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Personalized Citizen Assistance for Social Participation (APIC) adapted for older adults with visual impairment: Results from a mixed study

Caroline Pigeon^{a,b,1}, Judith Renaud^c, Yves Couturier^{d,2}, Dominique Giroux^{e,f,g,3}, Andrée Sévigny, Marie-Josée Levert^{h,i}, and Mélanie Levasseur^{a,b,4*}

^aSchool of Rehabilitation, Faculty of Medicine and Health Sciences, Université de Sherbrooke, Sherbrooke, Canada; ^bResearch Centre on Aging, Centre intégré universitaire de santé et de services sociaux de l'Estrie – Centre hospitalier universitaire de Sherbrooke, Sherbrooke, Canada; ^cSchool of Optometry, Université de Montréal, Montreal, Canada; ^dSchool of Social Work, Université de Sherbrooke, Sherbrooke, Canada; ^eDepartment of Rehabilitation, Faculty of Medicine, Université Laval, Canada; ^fCentre d'Excellence sur le Vieillissement de Québec, Québec, Canada; ^gVITAM – Centre de recherche en santé durable, Québec, Canada; ^hFaculty of Nursing, University of Montreal, Montréal, Canada; ⁱCentre for Interdisciplinary Research in Rehabilitation of Greater Montreal, Montreal, Canada

* Corresponding author: Melanie.Levasseur@USherbrooke.ca

1. <https://orcid.org/0000-0002-7903-729X>; current affiliation: Laboratoire Ergonomie et Sciences Cognitives pour les Transports, Université Gustave Eiffel, Lyon, France.
2. <https://orcid.org/0000-0001-6848-8354>
3. <https://orcid.org/0000-0002-3264-5319>
4. <https://orcid.org/0000-0002-5914-0708>

Purpose. To explore the effects of the Personalized Citizen Assistance for Social Participation (APIC), an intervention adapted here for visual impairment, involving weekly stimulation sessions over six to twelve months, provided by trained and supervised attendants, on seven outcomes (social participation, leisure, independence, mobility, quality of life, health-related quality of life, and empowerment) in older adults with visual impairment, and to document its facilitators and barriers. **Methods.** A mixed-method design, which included a pre-experimental and an exploratory qualitative clinical research component, was used on 8 older adults (7 women) with visual impairment aged 70-86, and 8 attendants (5 women) aged 20-74. Before the intervention, directly after, and

four months later, older adults completed questionnaires on the 7 outcomes. During the intervention, attendants completed diaries and participated in monthly meetings. Semi-structured interviews were administered to all participants after the intervention. **Results.** Social participation, leisure, mobility, quality of life and empowerment had increased immediately after the APIC. These improvements were still generally observed four months later. Participants reported that the APIC improved older adults' capabilities, social participation, and social environment. **Conclusions.** The APIC is a promising intervention which helps older adults with visual impairment to deal with social restrictions.

Keywords: low vision; blindness; aging; leisure; mobility; quality of life; empowerment; community integration

Introduction

Visual impairment, which is prevalent mainly in older adults, has a considerable impact on active and healthy aging. Nearly 10% of older Canadians (65+) have visual impairment [1], and this proportion reaches about 40% in people aged 70 and over around the world [2]. As the proportion of older adults increases, so the number of adults with visual impairment continues to grow. In Canada, the proportion of adults aged 65 years and over reached 18.5% in 2021 [3], and is expected to rise from 21.4% to 23.4% by 2030 [4]. In addition to increasing the risk of depressive symptoms [5], health problems [6], loss of independence, mobility [7] and quality of life [8], visual impairment in older adults is also associated with restrictions in social participation [9–12]. Defined as a person's involvement in activities that provide interactions with others [13] in community life and in important shared spaces, social participation evolves according to the amount of time and resources available, and is based on the societal context, on individuals' desires and on what is meaningful to them [14]. In older adults, social participation is associated with a number of health outcomes, such as lower mortality [15], lower morbidity [16] and better independence [17]. Social participation for older adults was particularly impacted by the COVID-19 pandemic [18]. This pandemic led to an epidemic of loneliness in the United States. Older adults and people with disabilities were, and continue to be, particularly affected by this [19]. In addition to the personal impact of visual impairment on older adults, in 2019 its cost was estimated at \$18.4 billion in Canada, due to expenditure in the healthcare system, losses in productivity and informal caregiving, and with a reduced quality of life in the older adults affected [20]. Social participation can be facilitated when the capabilities of the person and his/her environment are optimized [21]. It can also be increased by innovative interventions, which are an important priority in alleviating the burden of visual impairment.

Several reviews of rehabilitation interventions carried out on older adults with visual impairment have suggested that a problem-solving approach might be more efficient than skills training or home adaptation [22,23]. The problem-solving approach consists of defining the problem, establishing realistic goals, searching for and implementing solutions and evaluating outcomes [24]. Based on a synthesis of 41 interventions aimed at fostering social participation in older adults, Raymond and colleagues suggested that, to be more effective, intervention should last more than six months, be personalized, foster empowerment and support the development of significant relationships and activities [25,26]. Only one of the interventions analyzed by Raymond and colleagues was carried out exclusively on people with visual impairment [27,28]. This involved 29 adults aged 55 and older, who participated in a 20-week multidisciplinary intervention with group meetings and home-based exercise sessions. Immediately after the intervention, participants' adaptation to vision loss was enhanced, their self-efficacy was greater, and their mental health was better [28]. Their sense of accomplishment and satisfaction with social participation was also maintained [27]. However, contrary to recommendations from Raymond and colleagues, this intervention was not personalized, and lasted less than 6 months.

Based on the results of Raymond and colleagues, the Personalized Citizen Assistance for Social Participation (known as APIC, the French acronym for *Accompagnement-citoyen personnalisé d'intégration communautaire*) [29] is a promising intervention that aims specifically to foster social participation using non-professional attendants and a problem-solving approach. Participants have one approximately three-hour-long stimulation session per week with their attendant, over six to eighteen months depending on the APIC version,

provided by a trained and supervised attendant. These allowed the participant to identify and become involved in significant social and leisure activities which were otherwise difficult to accomplish, by gradually mobilizing his/her personal and environmental resources. In its first version for adults with traumatic brain injuries, an 18-month APIC improved participants' accomplishment and satisfaction with social and leisure activities. A 6-month version of the APIC which was adapted for older adults with disabilities improved participants' social participation, leisure frequency [30], and mobility [31]. Twelve months after this intervention ended, older participants were still experiencing an increased quality of life and mobility [32]. In the context of this version of the APIC, personal and environmental facilitators relating to the accomplishment of social activities were identified: good health, motivation to accomplish something, positive self-perception, use of paratransit, and support and encouragement from family [33]. Barriers were, for example, health problems, fear of going outside, weather conditions, or an over-protective family [33]. The APIC was also implemented in a rural area within a community organization and delivered by citizen volunteers. It was prioritized by key actors [34], and fostered social participation, access to transportation, well-being, and the empowerment of older adults [35]. These first studies on the APIC highlighted two participant profiles. Profile 1 participants focused on their relationship with the attendant and enjoyment, were reluctant to plan opportunities for community integration or leisure activities, and wanted APIC to continue for a longer time. Profile 2 participants were committed to resuming, maintaining, exploring or experimenting with meaningful social and leisure activities [29,30,35]. One multiple case study also revealed that the APIC fostered the accomplishment of new activities, empowerment, and a sense of community in older adults with mental health problems [36]. Finally, factors which fostered the implementation of APIC were also identified, such as the conviction of key actors involved in the added value of the intervention, its coherence with the values and mission of their organization, and with the needs of the population they target [37]. Although the APIC has already been adapted for older adults with visual impairment, and implemented in a rehabilitation center [38], its effects on this population are unknown. The present study therefore aimed to explore the effects of the APIC on social participation, leisure, independence, mobility, quality of life, health-related quality of life, and empowerment in older adults with visual impairment, and to document the facilitators and barriers to the accomplishment of social participation in the context of the intervention.

Materials and methods

Study design and participants

A mixed-method design with a pre-experimental component was used before the COVID-19 pandemic, initially with 20 participants: 10 older adults with visual impairment, as defined by the International Classification of Diseases-10 [39], and 10 non-professional volunteer attendants. Two of the ten dyads discontinued the intervention. Participants were recruited using a convenience strategy, from people attending the rehabilitation center of the Eastern Townships Integrated University Center for Health & Social Services (Quebec, Canada) for older adults, community organizations, from announcements in newspapers and on the radio, and, for all participants, posters in the local community. To be eligible, older adults had to: 1) be aged 60 or older, 2) have moderate to severe visual impairment based on visual acuity and visual field measurements, 3) report restrictions in social participation, 4) live in a conventional

home (or in a residential facility for independent or semi-independent seniors), 5) have preserved cognitive functions based on the clinical judgement of rehabilitation center professionals, and 6) to be already attending, or have a referral to attend, the rehabilitation center. The inclusion criteria for attendants were: 1) motivation to commit to the program for several months (this was evaluated by the volunteer Coordinator in the rehabilitation center), 2) availability for the APIC, including weekly sessions with one older adult over six to nine months, for the initial training and monthly meetings, and 3) possession of a clean criminal record. The Research Ethics Committee of the CIUSSS Estrie – CHUS approved the study (2018-2381), which was conducted in accordance with the Declaration of Helsinki and its amendments [40].

Data collection procedure

Eligible older adults were met individually at home by the first author, a trained postdoctoral fellow, who administered the questionnaires and conducted qualitative interviews. The participants first signed an informed consent form read to them by the first author. When desired, a large-print version of this form was mailed in advance. At baseline (T_0), eight questionnaires were verbally administered over approximately 120 minutes. Based on their interests in activities, age and gender preferences, geographic proximity and availability to begin the intervention, older adults were then paired as quickly as possible [1-4 weeks; median \pm semi-interquartile interval ($Md \pm Q$) = 2.5 ± 1] with one attendant. After the intervention, older adults verbally completed the same questionnaires (T_1). Two to four weeks ($Md \pm Q$ = 3 ± 0) after answering the questionnaires, they participated in a face-to-face semi-structured interview lasting about 30-100 ($Md \pm Q$ = 44 ± 6) minutes. They were contacted by phone afterwards to validate a synthesis of the interview. Finally, older adults verbally completed the same questionnaires twelve to twenty weeks ($Md \pm Q$ = 16 ± 0.8) after the end of the intervention (T_2).

Attendants signed an informed consent form at the beginning of their training. During the intervention, they completed a diary after each session and participated in an audio recorded monthly meeting. After the intervention, the first author carried out three semi-structured 60-minute group interviews with 2 or 3 attendants according to their availability, in the presence of another author (ML), who produced a synthesis of interviews for validation by attendants. The attendants also completed a socio-demographic questionnaire.

APIC intervention

Each attendant met one older adult for three hours per week over six to nine months with the objective of helping him/her to identify and accomplish meaningful social and leisure activities. Before the intervention, five attendants had a day and a half training session, and, due to time constraints, three others had one half-day of condensed training. Similarly to another version of the APIC [30], the training included information on aging, loss of independence, community resources and the personalized communication approach [41]. The training also targeted the ways in which attendants can help older adults to accomplish meaningful activities which are difficult by encouraging empowerment, gradual mobilization of personal and environmental resources, and integration into the community. For this study, training was also adapted to include components related to visual impairment, such as sensorial impairment sensibilization, with simulation videos and role-playing activities with low vision simulation glasses, learning to

be a sighted guide and an introduction to assistive devices. Supervisors read attendants' diaries to monitor the progress of the sessions, and to allow them to intervene with older adults and/or attendants if necessary. Supervisors also held monthly two-hour group meetings for attendants, which allowed them to share successes and challenges encountered, and collectively think about solutions. Individual meetings were available when recurrent difficulties arose. A social worker **of the rehabilitation center**, who also happened to have a visual impairment, the volunteer coordinator, and the **first author** were responsible for the training and supervision of attendants.

Outcome variables and tools

Data were gathered from one sociodemographic and seven main-outcome questionnaires, **semi-structured interviews, individual with older participants and in group with attendants**, attendants' diaries, and transcriptions of attendants' monthly meetings. **Social participation** was operationalized by the Assessment of Life Habits (Life-H [42], 3.1 abbreviated French version [43]). The Life-H is composed of two scales measuring accomplishment and satisfaction in six daily activities and six social roles. Higher scores indicate greater social participation, and a change of 0.5 points on accomplishment and satisfaction scores is clinically significant [44]. The Life-H has good inter-rater (0.89) and test-retest (0.95) reliability for older adults with disabilities [45] and has been previously administered to older adults with visual impairment [46]. The Leisure profile [47] measured involvement and interest in **leisure activities**, attitudes toward leisure, and the difficulties encountered in leisure activities. Higher scores indicate a high level of involvement in leisure activities, a positive attitude towards leisure activities, and more difficulty in accomplishing these activities. The leisure profile has acceptable inter-rater (kappa 0.21-0.80) and test-retest (0.41-0.60) reliability [47]. The Functional Autonomy Measurement System (SMAF [48]; French version [49]) assessed **independence**. Higher scores indicate greater disability. The maximum score of 87 designates a high level of dependence; a five-point change in the total score is considered to be clinically significant [50]. The SMAF has good inter-rater (0.96) and test-retest (0.95) reliability [48,51]. The Life-Space Assessment (LSA [52]; French version [53]) measured **mobility**. This tool considers the extent of mobility space, frequency of travel and the use of technical or human assistance to calculate a total score for travel habits. A change of 5 points in the total score is considered to be clinically significant [52]. This questionnaire has a good test-retest reliability (0.87) [53]. The Quality of Life Index [54] (French version [55]) measured the **quality of life** in four dimensions: health and functioning, socioeconomic, psychological/spiritual, and family. Higher scores indicate better quality of life, and a change of 2-3 points in the dimensions or the total score is clinically significant [56]. This questionnaire has a good test-retest reliability (0.81-0.87) and internal consistency (Cronbach's alphas = 0.90-0.93) [54,57], and has been previously administered to older adults with visual impairment [58]. The National Eye Institute Visual Function Questionnaire-25 (VFQ-25 [59]; French version [60]) assessed the **impact of visual impairment on health-related quality of life**. Higher scores indicate better health-related quality of life, and a change of 10 points in the total score is clinically significant [61]. This questionnaire has a good internal consistency (Cronbach's alphas = 0.73-0.87) [62,63] and test-retest (0.91) reliability [63]. Finally, **empowerment** in relation to health care services was assessed using the Health care empowerment questionnaire, developed in French [64]. This questionnaire assesses 3 factors of empowerment: involvement in decisions, involvement in interactions and level of control. A higher score indicates greater empowerment. With a test-retest reliability

between 0.36 and 0.67, this instrument has a good internal consistency (Cronbach's alphas = 0.83) [64].

Two semi-structured guides, one for each type of participant, and composed of open-ended questions, were used. They were validated by two external experts in qualitative research, and inspired by a previous experimentation of the APIC [30]. The first guide explored older adults' perception of the impact of the intervention on their activities, relationships and environment, and their experiences of the APIC such as *"Tell me about your assistance experience, your relationship with your attendant and the activities accomplished during the intervention"* or *"What benefits did the assistance experience bring you?"*. The second guide explored opinions of attendants on the impact of the intervention on the participant they were paired with, and their experience of the APIC such as *"What did you bring to the person you assisted?"*, or *"What challenges did you encounter during the accompaniment"*. The attendant's **diaries** contained 22 items divided into 6 parts describing older adults' aspirations, the identification of meaningful social and leisure activities, obstacles to their accomplishment, ways to overcome these obstacles, the accomplishment of the meaningful activities and the reflections on actions undertaken. For example, in *Exploring ways to overcome obstacles*, attendants were invited to provide information on the strategy discussed with and prioritized by the older adult. Finally, the **monthly meetings** of attendants were recorded.

Data analysis

Descriptive statistics were used to describe the socio-demographic characteristics of participants, and results for the main outcomes. Scores were compared using the Friedman test, and exploratory data analyses were performed when $p \leq 0.1$. A Wilcoxon signed rank test was used to identify changes in the main outcomes between the different moments of data collection: before (T_0), directly after the intervention (T_1), and about 4 months later (T_2). As one older adult did not complete questionnaires at T_1 and T_2 , the sample size for quantitative data is 7. This sample size allowed detection of a standardized difference of 1,32 or more between two means according to paired bilateral Wilcoxon signed rank test based on a significance level of $p < 0.05$ and power of 80%. **Because of the exploratory nature of this study and the influence of seasonal variations on Quebecers' social participation, leisure, independence and mobility, Bonferroni correction was not used and changes at any of the postintervention measurement times with $p < .05$ were considered to be potentially attributable to the intervention.**

Individual interviews with older adults ($n=8$), the three group interviews with attendants ($n=8$), transcripts of nine attendants' meetings ($n=8$), and 104 attendants' diary entries ($n=8$) underwent thematic content analysis using mixed extraction grids [65]. The qualitative data analysis involved data collection, reading of data, division of data into units of sense, organization and reformulation of data in disciplinary terminology, and synthesis. Themes which emerged from the data collected were organized and renamed according to the Human Development Model-Disability Creation Process (HDM-DCP [66]). The HDM-DCP is a model of human development and disability which illustrates interactions between personal and environmental factors, and participation. Sample size and triangulation of the data favored deep exploration and data saturation. The first author exhaustively analyzed the data, and two other authors (ML and JR) co-coded one third of the data.

Trustworthiness of the qualitative component has been enhanced by collaborative reflexivity throughout the study [67]. Three members of the research team already experienced the APIC with other populations, two other members had experience in studies involving people with visual impairment, and all members had experience in studies with older adults. Six members had experience in qualitative studies. Team initially discussed the research process to identify potential biases related to their experiences, and the fit between the aim of the study and methods. While the first author was actively engaged in the intervention and the data collection, the other members had no contact with the participants, excepted the senior author who assisted in the semi-structured group interviews with attendants after the intervention. The first author regularly debriefed her two supervisor and two professionals of the rehabilitation center involved, particularly about how her involvement with older adults and attendants could influence the intervention. Participants were informed that their participation was voluntary, the confidentiality of their data was guaranteed, and their possibility to withdraw from the study at any time without any consequences. After data collection, to confirm accurate representation of their perspectives, participants validated interpretations. The HDM-DCP [66] was chosen as a suitable theoretical framework to inform data. Data analysis was performed by three researchers with complementary experiences, and the other authors brought knowledge and insights to the discussion. Careful consideration was given to ensure each participant was represented in the selected verbatims, and a well-balanced integration of participants' verbatims and authors' descriptions.

Quantitative and qualitative analyses were conducted using respectively SPSS Statistics, version 29.0.0.0 (SPSS, Chicago, IL) and NVivo, version 14 (QRS International, Victoria, Australia).

Results

In this section, participants and intervention characteristics will first be described. The effects of APIC will then be explained. Finally, facilitators and barriers to the accomplishment of social activities in the context of the intervention will be presented.

Participants

Two dyads did not complete the intervention: one older adult left before the first session for medical reasons, and the other after the 4th session due to personal reasons on the part of the attendant. The older adult from this last dyad could not be paired again as no other attendant was available. The final number of dyads was, therefore, eight. Each dyad was assigned a number preceded by the letter O for older participants and the letter A for attendants (Table 1).

Aged between 70 and 86, most older adults who received assistance were women and lived alone (Table 1). The majority had severe visual impairment or blindness for 2 to 67 years ($Md \pm Q = 6.5 \pm 11.75$), due to age-related macular degeneration in half of them. One acquired her visual impairment in childhood, two during adulthood, and five after the age of 60. During the intervention, one older adult who lived in a senior residence moved to her son's house (O4), and another moved from one senior residence to another (O8). Between T1 et T2, yet another woman moved from one senior residence to another. Visual impairment came from a variety of diagnoses, and half of the older participants had between one and three other

health conditions (Table 1). One participant (O6) was diagnosed with Lewy body dementia during the intervention, and another was in the process of being diagnosed for a neurodegenerative disease. Another participant (O8) was hospitalized for several months immediately following the intervention; she attended the semi-structured interview but did not complete the post-intervention questionnaires.

[Please insert Table 1 about here]

The majority of attendants were women ($n=5$; 62.5%) aged between 20 and 74 years old ($Md\pm Q = 51.0\pm 22.13$), students or retired individuals, with previous experience as a volunteer ($n=6$; 75.0%; Table 2).

Intervention characteristics

Older adults and their attendants met about 17 times ($Md\pm Q = 17.5\pm 7.4$) over a period of 30 weeks ($Md\pm Q = 30.5\pm 2.1$; Table 2). These meetings constituted almost two thirds (63.5%) of the total number of sessions. Participants missed meetings for various reasons: holidays, medical reasons, hospitalizations and student exams for attendants.

During the intervention, dyads participated in various activities: in social activities (chatting, eating out, at home or picnicking, shopping, going to the library), physical activities (walking), artistic activities (knitting, photography, crafting an illustrated biography), intellectual activities (reading), or leisure activities, such as car outings. Volunteers also provided support for daily activities (administrative tasks, hairdresser appointments, smartphone settings or trial and purchase of an e-reader), although this was not strictly within the scope of the APIC. They did this to a much lesser extent.

Two profiles were observed: profile 1 consisted of older adults who focused on their relationship with the attendant and on enjoyment, and profile 2 where older adults focused on resuming, maintaining, exploring or experimenting with meaningful social and leisure activities. Profile 2 was the most represented profile (Table 2), and four out of five Profile 2 older adults went outside with their attendants during every, or almost every, session.

[Please insert Table 2 about here]

Effects of APIC

Quantitative results

Based on comparisons before (T_0) and after (T_1) the APIC, older adults reported an increase in satisfaction with social participation, both in daily and social activities, frequency of leisure practice, maximal life-space mobility, quality of life, especially in the health and functioning domain. They also reported an increase in empowerment, particularly in involvement in interactions and level of control (Table 3). According to comparisons between T_0 and T_2 , the majority of improvements persisted beyond the four months which followed the APIC intervention, with the exception of the total quality of life score, and of the health and functioning sub score of Quality of life. In addition, accomplishment in social activities, life-space mobility, and the socio-economic category of quality of life all improved at T_2 compared to T_0 . However, dependence in instrumental activities increased between T_0 and T_1 , but not

between T₀ and T₂. Finally, no significant difference was found between T₁ and T₂.

[Please insert Table 3 about here]

The study of individual scores, showed a clinically significant increase in social activity accomplishment between T₀ and T₁ and between T₀ and T₂ for 5/7 older adults, including the four Profile 2 participants for whom post-intervention data was collected. The 3 older adults who showed a clinically significant improvement in their total score of social participation accomplishment at T₁, and which persisted at T₂, were Profile 2 participants who left their home at every session or almost every session; the 4th Profile 2 participant who went outdoors at every session was the one with no post-intervention data.

Qualitative results

Most older adults reported being satisfied with their involvement in APIC, and said they would recommend it to others, and participate again if they had the opportunity. One woman responded: *"Oh yes, I would like another [attendant], that is for sure. I would recommend it to anyone, especially people with visual impairment. It is good to have someone who can take us around!"* (O8). Another older adult was willing to participate in the APIC again but not with the same attendant.

Regardless of their profile, all older adults found their involvement in the APIC beneficial, with an influence on both personal and environmental factors, as well as on social participation (Table 4). No negative consequences of APIC were expressed. The presence, assistance and encouragement of attendants during activities and discussions enabled older adults to develop their behavioral capabilities, such as physical well-being and self-esteem, as expressed by this Profile 2 woman who went out for a walk with her attendant at every session, and whose project was to find someone else to walk with after APIC: *"I found that having a regular walker [the attendant] was very good for me. In terms of health and morale. Talking to someone. When you walk, you talk, you share with each other. It was really good for me."* (O2). Another woman mentioned the benefits of being accompanied by a proactive and kind attendant: *"When you have someone like that, it gives you courage. I do not know, it cheers you up."* (O1). The APIC also helped older adults to cope with worries and concerns, as for this Profile 1 woman who talked a lot with her attendant during the sessions: *"It makes us grow, teaches us that we are not alone, not the only ones who have problems or need help. You have to accept help."* (O5). It also led them to broaden their horizons on social and leisure activities. This was the case for one woman who spent her life caring for her family and home: *"I have never done this before, I was always at home, working. I did not do much to occupy my time. I saw that could do other things that were more fun."* (O4). Empowerment of older adults also increased, as expressed by a woman who learned with her attendant to ask for favors in different contexts, such as applying for paratransit, joining the library, asking for information from sales staff in stores: *"She has taught me to say what I feel, what I want, what I desire."* (O8). An attendant analyzed how the Profile 2 woman she was paired with gradually developed motivation to continue go out after the APIC and ideas for finding someone to take on walks: *"I gradually felt an increasing empowerment in her. Initially, [she] was more inactive. With each step, little by little, [we] found someone to accompany her for walks. She was coming up with ideas of her own, which did not often happen at the beginning (...) she was proud to tell me that she had ideas."* (A2). With APIC, older adults have also reported exercising their mobility and intellectual capabilities, as illustrated by this woman who used

her walker in her house and garden with her attendant at each meeting: *"It helped me become aware of myself, that I'm still able to walk even though I have a walker. (...) That helped me with my legs. It made me more solid, stronger. Maybe that is why I am the way I am today. If I had not done anything... It helped me a lot"* (O6).

[Please insert Table 4 about here]

In addition to having an impact on older adults' personal capabilities, the APIC also modified their social environment. For example, the attendants gave social support to older adults, as one attendant who accompanied a Profile 1 woman and whose sessions consisted mainly of discussions commented: *"What I brought her was presence, interest and, listening - a lot of listening. I listened a lot. Discretion, to reassure her in her confidences."* (A6). APIC also allowed participants to extend their social network. As this Profile 2 man who went out a lot with his attendant said: *"Getting out, meeting new people, seeing old friends/acquaintances too, people I had not seen in 30-40 years."* (O3). For some participants, activities performed during the APIC also led to changes in attitudes within existing relationships, as in the case of one woman who, during an APIC session, bought a bottle of wine for a neighbor who previously seemed annoyed at having to do favors for her: *"Since then, things have improved. His character is pleasant. He really appreciated it. He even came to my house to thank me."* (O2). An attendant who helped her participant to craft an illustrated biography during the intervention even said that reading this biography modified the attitude of the woman's children towards her: *"It helped her children appreciate who she was. (...) She did not realize [before] how important little details, little stories like that, were to her children. The fact is, she shared it with me, it allowed her to share it with others, and it helped change the family dynamic."* (A4).

In terms of social participation, the presence of the attendant allowed the older adults to be occupied and entertained throughout the intervention (Table 4). In addition, after the APIC, older Profile 2 adults continued to carry out certain activities that they had never done previously, or had stopped doing before the intervention. The intervention encouraged participants to take on responsibilities and be more involved in the community. One woman became a volunteer after the APIC said: *"Knitting with volunteers for people in need! So, I got into it, something I never have done before."* (O4). Moreover, participation in the APIC increased the instrumental activities of older adults, such as using paratransit, going shopping, or taking care of themselves. One woman commented: *"It gave me back the desire to doll myself up, to dress younger. Otherwise, I would have hung out in my pajamas until 4pm."* (O8). Attendants also introduced or consolidated the use of technical aids or technology. One attendant, for example, lent an older man an e-reader to try, and then helped him to buy his own: *"It gave me back the taste for using my eyes to read (...) a book where you can enlarge the characters, the page as you like, it's fantastic. I'm able to read it. I have developed a taste for it, and every night I sit down and read before going to bed."* (O3). Finally, older adults were able to undertake new activities after the APIC. One Profile 2 woman who went on only a few outings with her attendant during the APIC sessions subsequently dared to go out after the intervention: *"I am more confident. If I want to go, I go. Last week I went to have my shoes soled. It (i.e., APIC) is like a safe haven for me. Is that weird? You know, it is as if I told myself that if something does not work out, (...) there is always a way out, (...) Before [the APIC], as I am blind, it was difficult to go out alone."* (O4).

Facilitators and barriers to the accomplishment of social activities in the context of the APIC

More barriers to the accomplishment of social or leisure activities than facilitators were identified in the context of the APIC (Table 5). These factors were mainly personal, and to a lesser extent, environmental.

Personal factors

Personal facilitators and barriers to social participation were mainly related to general health, **in particular** sensory, **memory**, or to mobility and behavioral capabilities. For **sensory capabilities**, the presence of visual residuals was reported as a positive factor, as one attendant mentioned: *"She was able to read, she needed a **magnifier** but I found her very functional in her everyday life. Outdoors, she was able to see steps, potholes, slopes and to avoid them."* (A5). Visual impairment may however have been a barrier to social participation for other older adults, as it had a direct impact on their leisure practice, mobility, or even social interaction: *"The fact that she is visually impaired, I think, adds to the idea of proximity, the idea that you really have to trust other people."* (A2). However, visual impairment was not always an obstacle, as described by this attendant: *"The fact that he is disabled does not exist for me. The only thing is that when we go for a walk he will put his hand on my shoulder to guide himself."* (A3). Hearing impairment or tinnitus also limited the choice of possible activities, or negatively influenced experiences in the community: *"In public places, it is difficult, because with hearing aids, the noise is louder (...), I had trouble concentrating."* (O2).

[Please insert Table 5 about here]

The combination **of incapacities, dual sensory (vision and hearing) or memory** impairments, in particular, made the experience very challenging, as one attendant who accompanied a woman with several disabilities reported: *"I thought I was paired with someone who just had a vision problem, but when I realized that she had many others, hearing and all that... The contact was difficult, it was just difficult to have a conversation with her."* (A1).

Mobility difficulties, whether related to problems of balance or endurance, were clearly a challenge, as in the case of this woman, whose objective was to walk to a café: *"It was too far. I had no energy left after going there and back"* (O7). The inability to drive a car due to visual impairment also impeded mobility and social participation, as for this man who drove a lot before his visual impairment: *"If I had a car, I would be involved in the community in a different way, that is for sure. But now I cannot drive."* (O3).

For **behavioral capabilities**, motivation to practice more social or leisure activities clearly impacted the intervention, as lack of motivation was cited as a major barrier by attendants, specifically in older Profile 1 adults, who tended not to express a desire for more community activities. According to one attendant: *"Sometimes there were objectives we could not reach, because often the lady wasn't that motivated to achieve them."* (A5). Anxiety, depression and fears about others also negatively impacted social participation, as expressed by another attendant: *"She is a fearful person. She was always afraid of meeting young people on the sidewalk."* (A7). Negative self-perception, such as the feeling of not being capable, or being too old have also been expressed by older adults, such as a Profile 1 woman for whom

the sessions mainly consisted of discussions with her attendant: *"We have not had many activities. I am not able to do any."* (O1). On the contrary, self-confidence and empowerment fostered social participation. One Profile 2 woman, who engaged in many different activities with her attendant commented: *"It is a question of developing this confidence. And to go, more and more and more. That is what I try to do, that is what I manage to do."* (O8).

Environmental factors

Regarding the **physical environment**, weather conditions negatively influenced social participation in older adults, especially in winter. Paratransit, when used, had a positive impact on participation, as expressed by this attendant who helped her participant to use it: *"After she found out about paratransit, she no longer had any problems with social participation."* (A4). However, some older adults did not want to use paratransit, especially when they had a bad experience with it: *"Paratransit bothers him, he had problems with it."* (A3).

Support and encouragement from attendants were important positive factors for the **social environment**. One woman, who was given self-confidence by her attendant's support said: *"I am a rather shy, reserved person, and I needed this [the intervention]. When you are 75, you are always going to be a bit withdrawn. But she guided me. She gave me confidence. (...) If it had not been for her, I would have stayed in my little town."* (A8). Pleasure at spending time together was also a positive factor, as was the case for one man who became friends with his attendant: *"We have created a bond of friendship that theoretically shouldn't be there. He should just be an acquaintance from the [research] project. But we came out of it friends."* (O3). In some situations, over-protection of the family had a negative impact on participants' social participation. One older Profile 1 adult who obeyed her daughter's instructions after she reprimanded her for going out once with her attendant reported: *"My daughter said: 'You should not have done that, you could have fallen. It is not her job to do that. You could have got her into trouble if something had happened.' I did not do it again."* (O6). Her attendant also reported: *"Her daughter would not let her, but I could see that she wanted to do more."* (A6). In addition, several attendants said that the limited availability of older adults made it difficult to carry out the intervention: *"For me, the biggest problem was availability. There were all these services she was receiving, and I had to fit in around whatever time was left."* (A6). Finally, the lack of service adapted to visual impairment also reduced the range of leisure and social participation activities. *"It was hard to imagine what we could do. Most of the services offered often involve vision."* (A2) reported one attendant who failed to find social participation activities to do with their participant, other than going out for a walk.

The intervention can improve facilitators. This is the case for all the personal factors identified, except for the presence of residual vision, and of one physical environmental factor, paratransit use (Table 5; see Effects of APIC). Almost all of the different barriers were encountered by both Profile 1 and Profile 2 participants. However, Profile 2 participants overcame them. One woman who walked with her attendant at each meeting, whatever the weather said: *"In the days before, I said to myself we are going to go walking, so we are going to go. And even when it was cold we braved the cold (...) even when it was freezing, we went anyway."* (O7).

Discussion

This study aimed to explore the effects of the APIC on social participation, leisure, independence, mobility, quality of life, health-related quality of life and empowerment of older adults with visual impairment, and to document the facilitators and barriers to social participation in the context of the intervention. Although APIC studies on adults with traumatic brain injuries [29], older adults with disabilities [30–32,37], and older adults with mental health problems [36] have already been conducted, this is the only study which explores the effects of APIC on older adults with visual impairment. After a 6-12-month intervention, older adults' satisfaction with social participation, leisure practice, life-space mobility, quality of life, and empowerment all **changed** in the immediate aftermath and 4 months on. However, dependence in instrumental activities significantly increased just after APIC, and health-related quality of life did not significantly improve. The increase in dependence may be related to health problems which occurred during the APIC intervention (hospitalizations, neurodegenerative diseases, reduced vision) and/or house moves, or to the fact that instrumental activities may either have been abandoned in favor of social and leisure activities or assigned to other people. The decline in vision experienced by some participants during APIC may also explain the lack of **change** in health-related quality of life, measured by the VFQ-25, despite **changes** in quality of life as measured by the Quality of Life Index.

The positive effects perceived by older adults and their attendants were numerous, and mainly concerned participants' capabilities, specifically behavioral capabilities, and social participation. Positive effects on their social environment were also noted. As in previous studies conducted with APIC [27], two profiles with slight differences were observed: the desire for the APIC to continue for a long time was not specific to profile 1, and profile 2 was the most represented profile. Although the intervention **influenced** the quality of life of older adults as a whole, APIC seems to have had a greater impact on social participation for Profile 2 participants, **especially those who left the home at every session or almost every session**.

Facilitators and barriers identified are comparable to those found in the APIC version adapted for older adults with disabilities [33]. In the present version, visual impairment does not seem to have been a major personal factor. For some older adults, and for some attendants, it was sometimes difficult to distinguish between barriers related to visual impairment, and other impairments, general health difficulties and age. Dual sensory impairment has been found to have an impact on communication within dyads, and to have psychosocial effects in older adults [68]. In our study, personal and environmental barriers were encountered by older adults with profile 1 and older adults with profile 2. However, motivation to practice more meaningful social and leisure activities seems to be the facilitator that leads those with profile 2 to overcome any barriers encountered.

APIC therefore seems to have different impacts on different levels (reflexive process, action taking, effects), depending on the type of participant profile. Firstly, the discussions and the pleasure of being together enable older adults to undertake a reflective process on themselves, and this leads to an improvement in their self-confidence, well-being, and empowerment. In the case of older Profile 2 adults, this reflective process also broadens their horizons on the importance of social and leisure activities and community involvement, leading them to search for and identify the means to carry out such activities. For older Profile 1 adults, actions during APIC were directed towards activities they already engaged in before APIC (e.g.: knitting, walking around the house), or that they did not specifically plan to continue afterwards (e.g., chatting with the attendant). For older Profile 2 adults, actions were

directed towards new social and leisure activities that they intended to maintain after APIC. The actions enabled participants to improve their capabilities, and those in the profile 2 category to further improve their social participation and community involvement.

The present study therefore shows the relevance of APIC for older adults with visual impairment, either acquired early in life or with age. These results are supported by another study which shows that improving social support encourages post-traumatic growth following age-related macular degeneration, i.e. when the struggle with highly challenging life circumstances results in positive outcomes [69]. Nonetheless, for older Profile 1 adults, it might have been more appropriate and beneficial to receive friendly visits from volunteers. Even if the voluntary visit services provided by some local authorities are less effective than interventions where the beneficiaries are active, as in the APIC program, [70], friendly visits may be more appropriate for people who do not wish to have greater involvement in community life. However, it would have been difficult to determine the profiles before APIC, since the motivation of some Profile 2 participants to undertake new activities was only revealed during, and as a result of, the intervention. One recommendation for future adaptations of APIC would be to plan a meeting between the participant, the attendant and the supervision team to decide whether to continue the APIC or to refer the older adults to friendly visits instead.

Strengths and limitations

This **exploratory** study **is the first to** show that the APIC program **has positive influences** on older adults with visual impairment. The qualitative analysis made it possible to identify **relevant** APIC effects which are not measured by questionnaires. It also provided explanations on how the intervention impacted on older adults, and highlighted factors relating to their social participation, in their own words and in those of their attendants. The plurality of data sources allowed triangulation of the data, deep exploration and its saturation. **However**, the limited number of older adults enrolled **was among the limitations** of the study **and Type I errors might have occurred**. This **small sample size** was related to the complexity of the APIC (the necessity of double recruitment, the pairing of older adults and attendants according to their preferences, and its synchronization), as has been shown previously in the version adapted for older adults with disabilities [37]. Another limitation concerns the **study design, in particular the** absence of a control group **with a randomized assignment**.

Conclusion

This study showed that the APIC, which consisted of a weekly accompaniment by an attendant for approximately 6 months, with a view to identifying and performing social and leisure activities, **have influences on** the behavioral capabilities, environment and social participation of older adults with visual impairment. The present study adds to the body of knowledge on APIC research, by demonstrating that APIC can **influence** social participation **of** participants, depending on their motivation to be better and more actively involved in their community. After **promising** studies in Canada on adults with traumatic brain injuries [29], older adults with disabilities [30–33,35], older adults with mental health problems [36], and now older adults with a visual impairment, APIC could be extended to other populations, including older adults living in a long-term facility, and in other countries. **The APIC adapted to older adults restricted in at least one instrumental activity is currently the subject of a pragmatic multicenter randomized controlled trial [71], that have been carried out during the COVID-19**

pandemic [72]. Based on a design offering a higher level of evidence, this study should provide valuable information on the effectiveness of this intervention.

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Declaration of interest statement

The authors have no competing interests to declare.

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Table 1. Characteristics of older adults having a visual impairment (n=8)

Continuous variables		Md±Q
Age (years)		75.5±5
Duration of visual impairment		6.5±11.8
Categorical variables		Frequency (%)
Gender (Women)		7 (87.5)
Type of residence	Owner	2 (25.0)
	Tenant	3 (37.5)
	Senior residence	3 (37.5)
Living situation	Alone	5 (62.5)
	With family member	3 (37.5)
Education (years)	1-6	1 (12.5)
	12-14	4 (50.0)
	15-16	2 (25.0)
	>16	1 (12.5)
Income (\$ Can)	10,000-20,000	1 (12.5)
	20,001-25,000	5 (62.5)
	25,001-40,000	1 (12.5)
	>40,001	1 (12.5)
Self-Rated Health	Excellent	1 (12.5)
	Good	1 (12.5)
	Fair	5 (62.5)
	Poor	1 (12.5)
Visual impairment ^a	Moderate	3 (37.5)
	Severe	4 (50.0)
	Blind	1 (12.5)
Visual diagnosis [*]	Glaucoma	3 (37.5)
	Oculopharyngeal muscular dystrophy	1 (12.5)
	Age-related macular degeneration	4 (50.0)
	Retinitis Pigmentosa	1 (12.5)
	Stroke	1 (12.5)
Visual impairment duration (years)	2-3	4 (50.0)
	10	1 (12.5)
	20	1 (12.5)
	>40	2 (25.0)
Other health conditions ^{a *}	Diseases of the nervous system	1 (12.5)
	Diseases of the circulatory system	2 (25.0)
	Injury, poisoning and certain other consequences of external causes (including traumatic brain injury)	2 (25.0)
	Diseases of the musculoskeletal system and connective tissue	2 (25.0)

	Other: falls, knee surgery	2 (25.0)
	No other health condition	4 (50.0)

*Multiple responses possible; Md±Q: median ± semi-interquartile interval; ^aaccording to the International Classification of Diseases-10 [39]

Table 2. Dyad characteristics (n = 8)

Dyad #	Older adults with visual impairment			Attendants			# of meetings	Intervention duration (weeks)
	Age	Gender	Profile	Age	Gender	Occupation		
1	85-89	Women	1	60-64	Women	Retired	29	31
2	70-74	Women	2	40-44	Women	Student	18	31
3	70-74	Men	2	70-74	Men	Retired	35	49
4	80-84	Women	2	20-24	Women	Student	10	26
5	80-84	Women	1	20-24	Men	Student	12	30
6	70-74	Women	1	65-69	Women	Retired	17	30
7	70-74	Women	2	65-69	Men	Retired	29	40
8	75-89	Women	2	20-24	Women	Student	15	23

Profile 1: Focuses on relationship with attendant and enjoyment; profile 2: focuses on resuming, maintaining, exploring or experimenting with meaningful social and leisure activities

Table 3. Comparisons of scores before and after the intervention (n=7)

Continuous variables	T ₀ (Md±Q)	T ₁ (Md±Q)	T ₂ (Md±Q)	Friedman <i>p</i> value	Wilcoxon tests
Social Participation (Life-H)					
<i>Accomplishment</i> (/9)	5.6±0.6	6.3±0.4	6.2±0.6	.16	
Daily activities	6.1±0.8	6.7±0.5	6.4±0.4	.57	
Social activities	4.1±0.7	5.6±0.2	5.5±0.7	.07	b
<i>Satisfaction</i> (/5)	3.0±0.2	4.1±0.2	4.1±0.4	< .01	a,b
Daily activities	3.1±0.2	4.2±0.3	4.0±0.3	.03	a,b
Social activities	2.9±0.2	4.0±0.2	4.2±0.3	.02	a,b
Leisure profile					
<i>Involvement</i>					
Interest (/30)	21.0±2.8	18.0±3.3	20.0±2.5	.54	
Frequency of activities (/30)	10.0±1.5	13.0±2.0	12.0±2.0	.02	a,b
<i>Desire to modify</i>					
Practice (/30)	3.0±0.8	1.0±1.3	1±1.3	.11	
Frequency (/30)	5.0±1.3	4.0±0.5	4±1.3	.85	
<i>Difficulties</i>					
Impairments (/17)	5.0±2.0	8.0±0.8	6±1.8	.96	
in leisure (/17)	4.0±0.8	4.0±2.0	2±0.5	.46	
Physical environment obstacles (/5)	1.0±0.8	1.0±0.8	1±0.5	.35	
in leisure (/5)	1±1.3	1.0±0.8	2±0.5	.097	
Social environment obstacles (/5)	3±0.3	2.0±0.5	2±0.8	.40	
in leisure (/5)	3±0.5	2.0±0.5	1±0.5	.14	
Functional independence (SMAF; /87)	12.0±6.0	12.0±7.3	11±3.4	.15	
Daily activity	0.0±0.8	0.0±0.0	0±0.3	.58	
Mobility	1.0±1.5	2.0±1.5	2±2.3	.26	
Communication	2.0±0.5	2.0±0.8	2.0±0.0	.44	
Cognitive functions	1.0±0.5	1.0±0.5	1.0±1.0	.95	
Instrumental activities	5.0±4.0	10.0±3.8	7.5±3.3	.01	a
Life-space Mobility (LSA; /120)	29.0±4.5	35±3.5	40±3.5	.08	b
LS-Maximal (/5)	4.0±0.3	5±0.3	5±0.3	.02	a,b
LS-Equipment (/5)	2±0.5	2±0.3	2±0.3	.31	
LS-Independent (/5)	1±0.5	1±0.3	1.0±0.8	.74	
Quality of life (QLI; /30)	23.2±3.5	25.3±2.6	24.4±4.2	.07	a
Health and functioning	21.5±3.2	21.7±3.2	17.2±5.0	.10	a
Socio-economic	22.3±4.1	25.3±2.1	27.2±3.0	.03	b
Psychological/spiritual	25.7±2.9	26.7±3.1	26.5±1.4	.77	
Family	26±5.8	28±4.1	30.0±5.1	.72	
Health-related quality of life (VFQ-25; /100)	49.3±10.3	39.3±9.5	46.4±15.4	.62	
Empowerment (HCEQ; /16)	8.6±1.8	11.7±2.2	12.4±0.5	< .01	a,b
Involvement in decisions (/16)	5.3±2.0	5.7±7.8	7.0±1.3	.87	
Involvement in interactions (/16)	7.0±1.6	13.0±2.0	14.0±0.6	< .01	a,b
Level of control (/16)	12.0±3.0	16.0±4.2	14.7±1.7	.01	a,b

T₀: before the intervention; T₁: after the intervention; T₂: about four months after the intervention; Md±Q: median ± semi-interquartile interval; Life-H: Assessment of Life Habits; SMAF: Functional Autonomy Measurement System; LSA: Life Space Assessment; LS-Maximal:

with any type of assistance; LS-Equipment: without human assistance; LS-Independent: without technical or human assistance; QLI: Quality of Life Index; VFQ-25: The National Eye Institute Visual Function Questionnaire-25; HCEQ: Health Care Empowerment Questionnaire

Differences associated with Wilcoxon signed rank test:

a: T_0 differs significantly from T_1

b: T_0 differs significantly from T_2

c: T_1 differs significantly from T_2

Table 4. Synthesis of the effects of the APIC on older adults

1. Personal factors	
1.1. Increased capabilities	
	Behavioural
	Affectivity
	Increased psychological and physical well-being: pleasure, quality of life, freedom feeling, health feeling of being listen and understood^a,
	Increased self-esteem: self-confidence, feeling of being capable, pride
	Reflective process on oneself life, the need to cope with worries and concerns and broaden oneself horizons
	Increased motivation to do social and leisure activities, to going out, to interact with other
	Increased empowerment: daring to try, making choices
	Increased mobility capabilities: walking, taking the stairs
	Increased intellectual capabilities: memory, orientation
2. Environmental factors	
2.1. Social environment	
	Increased support: reassuring presence^a, having someone to do activities with^a, using community services
	Increased social network: creating new^a or reconnect with old relationships
	Changed attitudes and relationships of family, friends and neighborhood
3. Social participation	
3.1.	Increased social and leisure activities (during APIC:) chatting^a, (including after APIC:) walking, strolling, shopping, going to library, reading
3.2.	Being occupied and diverted ^a
3.3.	Increased responsibilities and involvement in the community: joining an organization, visiting older people, knitting for an organization
3.4.	Increased daily activities required to social and leisure activities: taking care of oneself, taking adapted transport
3.5.	Increased use of technical aids and technology: white cane, walker, smartphone, e-reader

Themes in **bold** were identified for a majority of older adults (n>=4); ^a Including improvements due to attendant presence.

Table 5. Synthesis of facilitators and barriers to social participation

	Facilitators	Barriers
Personal factors		
General health		Diminished health (including decline during the APIC) Fatigue
Sensory capabilities	Residual vision	Visual impairment (including decline during the APIC), hearing impairment (including tinnitus)
Intellectual capabilities		Memory impairment
Mobility capabilities	Endurance ^a	Diminished balance
Behavioural capabilities	Motivation to practice more activities ^a Self-confidence, feeling of being capable ^a Empowerment ^a	Lack of motivation Anxiety, depression Lack of self-confidence (feeling of being too old, not capable) Lack of confidence in other
Environmental factors		
Physical	Using paratransit ^a	Not using paratransit Weather (winter)
Social	Support and encouragement from attendant Pleasure to be together (with attendant)	Over-protection by family Being too busy Lack of services or activities adapted to visual impairment

^a Facilitators that could be improved with the APIC