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Psychosocial Impact of Assistive Technologies for Mobility and Their Implications for Active Ageing

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Abstract

Active ageing is defined as the process of optimizing opportunities for physical, social and mental health to enable older people to take an active part in society without discrimination and to enjoy an independent and good quality of life. The World Health Organization assumed this as a process for increasing and maintaining an individual's participation in activities to enhance his/her quality of life. In this survey, the authors addressed the following question: "Is assistive technology (AT) for mobility contributing to enhancement of lifelong capacity and performance?". From June 2015 until February 2016, 96 community dwelling adults, AT users for mobility (powered wheelchairs, manual wheelchairs, lower limb prostheses, walkers, crutches and canes), aged 45-97, mean 67.02 +/- 14.24 years old, 56.3% female, were interviewed using the Psychosocial Impact of Assistive Devices Scale (P-PIADS), the Activities and Participation Profile related to Mobility (APPM) and demographics, clinical and questions about AT use and training. The participants' profiles revealed moderate limitation and restrictions in participation, measured by the APPM (2.03). Most participants showed positive impact of AT; average scores obtained from the P-PIADS subscales were: Self-esteem 0.62, Competency 1.11 and Adaptability 1.10. P-PIADS total was 0.96, with the powered wheelchair users scoring the highest (1.53) and the walker users scoring the lowest (0.73). All subscales and P-PIADS total were positively correlated with the activities and participation profile. There was no relation between age and the psychosocial impact of AT or activities and participation profile. These results encourage the authors to follow these participants up for a lifelong intervention. To accomplish that aim, currently, the protocol is implemented at the AT prescribing centers in Coimbra, Portugal in order to assess the impact of AT on participation in society, one of the domains of the Active Ageing Index, a new analytical tool to help policy makers in developing policies for active and healthy ageing.

Keywords: *active ageing; social participation; mobility; assistive technologies; service delivery*

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1. Introduction

Challenges associated with ageing are a subject of ever increasing importance, not just in Europe, but worldwide. People are living longer than ever before. This means that older people now constitute a growing segment of society [1, 2]. By 2025 about one-third of Europe's population will be aged 60 years and over, and there will be a particularly rapid increase in the number of people aged 80 years and older. This will have an enormous impact on the European society [2, 3].

In the light of these demographic trends the expressions "active ageing", "successful ageing" and "healthy ageing" have become increasingly common. Active ageing is defined as the process of optimizing opportunities for physical, social and mental health to enable older persons to actively participate in society without discrimination and achieving an independent and good quality of life (QoL) [3]. The World Health Organization (WHO) [4] assumes this as a process for increasing and maintaining an individual's participation in activities to enhance his/her quality of life. Moreover, it emphasized that opportunities for health, participation and autonomy have to be optimized in order to improve quality of life as people age. Participation is understood in the broadest sense including social, economic and political participation and social inclusion/integration [3, 5]. Autonomy ought to be promoted by reducing the restrictions and limitations imposed upon that right by the communities in which ageing persons live and by themselves [3, 6]. Particularly, there is a strong relationship between the capacity for active ageing and the domains of social participation and independent living [1].

Active ageing is a concept that takes in not only the challenges, but also the opportunities of longevity. This includes opportunities for older people to continue working, to stay healthy longer and to contribute to society, taking into account their ability to optimize adaptation, i.e. making the most of one's remaining capacities and compensation for losses and limitations [7]. To enable older people to remain healthy, active and independent as long as possible should be reflected in interventions for promoting participation, social inclusion, autonomy and non-discrimination [5,8].

According to diverse agencies and authors, it is important to recognize that with increasing age and life expectancy, older adults are more likely to experience impairments [3, 9]. Disability means difficulty or dependency in carrying out daily self-care activities, living independently in one's own home or playing essential social roles [3].

Mobility difficulties seem to be the major cause of disability among older persons [10, 11]. In this context, just as negative health outcomes are associated with problems in mobility, health well-being and independence are enhanced through strategies to optimize mobility, suggesting the adoption and use of assistive technology (AT) for mobility [2, 3, 12, 13].

The primary purpose of AT is to maintain or improve an individual's functioning and independence, facilitate participation, and enhance overall well-

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being and QoL [9]. It is a fundamental part of broader, integrated health and social system solutions for supporting older adults [12].

The AT can provide social and emotional benefits to its users. Even though these benefits may be countered by negative side effects. Access to technology allows users to become more independent, experience greater feelings of security, social integration, and autonomy and have higher social and economic aspirations as a result; however, AT users may fear stigmatization for using devices that identify them as having disability. They may also feel overly dependent on certain devices and vulnerable if those devices fail, or experience frustration and feelings of helplessness and anger when AT does not function as expected. These negative factors may impact on AT adoption, abandonment, and non-use [14].

Adoption, and abandonment (discontinuance) of AT are influenced by psychosocial factors which can be assessed by using self-report measures as they reflect the real-world experiences of AT users. In fact, predictors of abandonment included lack of consideration of the device users' opinion, change in the device user's needs, and poor device performance [15]. Assessment of self-reported outcome is important because it provides the opportunity to share opinion about their intervention. It has been shown that patients who feel listened to by their health care professional have better outcomes than those who do not [3, 15]. For improving AT service delivery, persons with disability have to be entitled to access AT to facilitate their full and effective participation in society and reasonably expect to be central to the decision-making process of services that provide these technologies [16].

Access to needed AT is a significant determinant of active ageing and enabling older people to a good QoL. This means having access to a wide selection of devices that support and improve the basics of daily life [8].

According to these findings efforts to assess the psychosocial impact of AT on social participation are of great importance. The limitations and restrictions on mobility become critical when they interfere with participation particularly in social involvement, civic and community and, consequently, dependence on others. The measurement of users' perceived impact of AT is required for evaluating the results achieved with the equipment lifelong. Besides that, a better understanding of the effect of AT use on quality of life can support reasoning and decision making when providing services to persons with disability.

In this survey, the authors addressed the following question: "Is AT for mobility contributing to enhancement of lifelong capacity and performance?"
The purpose of this study was to explore: 1) the AT psychosocial impact on the participation profile of the middle age till too old adults; 2) the effects of age on participation profile and the AT psychosocial impact; 3) the influence of users' input in AT selection; 4) the influence of training after AT provision.

2. Materials and Methods

A descriptive, exploratory and cross-sectional study was designed and approved by three Rehabilitation Centers in the central region of Portugal, using a convenience sample of participants (n=96), who were recruited by doctors and physiotherapists external to the study, and interviewed by a trained junior researcher, who never have been in contact with them. To obtain the maximum response it comprised all individuals who have voluntarily agreed to participate in the study and met the following inclusion criteria: users of assisted mobility technology (powered wheelchairs, manual wheelchairs, lower limb prostheses, walkers, crutches and canes), for at least four months, with 45 years or older, with whatever health condition, and living in the community. To guarantee an age spectrum large enough to study the influence of age on the participation profile as well as on the psychosocial impact of AT, it was decided to include community dwelling adults from middle to old age. The period for collecting the data was carried out between June 2015 and February 2016, for a total of 7 months. During this time participants responded to the Psychosocial Impact of Assistive Devices Scale (PIADS) [17], the Activities and Participation Profile related to Mobility (APPM) [18] and demographics, clinical and AT questions.

The PIADS is a tool for assessing psychosocial factors. It was developed specifically to assess the perceived impacts technologies and assistive devices have on the quality of life of users. It is a 26-item self-report measure that is available in English, Portuguese (P-PIADS) [19] and many other linguistic and cultural translations. It captures the constructs of perceived competency, adaptability and self-esteem in three separate subscales which reflect the fundamental dimensions within which an assistive device may affect quality of life. The competence subscale is composed of 12 items related to perceived functional capability, independence, and performance. The adaptability subscale is composed of 6 items that reflect inclination or motivation to participate socially and take risks. The self-esteem subscale is composed of 8 items reflecting self-confidence, self-esteem, and emotional well-being. Respondents are shown a list of words or phrases that describe how using an assistive device may affect them (e.g. efficiency, happiness, and sense of control). For each word or phrase they rate on a seven-point Likert scale ranging from -3 “maximum negative impact” to +3 “maximum positive impact” the extent to which they are affected by wearing or using their assistive device. The midpoint, 0, indicates no impact or no perceived change as a result of using the device [17].

As noted above, the PIADS was developed specifically to assess psychosocial outcomes from assistive technology. The term ‘psychosocial’ refers to factors within the person (internal factors) and as well as to factors attributable to the environment that affect the psychological adjustment of individuals who have a disability.

The APPM is an 18-item scale designed taking into account the existence of activities that can be conditioned by mobility and that are related to the interactions and social relations, education, employment, money management, social and community life. It may influence the active participation of any person as a full

member of the society. It is intended to improve understanding of the difficulties an individual experiences in performing certain daily activities in their natural environment. Ratings are done using a 5-point Likert scale from 0 "no limitation/restriction" to 4 "complete limitation/restriction". In between, 1 "mild limitation/restriction", 2 "moderate limitation/restriction" and 3 "severe limitation/restriction". Since some activities may not apply, not all activities may be rated. An individual's participation profile is produced as a result [18].

Through an additional questionnaire, data obtained included demographics - age, gender, formal education (number of completed years at school), social and familiar status, current occupation; clinical - medical condition and its onset; and AT questions - type of AT currently using, onset of AT use, input in device selection and training of AT oriented by professionals (semi-open questions which allow interviewer to classify as yes or no; examples: decision about type of AT among different options, informed decision based on personal and environmental needs, opportunity to test AT before purchase, access to AT training program, oriented by a physiotherapist or an occupational therapist, among others). Descriptive statistics, including mean, standard deviation, range, frequency and percentage, were used to describe the participants and to perform preliminary analyses of differences in the P-PIADS and APPM.

The correlations between APPM and the P-PIADS (total and subscales) and age were carried through Pearson's Coefficient. The differences between groups (whom with and without input in device selection and whom who received and not received training after AT provision) were evaluated using the Student t-test for independent samples. Cronbach's Alpha of P-PIADS and Cronbach's Alpha of APPM were analyzed to assure their internal consistency in this sample. Statistical test of the Normality was done for all variables using the Shapiro-Wilk Test.

3. Results

The mean age of the sample was 67.0 (SD=14.25) years. The majority were women, representing 56.3%. Approximately 72% of the participants lived with immediate or extended family and 28% lived alone, 91% were retired or unemployed due to disability. Osteoarthritis or mobility limitation due to fractures were the most prevalent diagnoses (47%), followed by neurologic conditions (33%) and a wide range of other conditions (20%), with a minimum of one year onset and maximum of 53 years (M=9.86 years; SD=10.88 years). More than 60% of the participants used crutches or canes. Other participants used standard models of wheelchairs (20.8%), walkers (10.4%), powered wheelchairs (5.2%), and lower limb prostheses (2.1%). All the AT had been used for at least 4 months, to a maximum of 288 months (M=40.07; SD=50.16).

As showed in Table 1, the participation profile of all sample revealed moderate limitation and restrictions in participation (2.03). The data obtained by P-PIADS, with a Cronbach's Alpha 0.94 in this sample, demonstrated that the participants showed positive impact of AT; average scores obtained from the

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subscales were: competency 1.11, adaptability 1.10 and self-esteem 0.62. P-PIADS total was 0.96, with the powered wheelchair users scoring the highest (1.53). We record this data, but we cannot hide that there were only 5 powered wheelchair users, a low number to draw a strong conclusion. Meanwhile, the walker and standard wheelchair users scoring the lowest (0.73 and 0.78, respectively). Further, the powered wheelchair users were younger than those using a standard wheelchair, with a mean age of 47.0 and 64.5 years, respectively (p=.001).

Table 1: Participation profile and psychosocial impact of AT by group of assistive device

	Total AT (n=96) Mean (SD)	Manual Wheelchair (n=20) Mean (SD)	Powered Wheelchair (n=5) Mean (SD)	Walkers (n=10) Mean (SD)	Crutches (n=34) Mean (SD)	Canes (n=25) Mean (SD)	Lower limb prostheses (n=2) Mean (SD)
APPM	**2.03**	**2,32**	2.16	**2.63**	1.94	**1.70**	1.80
	(0.78)	(0.90)	(0.77)	(0.47)	(0.72)	(0.70)	(1.03)
Competency	**1.11**	0.95	**1.73**	0.93	1.26	0.96	1.46
	(0.86)	(1.10)	(1.00)	(0.92)	(0.81)	(0.64)	(0.41)
Adaptability	**1.10**	0.90	**2.07**	0.93	1.24	0.90	1.83
	(1.17)	(1.32)	(1.53)	(1.23)	(1.18)	(0.88)	(1.41)
Self- esteem	**0.62**	0.45	**0.98**	0.30	0.81	0.55	0.69
	(0.99)	(1.06)	(1.17)	(1.54)	(0.92)	(0.78)	(0.88)
P-PIADS total	**0.95**	**0.78**	**1.58**	**0.73**	1.12	0.82	1.31
	(0.90)	(1.05)	(1.16)	(1.11)	(0.86)	(0.66)	(0.10)

Table 2 demonstrates that all P-PIADS scores were negatively correlated with the APPM score (APPM Cronbach's Alpha in this sample was 0.80). Participants with the higher psychosocial impact scores were those with better performance in social participation. Among all subscales, self-esteem had the strongest correlation with the participation profile (r=-.369; p<.001).

Concerning age, there was no correlation with P-PIADS scores or APPM score.

Table 2: Relation between APPM, age and P-PIADS (N=96)

	APPM		Age	
	r	*p value*	*r*	*p value*
APPM		-	.039	.705
Competency	**-.284**	**.005**	-.198	.053
Adaptability	**-.232**	**.023**	-.153	.138
Self-esteem	**-.369**	**.000**	-.076	.462
P-PIADS_total	**-.321**	**.001**	-.160	.121

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Forty of the participants (41,7%) received device training and 62 (64,6%) had given input in their device selection.

Individuals who gave no input in the AT selection (n=34) scored below 1 in all scales and on the P-PIADS. In contrast, those who gave input scored above 1 in competency (0.84 vs. 1.26, *p*=.02), adaptability (0.78 vs. 1.28, *p*=.04) and P-PIADS total (0.69 vs. 1.11, *p*=.02). Self-esteem subscale was the exception (0.39 vs. 0.75, *p*=.88), with both groups scoring below 1.

Although the lack of statistical significance, the APPM score was worse among participants who gave no input in device selection (2.22) than those who did (1.93), showing a possible tendency for its relevance.

No significant differences were found for P-PIADS scores or APPM scores between those who received and those who did not receive training (Table 3).

Table 3: Psychosocial impact of AT and participation profile among who gave/did not give input in the AT selection and among who received/did not receive AT training after provision

	Input in the AT selection	Mean	SD	*p value*	Training of AT	Mean	SD	*p value*
Competency	No	0.84	0.89	**.023**	No	1.06	0.77	.544
	Yes	**1.26**	0.83		Yes	1.17	0.98	
Adaptability	No	0.78	1.12	**.046**	No	0.95	1.16	.158
	Yes	**1.28**	1.18		Yes	1.30	1.18	
Self-esteem	No	0.39	0.92	.088	No	0.62	0.82	.985
	Yes	**0.75**	1.03		Yes	0.61	1.21	
P-PIADS_total	No	0.69	0.87	**.028**	No	0.90	0.79	.493
	Yes	**1.11**	0.89		Yes	1.03	1.04	
APPM	No	2.22	0.81	.085	No	2.05	0.81	.491
	Yes	1.93	0.75		Yes	2.00	0.74	

4. Discussion & Conclusion

Our findings indicate that the use of mobility devices has a positive impact on psychosocial factors, particularly at the competency and adaptability levels. They seem to produce a minor impact on self-esteem, also observed in previous studies and, probably, related to stigma or negative connotation associated with the use of an AT [20, 21, 22].

Previous research from Cowan and collaborators [23] and Hoenigi, Giacobbi and Levy [24] argued that this view is also partly fostered by rehabilitation professionals, who emphasize the importance of personal and environmental factors for impact on the users' life. And, as proposed by McMillen and Soderberg [25], greater focus should be placed on the emotional aspects associated with disability instead of emphasizing only physical dysfunctions and symptoms.

Users who give input on their device selection appear to have higher participation profile and percept higher devices' impact on psychosocial factors, compared to those who did not. Mobility devices seem to be more effective when they are molded to meet specific requirements or needs, as already confirmed by Scherer and Glueckauf [26]. The same authors concluded that AT which is imposed on the user, and does not fit their preferences or lifestyle, hinders interactions with others or creates barriers to social activities and is less likely to be used [26]. Several studies have linked these reactions to feelings of lack of control over an important decision in their life, suggesting that including the users as a key element in the AT selection process is needed for their better performance in daily activities and social rules [21, 26]. Our study confirmed the impact of devices is more positive for those who were involved in AT selection than for those who were not. This finding is an important insight for rehabilitation centers and professionals in redefining the AT prescription models and empowering their AT clients as a means for achieving better outcomes [14, 26, 27].

Correlations between device training and social participation, as well as training and psychosocial impact of AT, were also shown by Cowan and collaborators [23] and Hoenigi, Giacobbi and Levy [24], who concluded that monitoring and training by professionals, usually physical therapists or occupational therapists, generate more confidence and sense of well-being, overcoming the difficulties generated by the environment. However, our findings showed no differences in the participation profile and psychosocial impact among those who received and those who did not receive training. This findings may result from the lack of effectiveness of the monitoring process and training phase after device acquisition [26], inviting discussion about the AT prescription models by moving the focus of the AT monitoring and training out from clinical settings into the natural environment in which AT devices are used [24]. As recognized by the WHO model for health, based on functioning [28], users´ capacity (the ability to do) is distinct from users´ performance (what they do in a daily basis, in his or her natural environment). As stated before, there is a strong relationship between the capacity for active ageing, social participation and independent living [1]. Thus, intervention should take place in both clinical and natural settings.

The results of this study help researchers and clinicians to understand that if the clients do not adopt AT that meet their personal needs and, at the same time, the professional services for device selection and training are not effective, devices may do little to improve psychosocial outcomes, quality of life, participation, independence and mobility within the community [14, 26, 29].

This study does not intend to study geriatric populations. In contrary, it was proposed as a contribution to a better understanding of active ageing in a social participation perspective. Supported by this argument, another important finding from this study, is the lack of correlation between social participation and age, which argues against the idea that older persons have more difficulty in performing

activities and participating in society, as reported in previous research [30]. The APPM results may have been influenced by the fact that the participant could mark *not applicable* if some those questions were not significant to them, answering only the ones that match his or her interests [18]. Since the questionnaire is a tailored, person-centered measure, it was less likely influenced by age or other personal factors.

There was, at the same time, no correlation between age and psychosocial impact of AT. Therefore, we conclude the mobility devices could be beneficial at any age, as already documented in previous research [31]. However, they are perceived as stigmatizing by many older adults [32] and sometimes difficult to deal with [31]. Consequently, policies should encourage the prescription of easy to manage assistive devices for mobility and accessible environments, to increase quality of life and to compensate activities' limitation, facilitating independent living and helping older persons to be more active and independent [26, 33].

The results are in line with the policy for active ageing, defined by the WHO as the process of optimizing health opportunities and active participation in society, to improve the independence and quality of life as people aged [4]. Technologies can play an important role for all persons lifespan, and some studies have also shown they are cost-effective for health and social services [2, 34].

Although the low number of participants using powered wheelchair, the finding that their impact is the highest when compared to other mobility devices may be explained by the trend or motivation of their users to participate socially and take risks, supported by the fact that those participants were the youngest of the group and who are living alone. A study from Devitt, Chau and Jutai came to the same conclusion [20]. Although, it was restricted to persons who had multiple sclerosis and were using wheelchairs (powered or manual).

Manual wheelchairs and walker users were those with the poorest social participation profile, in line with the magnitude of their disability [14]. The use of a wheelchair in itself indicates serious limitations in the body's functions related to the mobility, which may be aggravated by barriers on the environmental and social contexts. For this reason, and because the participants are integrated into the community, they were more likely to experience restrictions in community and recreational participation, with poor psychosocial impact of the devices, as confirmed in our study.

According to the Portuguese National Institute of Rehabilitation (INR), 47.7% of the assistive devices, prescribed and provided free of charge for the individual in 2013, were to persons aged 20-64 years, compared with 17.7% to those aged 65 years and older. Mobility assistive devices comprised 19.0% and 13.3% of the prescriptions to the same age groups, respectively [35]. Thus, as we reported before, age is not a key factor in determining the impact of mobility assistive devices; however, the finding alerts to the potential impact of AT services, systems and politics as barriers to the active ageing policies. Searching for possible other causes, we identified the

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AT costs as an important determinant, if not the most important. For example, and considering the average cost of each of the two groups of wheelchairs (manual and powered) it was found that the average cost of a manual wheelchair and a powered wheelchair is significant [35]. Service providers and policy makers should be more cognizant of the potential effects of cost on AT outcomes, once the tendency is to prescribe the cheaper ones, even if they are not the more adequate to the individual.

On the other hand, those who use a cane and crutches experience seem to experience fewer restrictions and limitations in social participation. In general, this type of devices is associated with better mobility and, consequently, fewer restrictions on participation. These results are consistent with those reported by Carver et al. [14].

In Portugal, assistive technologies research is still scarce. A significant strength of the present study was that it helps rehabilitation professionals to better understand the impact of AT for mobility on users' participation in daily life, and design better interventions which are both meaningful to users and cost-effective.

Possible limitations of this study were the sample size which was not large enough for valid AT subgroup analysis; the absence of follow-up; lack of details about the input in device selection and training given by AT service providers; and lack of information about environmental barriers.

In conclusion, mobility devices have a positive impact on users' social participation at all ages. It is important to guarantee that equipment and associated training are provided by skilled professionals and that users give input in the selection of their assistive device in order to achieve a better performance in everyday tasks, reducing the likelihood of rejection and abandonment and enhancing lifelong independence.

Future investigations will be necessary in order to perform a follow-up after 1-6 months and 12-18 months after device provision [36, 37, 38] for a comprehensive assessment of the impact of AT on social participation, one of the most important domains of the Active Ageing Index, an important instrument suggested as an useful and adequate base to develop policies for active and healthy ageing [1]. Future studies should also account simultaneously for environmental factors, AT training components, and predictors of psychosocial impact of mobility devices, to improve the understanding of their relationship with the capacity for active ageing and the domains of social participation and independent living.

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Author Contributions

ACM: generated and supervised the research project, drafted the manuscript; BF: collected the experimental data, analysis, interpretation of the data; JPP, ACM and

BF: analysis, interpretation of the data and critical revision; JJ: critical revision. All the authors have read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Abbreviations

The following abbreviations are used in this manuscript:

APPM: Activities and Participation Profile related to Mobility
AT: Assistive Technologies
PIADS: Psychosocial Impact of Assistive Devices Scale
P-PIADS: Psychosocial Impact of Assistive Devices Scale, Portuguese version
QoL: Quality of Life

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