Assistive technology for persons with profound intellectual disability: a European survey on attitudes and beliefs

Sara Nijs and Bea Maes

Parenting and Special Education Research Unit, KU Leuven, Leuven, Belgium

Sara Nijs, Parenting and special education research unit, KU Leuven, Leopold Vanderkelenstraat 32, PO Box 3765, 3000 Leuven, Belgium. E-mail:

sara.nijs@kuleuven.be

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Background: Persons with profound intellectual disability (PID) are mostly not able to use assistive technology (AT) independently. Caregivers play an important mediating role in implementing AT in the daily life of persons with PID. Both first-order barriers, extrinsic to caregivers, and second-order barriers, intrinsic to caregivers, influence the attitudes and behaviours of caregivers with regard to AT-use. It could be asked if increased knowledge on and experience with AT may impact the effect of first- and second-order barriers. This study investigated how knowledge and experience influence the professional caregivers' beliefs about which factors may impact the AT use in persons with PID and their intentions to use AT for persons with PID.

Methods: A questionnaire on the experienced limitations and successes in using AT was developed. The questionnaire was sent to professionals working with or responsible for persons with PID in various countries in Europe. In total the answers of 195 respondents were included in this study.

Results and conclusions: This study's results demonstrate that AT is used for various reasons in persons with PID, mostly to support communication and interaction or for fun or relaxation. Based on the answers of the respondents can be concluded that both experience and knowledge of caregivers seem to influence first- and second-order barriers. Besides, a possibility to overcome the second-order barriers is to provide professionals with possibilities to increase their knowledge and experience.

Implications for rehabilitation

- AT for persons with PID is mostly used for communication and interaction or for fun and relaxation.
- Professional caregivers believe that AT-use may positively influence various aspects in the life of persons with PID, especially communication and interaction, active engagement and participation in activities, and self-esteem of the person.
- Caregivers need to have sufficient experience in order to rate the barriers of AT-use as less limited in the group of persons with PID.
- In order to overcome the barriers experienced in implementing AT in persons with PID, knowledge of caregivers is essential.

Keywords: assistive technology; profound intellectual disability; survey research; beliefs; knowledge; experience, professionals

Introduction

Due to the rapid development of new technologies, the life of modern people is full of technological devices and applications which extend their abilities. In this context, assistive technology (AT) became a main area of interest in the disability field. AT refers to *“a variety of devices (and services related to their use) aimed at helping persons with disabilities and special educational / rehabilitation needs to function better within their daily context and achieve a higher quality of life”* [1,p.1]. As AT is described as an environmental factor which may facilitate the functioning of the person with a disability in the International Classification of Functioning, Disability and Health, every person with a disability may profit from the use of AT [2]. Although AT has the potential to improve a person’s functioning and independence, according to the WHO [3,4] only one in ten persons of the population that may profit from the use of AT has actual access to AT. Research also confirmed that persons with intellectual and/or multiple disabilities have only limited access to technology and that technology is underutilized by this population [5,6,7].

In order to provide increased opportunities to use AT and have access to AT, interest for the use of AT in the group of persons with intellectual disability has grown in research during the last decade. Especially for the group of persons with profound intellectual disabilities it may be challenging to use AT. The cognitive developmental level of persons with PID is considered to be lower than two years ($IQ < 25$) and often they have additional communicative, sensory, or physical disabilities [8]. They only acquire basic cognitive skills and lack symbolic or reasoning skills. Most research focusing on AT use in persons with PID consists of case studies, demonstrating that persons with PID are able to use technological devices, when these are adapted to their behavioural repertoire and when they have the opportunity to learn to use these devices [e.g.1,9-17]. These studies have shown that AT enables persons with PID to make

requests for objects or activities, to recruit attention, and/or to initiate social interactions [e.g. 1,10,13,18]. In addition, AT may support participation and engagement of persons with PID in basic leisure or occupation activities [e.g. 1,11,12,14,17,19] and may positively influence the self-determination of children with PID [18]. Finally, the use of AT may positively influence community living and participation of persons with disabilities [20,21].

Caregivers play an important mediating role in implementing technology in the daily life of persons with PID [1]. Persons with PID depend on their caregivers for all aspects in life, also for the use of technological devices. Because of this dependence it is important to take into account the viewpoint of caregivers and why they do use or do not want to use AT for their clients with PID [22,23]. The attitudes and beliefs of professionals are described in the ICF framework as environmental factors which may be a possible facilitator or barrier for the functioning of the person with a disability [1].

In the scientific literature various barriers related to the caregivers are described which may lead to the underutilization of AT. Two broad types of barriers are distinguished, first- and second-order barriers. First-order barriers are resource-related and extrinsic to caregivers [24,25]. These barriers are for example the organizational culture of the setting [28], difficulties in procuring and managing equipment, and time constraints [27,26]. Additionally, a lot of the devices do not fulfil the universal design principles, such as flexible use, simple and intuitive use, and low physical and cognitive efforts which limits the potential use of the devices by persons with intellectual and/or multiple disabilities [27]. Custom made alternative devices for persons with special needs can be expensive [16]. As a result insufficient funding is often named as an important barrier in using AT [23,25,26]. Inadequate assessment and planning, and poor follow-up are also stated as important reasons for low rates of technology access in

persons with disabilities [23,25,28]. These first-order barriers may be described as types of resources such as time, training, or support which is inadequate or missing. One may feel the pressure to overcome every of these resource-related barriers before being able to start using the technology [24]. Second-order barriers are intrinsic to caregivers and include their beliefs about among others instruction, computers, established practices, and unwillingness to change [24,25]. The lack of awareness about AT is often named as a barrier [23]. Research showed that negative beliefs and attitudes of caregivers play a substantial role in the underutilization of technology by persons with intellectual disabilities [30,25,26]. In previous research the lack of knowledge and experience in caregivers were identified as well as barriers in successful AT-use [e.g. 1,1,30-32]. These second-order barriers hinder the implementation of technology especially when the use of the technology impacts the traditional practices of caregivers [27].

Both first- and second-order barriers influence the attitudes and behaviours of caregivers and are therefore often impossible to separate [25,29]. The weight assigned to the first-order barriers by the caregiver is at least in part related to the underlying second-order barriers [24]. To overcome first-order barriers funding, training for professionals, and purchasing more equipment are named. Second-order barriers are often described as being more resistant to change [25]. The knowledge and experience of caregivers are identified as essential factors to successful AT-use as these may influence their willingness to use AT, their beliefs in its possibilities, and the skills to use AT [e.g. 1, 29-32]. One could ask if increased knowledge and experience may impact the effect of first- and second-order barriers. This study will investigate how knowledge and experience influence the professional caregivers' beliefs about which factors may positively or negatively impact the AT use in persons with PID and their intentions to use AT in persons with PID.

Materials and methods

Participants

Universities, research centres, and large support organizations in Western-Europe with a focus or interest in persons with PID (IQ < 25 or developmental level < 24 months) were asked to distribute the online questionnaire in their country by e-mail, newsletters, website, and/or social media. The questionnaire was sent to professionals working with or responsible for persons with PID in the following countries: Belgium, France, Germany, Portugal, Spain, Switzerland, the Netherlands, and UK. The study was performed in coherence with the standards of the university ethical committee who reviewed and approved this study.

In total 556 respondents started the questionnaire of which 116 (20.9%) indicated that they do not work with or that they are not responsible for persons with PID. Another 236 (42.4%) respondents did not finish the questionnaire. In total 204 (36.7%) respondents finished the questionnaire. Nine of these respondents do not live in Europe (Mexico n = 1; USA n = 6; unknown n = 2) and were excluded. In total the answers of 195 (35.1%) respondents were included in this study.

A descriptive overview of the respondent group is provided in table 1. The respondent group consisted of 22 males (11.3%) and 137 females (88.7%). The mean age of the respondents was 40.74 years (range: 17 years – 67 years). Most respondents worked in Belgium (n = 93; 47.7%) and the Netherlands (n = 40; 20.5%). The other respondents worked in Germany (n = 24; 12.3%), France (n = 6; 3.1%), Austria (n = 2; 1.0%), Spain (n = 1; 0.5%), UK (n = 1; 0.5%), and Switzerland (n = 28; 14.4%). Most respondents obtained a bachelor's (n = 100; 51.3%) or master's degree (n = 69; 35.4%),

some respondents finished secondary education (n = 14; 7.2%) or indicated they had another degree (n = 11; 5.6%), one respondent obtained a PhD (0.5%).

Two questions in the survey asked the respondents to estimate their own knowledge and experience as being sufficient or non-sufficient in order to use AT in the group of persons with PID. Based on these questions the participant group was divided in subgroups. Most respondents indicated that they did not have sufficient experience (n = 122; 62.6%) to use AT and most respondents estimated that they did not have enough knowledge (n = 105; 53.8%) to use AT for persons with PID. There is overlap in these groups, although 11 (5.6%) participants indicated they had sufficient experience but not sufficient knowledge and 28 (14.4%) respondents indicated they had sufficient knowledge but not sufficient experience. Most direct support workers and behavioural experts indicated they did not have sufficient experience and knowledge to work with AT. On the other hand, therapists and teachers were more positive in their estimation of their knowledge. Based on the description of the respondent group in table 1, it can be concluded that most respondents who work in a day care centre or a regular school indicated they had enough experience to work with AT, in contrast to the respondents working in other employment posts. Most respondents working in a school for special or regular education or in a workplace indicated they had sufficient knowledge to work with AT. In the groups made based on the degree of education overall no major variance in the estimation of experience or knowledge can be observed.

[Insert table 1 about here]

Questionnaire

The questionnaire was designed based on the four step procedure described by Buckingham & Saunders [33]: (1) listing the hypotheses or key themes; (2) identifying the key concepts; (3) identifying the variables; (4) distinguishing independent,

dependent and mediating variables. Surveys used in previous research on AT [30,34-38] were screened and additional questions were added. The developed questionnaire was reviewed and tested by four professionals working with persons with PID. Based on their feedback minor changes were made. The questionnaire was translated in the various languages: Dutch, German, English, French, Spanish and Portuguese and put online using Limesurvey.

Before starting the questionnaire, respondents were informed about the purpose and goal of the study. They were asked if they support or are responsible for persons with PID ($IQ < 25$ or developmental level < 24 months), if not the questionnaire was ended. The other respondents moved on to the informed consent in which they were informed about the nature and purpose of the study and confidentiality of the obtained data. Participants were asked for their consent to proceed the questionnaire.

In the first phase of the questionnaire general information was asked: for how many persons with PID the respondents are responsible and for what purpose AT is used for this group at their work setting. This was followed by yes-no questions on the price and purchase of AT for the group of persons with PID. In the third and fourth phase respondents were asked to answer on a six point Likert scale to what extent they think various factors linked to AT (phase three) and linked to the disability of the persons (phase four) limit the use of AT in the group of persons with PID. In the fifth phase respondents were asked to indicate on a six point Likert scale to what extent they think AT may positively influence various factors in the life of persons with PID. In the next three phases respondents were asked to answer on a six point Likert scale to what extent they think various factors are needed to successfully use AT in the group of persons with PID. Factors were linked to the support worker (phase six), the organization (phase seven), and the environment (phase eight). In phase nine of the

questionnaire five additional yes-no questions were asked related to the training and estimation of the own knowledge and experiences with regard to AT use. In phase ten, three open questions asked about good practices and interesting facilities in their country. The questionnaire ended with demographic questions (e.g. age, gender, years of experience).

Analyses

Statistical analyses were conducted using the software package SPSS Statistics 24. Descriptive analyses were done for the demographic variables to get an overview of the participant group as well as for various yes-no questions.

Based on the assumption of equal appearing intervals for ordinal scales, means and standard deviations were calculated for the questions in which respondents were asked to score on a 6-point Likert scale [39]. In order to compare the answers of the groups created based on the estimation of their knowledge and experience, an unpaired sample t-test would have been used. However, the assumptions of normality were not met according to the calculation of the Kolmogorov-Smirnov test of normality and the Shapiro-Wilk test of normality. After reciprocal transformation, square root transformation, or log transformation the Kolmogorov-Smirnov test of normality and Shapiro-Wilk test of normality were still significant. Additionally, because of the small sample size in every group, it could not be assumed that scores were normally distributed. Therefore the non-parametric alternative, the Mann–Whitney *U* test, was used to compare the groups. Bonferroni adjustments were used to determine the significance level because multiple comparisons were made for every theme [40].

Results

Goals and positive influence of AT use

The respondents indicated that AT is used for various reasons in the support of persons with PID (table 2). Four respondents (2.1%) indicated no technology is used for these persons in their organization. Most AT is used to support communication and interaction (84.4%) and to relax or for fun (78.5%). The goals specified under ‘other’ are amongst others: emotion detection, safety, registration of sleeping behaviour, and therapeutic goals.

[Insert table 2 about here]

First-order barriers

Most respondents ($n = 118$; 60.5%) indicated that the available AT is not adapted to the abilities and disabilities of persons with PID. The cognitive efforts that are needed from persons with PID to use a device and the complexity of the devices were, according to the respondents, the most restrictive features of AT. Respondents estimating their knowledge or their experience as not sufficient to use AT in persons with PID indicated a higher level of restrictiveness on every question compared to respondents who indicated their knowledge or experience as sufficient. The needed cognitive effort was estimated to be significantly more restrictive by respondents who indicated not having sufficient knowledge to use AT ($U = 3521$, $z = -3.181$, $p = .001$; table 3; significance level with Bonferroni correction: $< .0071$).

[Insert table 3 about here]

According to the respondents the inability of people with PID to use the device independently was the most restrictive factor related to the persons with PID themselves. Having an additional hearing disability was experienced as least restrictive

(table 4). Respondents estimating their knowledge or their experience as not sufficient to use AT in persons with PID indicated a higher level of restrictiveness on every question compared to respondents who indicated their knowledge or experience as sufficient. Except for an auditory disability, which was indicated as being more restrictive by respondents who estimated their experience as sufficient. Respondents who estimated their knowledge as non-sufficient indicated the limited cognitive abilities ($U = 3440$, $z = -3.439$, $p = .001$) as significantly more restrictive than respondents who estimated their knowledge as sufficient (table 5; significance level with Bonferroni correction: $< .0045$).

[Insert table 4 about here]

To overcome these first-order barriers and in order to successfully support persons with PID in the use of AT extended knowledge about the person was most essential according to the respondents (table 5). Respondents who estimated their experience as sufficient indicated a higher necessity for various skills and knowledge related to the support staff. The only exception was specific knowledge about technology and knowledge on the various possibilities of technological assistive devices which was considered to be more necessary according to respondents estimating their experience as not sufficient. Respondents estimating having not enough knowledge indicated a higher necessity for various skills and knowledge related to the support staff, except for openness for innovation and personal interest in technology which was scored as more necessary by respondents estimating their knowledge as sufficient. None of these differences were significant (significance level with Bonferroni correction: $< .0083$).

[Insert table 5 about here]

With regard to factors of the organization, respondents indicated that budgetary support to buy, update, support, and continue the use of technological devices is highly needed in order to successfully use AT in the group of persons with PID (table 6). With regard to the cost of AT, most respondents reported that there is generally no good value for money in buying AT (73%) and that they need to be able to test an AT before buying it (98.5%). They also indicated that they experience difficulties in buying or borrowing an AT-device (59.5%). Most respondents (94.9%) stated that the government must allocate more financial support for AT. Respondents estimating their experience as sufficient reported a higher necessity for various organization related factors.

Respondents estimating their experience as sufficient reported structural budgetary support ($U = 3433$, $z = -2.921$, $p = .003$) and explicit goals in the individual support plans ($U = 3518.5$, $z = -2.752$, $p = .006$) as significantly more necessary compared to the respondents estimating their experience as not sufficient. Respondents estimating having enough knowledge indicated a higher necessity for various organization related factors than the comparison group, except for support by an expert in the organization in the use of technological devices which is estimated more necessary according to respondents indicating their knowledge as not sufficient. None of these differences were significant (significance level with Bonferroni correction: $< .0125$).

[Insert table 6 about here]

With regard to factors related to the environment, most respondents (53.8%) indicated that there is insufficient assessment and planning in the use of and the implementation of a new AT-device. They stated that support during start-up and implementation of AT is needed (table 7). Respondents estimating their experience as sufficient gave higher scores for the necessity of environment related factors.

Respondents estimating their experience as not sufficient reported that support in the

start-up phase is more necessary compared to the group who estimated their experience as sufficient. Respondents estimating having not sufficient knowledge indicated increased necessity for environment related factors, except for support in the use of technological devices by an independent organization which is estimated as more necessary by respondents estimating having sufficient knowledge (significance level with Bonferroni correction: $< .0125$).

[Insert table 7 about here]

Second-order barriers

According to the respondents AT may positively influence various aspects in the life of persons with PID (table 8). Especially engagement and participation in activities, communication, and self-esteem were highly scored outcomes. On the contrary, speed and fluency of acting, and participation in society are less positively influenced by the use of AT according to the respondents. Respondents estimating their experience as sufficient to use AT in persons with PID were more positive on the outcomes of AT-use compared to respondents who indicated their experience as non-sufficient. For the estimated influence on the participation in society this difference is significant ($U = 3185$, $z = -3.430$, $p = .001$). Respondents estimating their knowledge as sufficient to use AT in persons with PID were more positive about the outcomes of AT-use compared to respondents who indicated their knowledge as non-sufficient, except for the particular outcomes of the physical wellbeing, the speed and fluency of acting, and the self-esteem of the person (Significance level with Bonferroni correction: $< .0045$).

Most respondents (34.4%) found it sometimes frustrating to use AT in persons with PID, 8.7% found never frustrating and 13.8% found often frustrating. Respondents who estimated their knowledge (mean = 3.30) or experience (mean = 3.25) as not sufficient found it significantly more frustrating to use AT in persons with PID

compared to the group of respondents who indicated they have sufficient knowledge (mean = 2.82) or experience (mean = 2.79) (knowledge: $U = 3665$, $z = -2.789$, $p = .005$; experience: $U = 3553.5$, $z = -2.438$, $p = .015$). Respondents indicated that there are not sufficient training opportunities (81.5%), not sufficient information on the use of AT in persons with PID (83.6%), and too little opportunities to request help or support of an educated professional (65.1%).

Discussion

This study's results demonstrate that AT is used for various reasons in persons with PID, mostly to support communication and interaction or for fun or relaxation. The respondents' belief that AT-use may positively influence various aspects in the life of persons with PID, especially communication and interaction, active engagement and participation in activities, and self-esteem of the person. The aspects in life which can be least positively influenced by the use of AT according to the respondents are speed and fluency of acting and participation in society. The results of this survey study show that there are, according to the respondents, various first-order barriers which may hinder the use of AT in persons with PID. These findings are in accordance with previous research [e.g. 16,25-28]. These restrictive factors are among others that devices are not adapted to the limited abilities of persons with PID and that they ask too much cognitive effort to use, the limited budget, the lack of assessment, and poor follow-up.

Knowledge and experience seem to influence the perception of the respondents on first-order barriers. In the results a trend was observed that professional caregivers who estimated their knowledge and experience as sufficient experience the factors related to the person with PID or to the technological device as less limiting or restrictive compared to professionals who estimated their knowledge and experience as

not sufficient. Most of these differences were however not significant. The limited cognitive abilities of persons with PID and the needed cognitive effort to use AT were estimated significantly more restrictive according to respondents who estimated their knowledge as non-sufficient. With regard to what is needed to provide AT for persons with PID respondents with perceived experience tended to indicate a higher necessity for most skills and knowledge related to the support staff, for most factors related to the organization, and for most factors related to the environment. A comparable trend is present in the results of respondents with perceived sufficient knowledge, although on some factors respondents estimating their knowledge as not sufficient indicated higher levels of necessity.

The beliefs to use or not use AT can be described as second-order barriers. Experience and knowledge seem to influence these second-order barriers because professionals estimating their experience or knowledge as sufficient are more positive about the outcomes of AT-use for persons with PID than professionals estimating their experience or knowledge as not sufficient. Also the frustration, experienced during AT-use is influenced by the knowledge and experience of the caregivers. The group of professionals perceiving insufficient knowledge or experience indicated significantly higher levels of frustration when providing AT for persons with PID.

Some limitations with regard to this study can be formulated. First, only 35.1% of all respondents ended the entire questionnaire. Drop-out can partly be attributed to professionals who do not take care or are not responsible for persons with PID and professionals who do not work in Western-Europe. Besides, a large amount of respondents ended the survey in the middle of the questionnaire. A possible explanation may be the length of the questionnaire. The questionnaire contained 35 questions of which six included multiple statements which needed to be scored on a 6-point Likert

scale. Second, even though a relatively large group of respondents still completed the entire questionnaire it was not possible to take into account the various demographic variables to compare groups based on for example country, education level, employment post, or employment function. The groups made based on these variables were too unequally distributed or too small in order to compute reliable statistical analyses. Third, based on the results, it can only be concluded that knowledge and experience on the one hand and beliefs and intentions on the other hand are related. The results do not deliver insight in the direction of this relatedness. Additionally, an overlap between the group of respondents indicating themselves as having enough experience and having enough knowledge was found. It can be asked what the difference is between these groups and why someone estimates him- or herself as having enough experience or knowledge.

Future research could focus on what knowledge and which experiences are associated with a minimal level of experienced barriers and an optimal AT provision for persons with PID. It would be interesting to investigate which respondents indicate themselves as having enough knowledge and experience in providing AT: What knowledge and experiences do they have and how is this helpful for them in providing AT? The results of this survey suggest that having knowledge about AT and experience in using AT is related to the extent to which certain factors are experienced as more or less restrictive for the AT-use and the extent to which professional caregivers belief in the positive influence of AT use. Professionals estimating themselves as having sufficient knowledge or experience to use AT also belief more in the necessity of facilitative factors related to the support worker, the organisation, or the environment, to promote AT use in the group of persons with PID. For policy and practice it could be interesting to investigate how they can improve the knowledge and experience of

professional caregivers in order to restrict the experienced barriers and to improve the positive attitude towards AT. Having the knowledge and experience to work with AT is an important first step to successfully implement AT for persons with PID, this goes hand in hand with the facilitation of other factors such as facilitation by the organisation and the environment in order to be able to provide AT for persons with PID.

It can be concluded that knowledge and experience on the one hand and beliefs and intentions on the other hand are related. As pointed out in the introduction first- and second-order barriers are impossible to separate [25,29]. The first-order, extrinsic, restrictions cannot only be solved by providing more training, investing more money, or providing better planning. The degree to which these first-order barriers are perceived cannot only objectively be determined, but are also determined by the level of knowledge and experience. Besides, a possibility to overcome the second-order barriers is to provide professionals possibilities to increase their knowledge and experience.

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Table 1. Description of respondent group in total and subgroups based on estimation of experience and based on estimation of knowledge

		Total	Estimation of experience		Estimation of knowledge		
		N (%)	Sufficient	Not sufficient	Sufficient	Not sufficient	
			N (%)	N (%)	N (%)	N	
Gender	Male	22 (11.3)	8 (11.0)	14 (11.5)	13 (14.1)	9 (8.6)	
	Female	173 (88.7)	65 (89.0)	108 (88.5)	44 (85.6)	96 (91.4)	
Country	Belgium	93 (47.7)	30 (41.1)	63 (51.6)	41 (45.6)	52 (49.6)	
	The Netherlands	40 (20.5)	16 (21.9)	24 (19.7)	17 (18.9)	23 (21.9)	
	Germany	24 (12.3)	14 (19.2)	10 (8.2)	14 (15.6)	10 (9.5)	
	France	6 (3.1)	1 (1.4)	5 (4.1)	3 (3.3)	3 (2.9)	
	Austria	2 (1.0)	0 (0.0)	2 (1.6)	0 (0.0)	2 (1.9)	
	Spain	1 (0.5)	0 (0.0)	1 (0.8)	0 (0.0)	1 (1.0)	
	UK	1 (0.5)	1 (1.4)	0 (0.0)	1 (1.1)	0 (0.0)	
	Switzerland	28 (14.4)	11 (15.1)	17 (13.9)	14 (15.6)	14 (13.4)	
	Employment function	Direct support worker	40 (20.5)	7 (8.1)	33 (25.2)	14 (13.2)	26 (23.4)
		Behavioural expert	28 (14.4)	5 (5.8)	23 (17.6)	7 (6.6)	21 (18.9)
Therapist		65 (33.3)	33 (38.4)	32 (24.4)	37 (34.9)	28 (25.2)	
Policy maker		10 (5.1)	5 (5.8)	5 (3.8)	4 (3.8)	6 (5.4)	
Teacher		39 (20.0)	19 (22.1)	20 (15.3)	24 (22.6)	15 (13.5)	
Paid personal assistant		3 (1.5)	1 (1.2)	2 (1.5)	2 (1.9)	1 (0.9)	
Other		32 (16.4)	16 (18.6)	16 (12.2)	18 (17.0)	14 (12.6)	
Employment post		School for special education	61 (31.3)	29 (22.5)	32 (21.8)	33 (29.5)	28 (22.4)
	School for regular education	6 (3.1)	4 (3.1)	2 (1.4)	4 (3.6)	2 (1.6)	
	Residential facility	105 (53.8)	36 (27.9)	69 (46.9)	43 (38.4)	62 (49.6)	
	Day care centre	56 (28.7)	56 (43.4)	39 (26.5)	26 (23.2)	30 (24.0)	
	Workplace	9 (4.6)	4 (3.1)	5 (3.4)	6 (5.4)	3 (2.4)	
Degree of education	PhD	1 (0.5)	1 (1.4)	0 (0.0)	1 (1.1)	0 (0.0)	
	Master's degree	69 (35.4)	23 (31.5)	46 (37.7)	31 (34.4)	38 (36.2)	
	Bachelor's degree	100 (51.3)	40 (54.8)	60 (49.2)	47 (52.2)	53 (50.5)	
	Degree of secondary education	14 (7.2)	3 (4.1)	11 (9.0)	5 (5.6)	9 (8.6)	
	Other	11 (5.6)	6 (8.2)	5 (4.1)	6 (6.7)	5 (4.8)	

Table 2. Goals of AT, used by persons with PID in the facility where the respondent is employed

	N (%)
To support participation in society	82 (42.1%)
To support communication and interaction	165 (84.6%)
To increase the independence of the person with a disability	95 (48.7%)
To promote skill learning	105 (53.8%)
To compensate for visual, auditory and/or motor disabilities	95 (48.7%)
To support daily care	71 (36.4%)
To relax or for fun	153 (78.5%)
To support participation in activities	107 (54.9%)
Other	15 (7.7%)
No AT is used	4 (2.1%)

Table 3. Restrictive factors related to the device in the use of AT

		Estimation of experience		Estimation of knowledge	
		Sufficient	Not sufficient	Sufficient	Not sufficient
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Not being able to use the assistive device for various persons	3.70 (1.37)	3.44 (1.43)	3.86 (1.31)	3.5 (1.40)	3.88 (1.34)
The assistive device does not grow with the person and therefore does not permanently meet his needs and wishes	3.73 (1.31)	3.55 (1.33)	3.84 (1.29)	3.61 (1.24)	3.83 (1.36)
Complexity of the assistive devices	3.94 (1.28)	3.59 (1.52)	4.15 (1.07)	3.70 (1.43)	4.14 (1.10)
Necessity to update the assistive device	3.53 (1.27)	3.38 (1.31)	3.61 (1.25)	3.33 (1.33)	3.70 (1.20)
Maintenance of the assistive device	3.32 (1.25)	3.10 (1.34)	3.45 (1.18)	3.1 (1.32)	3.50 (1.16)
Restricted availability of the assistive device	3.87 (1.32)	3.77 (1.43)	3.93 (1.25)	3.82 (1.34)	3.90 (1.31)
Cognitive effort of the persons with a disability which is needed to use the assistive device	4.03 (1.38)	3.66 (1.54)	4.25 (1.24)	3.67 (1.48)	4.33 (1.21)
Restrictive safety of the assistive device	3.01 (1.46)	2.70 (1.49)	3.19 (1.42)	2.74 (1.47)	3.23 (1.42)
Time investment to use the assistive device	3.70 (1.33)	3.56 (1.32)	3.79 (1.33)	3.57 (1.34)	3.82 (1.31)

Table 4. Restrictive factors related to the disabilities of the PID in the use of AT

		Estimation of experience		Estimation of knowledge	
		Sufficient	Not sufficient	Sufficient	Not sufficient
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Having a physical disability		4.07 (1.30)	3.90 (1.44)	4.16 (1.21)	3.86 (1.37)
Not being able to use the assistive device independently		4.42 (1.19)	4.26 (1.33)	4.52 (1.09)	4.26 (1.26)
Not being able to provide their own safety in using the assistive device		3.99 (1.35)	3.66 (1.53)	4.19 (1.19)	3.68 (1.47)
Very limited cognitive abilities of the person		4.09 (1.37)	3.74 (1.63)	4.30 (1.16)	3.71 (1.48)
Having visual disabilities		4.12 (1.17)	4.04 (1.30)	4.17 (1.09)	3.92 (1.23)
Having hearing disabilities		3.71 (1.23)	3.77 (1.24)	3.67 (1.22)	3.64 (1.20)
Having communicative disabilities		3.95 (1.31)	3.84 (1.45)	4.02 (1.21)	3.81 (1.41)
Frustration of the person with a disability in using the technological assistive device		3.98 (1.23)	3.97 (1.32)	3.98 (1.18)	3.82 (1.33)
Lack of interest of the person with a disability in using the technological assistive device		4.09 (1.34)	4.00 (1.48)	4.15 (1.26)	4.01 (1.39)

Table 5. Skills or knowledge needed to successfully support and promote the use of AT

		Estimation of experience		Estimation of knowledge	
		Sufficient	Not sufficient	Sufficient	Not sufficient
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Specific knowledge about technology	4.25 (1.13)	4.12 (1.22)	4.33 (1.06)	4.12 (1.21)	4.36 (1.05)
Extended knowledge about the person with a disability	5.29 (0.79)	5.34 (0.75)	5.25 (0.81)	5.23 (0.77)	5.33 (0.81)
Openness for innovation	4.93 (0.91)	4.99 (0.94)	4.90 (0.90)	5.01 (0.90)	4.87 (0.90)
Personal interest in technology	4.29 (1.01)	4.36 (1.03)	4.25 (0.99)	4.37 (1.05)	4.23 (0.96)
Knowledge on the methodology to instruct persons with a disability in the use of assistive technologies	4.98 (0.87)	5.11 (0.79)	4.90 (0.91)	4.96 (0.90)	5.00 (0.86)
Knowledge on the various possibilities of technological assistive devices	5.02 (0.76)	4.97 (0.71)	5.05 (0.79)	4.99 (0.71)	5.05 (0.80)

Table 6. Factors of the organization needed to successfully support and promote the use of AT

		Estimation of experience		Estimation of knowledge	
		Sufficient	Not sufficient	Sufficient	Not sufficient
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Support by an expert in the organization in the use of technological devices	4.89 (0.89)	4.90 (0.97)	4.89 (0.84)	4.89 (0.97)	4.9 (0.82)
Explicit reference to the use of technological devices in the mission or goals of the organization	4.08 (1.26)	4.21 (1.38)	4.00 (1.19)	4.20 (1.30)	3.97 (1.23)
Structural budgetary support to buy, update, support, and continue use of the technological devices	5.14 (0.84)	5.32 (0.86)	5.03 (0.80)	5.19 (0.83)	5.1 (0.84)
Explicitly discuss the use of technological devices in the individual support plans	5.07 (0.78)	5.25 (0.76)	4.97 (0.78)	5.14 (0.79)	5.01 (0.78)

Table 7. Factors of the environment needed to successfully support and promote the use of AT

		Estimation of experience		Estimation of knowledge	
		Sufficient	Not sufficient	Sufficient	Not sufficient
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Stimulation by the family caregiver of the persons with a disability in the use of the technological devices	4.58 (0.99)	4.59 (1.01)	4.57 (0.99)	4.56 (1.00)	4.60 (1.00)
Support in the use of technological devices by an independent organization	3.76 (1.21)	3.81 (1.32)	3.73 (1.14)	3.77 (1.21)	3.75 (1.21)
Consistent use of the technological device in various living situations	5.07 (0.83)	5.16 (0.94)	5.02 (0.75)	5.06 (0.94)	5.09 (0.72)
Support of the various contexts in the use of the technological device	5.12 (0.75)	5.15 (0.91)	5.10 (0.65)	5.10 (0.85)	5.13 (0.67)
Support in the start-up of the use of the technological device	5.36 (0.69)	5.22 (0.80)	5.45 (0.59)	5.32 (0.79)	5.40 (0.58)

Table 8. Positive influence of AT on different aspects in the life of persons with PID

		Estimation of experience		Estimation of knowledge	
		Sufficient	Not sufficient	Sufficient	Not sufficient
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Learning and development	4.54 (1.01)	4.71(0.99)	4.43 (1.00)	4.67 (0.96)	4.43 (1.04)
Physical wellbeing	4.14 (1.26)	4.32 (1.21)	4.04 (1.28)	4.11 (1.24)	4.17 (1.27)
Degree of independence	4.19 (1.19)	4.34 (1.16)	4.10 (1.21)	4.23 (1.19)	4.15 (1.20)
Expression needs and wishes	4.56 (1.11)	4.74 (1.03)	4.46 (1.15)	4.59 (1.14)	4.54 (1.09)
Active engagement and participation in activities	4.61 (1.02)	4.77 (1.03)	4.52 (1.01)	4.68 (1.06)	4.55 (0.99)
Emotional wellbeing	4.51 (1.03)	4.75 (0.89)	4.37 (1.08)	4.54 (0.99)	4.49 (1.07)
Communication and interaction	4.63 (0.99)	4.88 (0.90)	4.48 (1.02)	4.68 (1.02)	4.58 (0.98)
A qualitative living environment	4.39 (1.14)	4.53 (1.13)	4.30 (1.14)	4.42 (1.10)	4.36 (1.18)
Participation in society	3.95 (1.34)	4.34 (1.33)	3.71 (1.30)	4.13 (1.32)	3.79 (1.35)
Speed and fluency of acting	3.43 (1.32)	3.53 (1.37)	3.37 (1.29)	3.42 (1.37)	3.44 (1.29)
Self-esteem of the person	4.60 (1.15)	4.75(1.13)	4.51 (1.16)	4.57 (1.20)	4.63 (1.11)