activities, *Mean (SD)*	4.5 (3.1)	4.9 (2.6)	1.1 (1.2)	**<.001**	& $
Productive activities, *Mean (SD)*	4.5 (3.3)	2.4 (2.4)	11.0 (3.9)	**<.001**	£ & $
Leisure Activities, *Mean (SD)*	4.3 (2.8)	4.7 (3.0)	2.7 (2.2)	**<.001**	& $
Physical Activity, *Mean (SD)*	0.6 (1.1)	0.5 (1.0)	0.5 (0.9)	.708	--
Self-Care, *Mean (SD)*	5.0 (2.1)	5.8 (1.9)	4.3 (2.1)	**<.001**	£ & $
Religious activities, *Mean (SD)*	0.2 (0.8)	0.1 (0.5)	0.0 (0.2)	**.016**	&
Getting around, *Mean (SD)*	1.6 (1.7)	0.6 (1.2)	1.7 (1.5)	**<.001**	£ $

£= Outpatients vs Residents; &= Outpatients vs Unaffected controls; $= Residents vs Unaffected controls.