Orientation Experiences and Navigation Aid Use in Lifespan

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Spatial orientation is essential for daily life, but it deteriorates with aging. The present study was aimed at investigating age changes across the adult lifespan in the self-reported use of navigation aids (maps, GPS, and verbal directions) and everyday orientation experiences (how much they went out, and how much they reached or lost their way to unfamiliar destinations). We also investigated to what extent these spatial behaviours are related to people's visuospatial working memory (VSWM) and self-reported wayfinding inclinations.

spatial behaviors visuospatial working memory sense of direction spatial anxiety GPS map aging navigation lifespan

1. Introduction

The abilities to navigate and orient oneself to the environment are essential in daily life for one to successfully reach destinations and avoid getting lost. Such abilities have been shown to decline with increasing age [1]. These impairments can limit older people's independence and safety of living, thus having an impact on their perceived quality of life [2]. Therefore, within the healthy and active aging domain perspective, it is important to extend our theoretical knowledge on older people's navigation issues and on the factors that can be related to them.

Among spatial behaviors across the adult lifespan, it is of interest to examine the everyday orientation experiences (going out, reaching places, and/or experiences of getting lost) [3] and the use of navigation aids. They comprise the instruments (e.g., maps, global positioning system-GPS) and modalities (e.g., asking for verbal directions) used to support moving in the environment. People's spatial behaviours are of interest for the identification of people's spatial profiles and, related to this, for people's navigation performance accuracy and navigation habits. Research has that aging changes people's spatial behaviors, such as their mobility, experiences of reaching places or getting lost, and the use of navigation aids. Research showed a decrease in map learning with aging and learning a route from a map before did not consequently help with the path navigation process. Also, having a map available while navigating did not increase the navigation performance[4]. However, older adults felt more secure when the map was there. Concerning GPS use, it seems to positively support navigation. When older adults are trained to use GPS tools, they increase their successful driving (e.g., reaching the destination). Furthermore, older adults reported using GPS to plan their trips to minimize their self-reported fear of getting lost[5]. On the contrary, spatial verbal directions appeared not to support spatial mental representations of older adults compared with other inputs,

such as maps[6]. However, such navigation-based spatial behaviors could relate to individual factors other than age, such as people spatial abilities and wayfinding inclinations.

2. Rationale and Aims

The present study started from the premise that self-reported spatial behaviors could be informative of people's navigation difficulties related to their objective spatial abilities. The literature showed age changes namely increasing age from youth to older age in self-reported spatial behaviors Apart from age, an adequate spatial profile [7] in terms of spatial abilities (VSWM) and inclinations could support functional spatial behaviors. However, little evidence regarding the young has suggested a relation between self-reported spatial behaviors in everyday life (use of navigation aids) and individual visuospatial factors . This issue merits being investigated with an adult lifespan perspective to better capture any age-related changes. In fact, in the adult lifespan, evidence exists that environment-based self-reports are linked, even if differently, to spatial performance, and individual visuospatial factors are related to environmental performance[8]. It is plausible that self-reported spatial behaviors (people-orientation experiences and navigation aid use) might also be linked to individual visuospatial factors. This issue has yet to be investigated. Examining age, visuospatial abilities, and people's attitudes in their relationship to spatial behavior contribute to a better understanding of older adults' everyday mobility. The self-reported experience could be informative about the impact of navigation issues on the daily life of older adults, to promote healthy and active aging. In this context, the present study was aimed at investigating from an adult lifespan perspective the relationship among self-reported everyday spatial behaviors, such as orientation experiences (tendency to go out, successfully reaching an unfamiliar destination, or getting lost), people's use of navigation aids (maps, GPS, verbal directions), individual visuospatial factors in terms of VSWM, and one's wayfinding inclinations (sense of direction, pleasure in exploring places, and spatial anxiety).

3. Methods

A sample of 456 people aged 25-84 years rated how much they use navigation aids (maps, GPS, verbal directions), how much they went out, and how much they reached or lost their way to unfamiliar destinations[7]. Then, they performed the jigsaw puzzle test (VSWM) and questionnaires on sense of direction, pleasure in exploring, and spatial anxiety [9][10].

4. Results

Linear models were run stepwise to determine whether the factors added to each step improved the model.

Everyday orientation experiences

For going out, Step 0 accounted for 4% of the variance, with both gender and years of education emerging as a significant predictor. Age (Step 1) emerged as a significant predictor and accounted for another 4% of the variance.

JPT (VSWM, Step 2) emerged as a significant predictor, meaning that higher JPT scores are associated with a higher frequency of going out, accounting for 2% of the variance. Step 3 accounted for 3% of the variance, with spatial anxiety emerging as a significant predictor, meaning that a higher level of anxiety is associated with a lower frequency of going out.

For the experiences of reaching an unfamiliar place (total $R^2 = 0.12$), Step 0 accounted for 2% of the variance, with years of education emerging as a significant predictor. Age (Step 1) emerged as a significant predictor and accounted for 2% of the variance. JPT (VSWM, step 2) emerged as a significant predictor, meaning that higher JPT scores is associated with a higher frequency of successfully reaching unfamiliar places, accounting for 4% of the variance. Step 3 accounted for another 4% of the variance, with spatial anxiety emerging as a significant predictor, meaning that a higher level of anxiety reduces the frequency of reaching an unfamiliar place.

For the experiences of losing one's way in an unfamiliar place (total $R^2 = 0.22$), Step 0 represented 4% of the variance, with years of education emerging as a significant predictor. Age (Step 1) emerged as a significant predictor and accounted for 8% of the variance. JPT (VSWM, Step 2) did not add any variance. Step 3 accounted for another 10% of the variance, with SDSR and spatial anxiety emerging as significant predictors, meaning that a low level of anxiety and a high sense of direction reduces the frequency of getting lost in an unfamiliar place.

Everyday navigation aids use.

For the use of the map (total $R^2 = 0.17$), Step 0 accounted for 10% of the variance, and years of education emerged as a significant predictor. Age (Step 1) did not emerge as a significant predictor and accounted for 1% of the variance. JPT (VSWM, Step 2) emerged as significant predictor, meaning that higher JPT scores are associated with the increased use of maps, accounting for 3% of the variance. Step 3 accounted for another 3% of the variance, with AtOT and spatial anxiety emerging as significant predictors, meaning that greater attitudes toward orientation and higher spatial anxiety are associated with higher map use.

For GPS use (total $R^2 = 0.35$), Step 0 accounted for 13% of the variance, with both gender and years of education emerging as significant predictors. Age (Step 1) emerged as a significant predictor and accounted for 19% of the variance. JPT (VSWM, Step 2) emerged as a significant predictor, meaning that higher JPT scores were associated with the increased use of GPS, accounting for 3% of the variance. Step 3 did not account for any variance.

For the use of verbal instructions (total $R^2 = 0.09$), Step 0 accounted for 3% of the variance, with gender emerging as a significant predictor. Age (Step 1) emerged as a significant predictor and accounted for 3% of the variance. JPT (VSWM, step 2) emerged as a significant predictor, meaning that high JPT scores were associated with a lower use of verbal instructions, accounting for another 3% of the variance. Step 3 did not account for any additional variance.

4. Discussion and conclusion

The present study shed light on people's self-assessed spatial behaviors in relation to individual differences, adopting an adult lifespan perspective. Considering the role of increasing age, associated with unsuccessful spatial behaviors, the role of spatial abilities (VSWM) and positive wayfinding inclinations played a role in promoting spatial behaviors. On the other hand, the role of spatial anxiety is detrimental for spatial behaviors, especially for losing in an unfamiliar place. For promoting active and healthy aging with regard to maintaining people's mobility and active use of navigation aids, it seems to be important to consider people spatial competences and wayfinding inclinations from youth to older age.

Taking into account the limitations and the results of the present study, future directions could be focused on efforts to promote healthy and active aging. Several individual factors relating to their spatial behaviors should be considered and thoroughly investigated in future studies to support older people's mobility and interest in exploring the environment. For example, their use of GPS for navigation should be analyzed in depth, given our increased reliance on GPS, even in aging [11], and the mixed findings on its influence on young and older adults' navigation accuracy [5]. Regarding the various individual differences relating to successful spatial behaviors, future studies could examine how to improve older adults' everyday spatial behaviors, by giving them training on the efficient use of orientation strategies (such as maps and GPS), basic cognitive abilities (such as VSWM), and on metacognitive reflection of their own wayfinding inclinations, for instance.

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