How self-esteem can affect ability to navigate: the role of gender and age

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Abstract

Introduction

Navigation is a complex and yet fundamental cognitive ability that can be affected by a variety of factors. Self-esteem is a psychological state that may enhance or compromise performance on a specific task. To our knowledge, this is the first study to explore the relationship between self-esteem and navigation ability and how the former may affect perceptions about the latter, by considering demographic indexes such as age and gender.

Methods

112 participants were included in the study [41 males (age: M=30.90±9.37). Data collection was obtained online and involved the Wayfinding Questionnaire (WQ), which is a self-report screening instrument for navigation-related complaints and the Rosenberg Self-esteem Scale (RSES).

Results

Males showed higher perceived navigation abilities compared to females, however, no significant differences were observed between genders in self-esteem. Moreover, self-esteem did not correlate with perceived navigation ability overall, but only with a specific aspect. On the other hand, older participants exhibited better perceived navigation abilities.

Discussion

According to our results, self-esteem was not linked to perceived navigation ability. Those results could be indicative on the different metacognitive to assess a perceived ability or state. On the other hand, a factor that was thought to compromise navigation ability, namely spatial anxiety, was related to the levels of self-esteem. Those findings could indicate similarities between monitoring anxiety and self-esteem. The role of self-esteem and spatial anxiety was contradictory to earlier reports, which could be the result of cultural differences or changes of females to the socioeconomic roles of modern societies.

Layman's Abstract

The ability to purposefully move oneself from one place to another is called navigation and is considered a fundamental cognitive ability that has allowed humans to explore familiar and unfamiliar environments. Navigation ability is a complex mental process that can be affected by several factors such as gender, age, or stress. On the other hand, self-esteem is a subjective psychological variable that is dependent on external cues for social and personal value.

The goal of the current study was the exploration of a probable relationship between navigational ability and self-esteem, whether increased levels of self-esteem would contribute to better perceived navigational abilities. Another goal of the current study was the identification of factor that could potentially affect this relationship such as gender and age.

For the purpose of this study, two questionnaires were administered to 112 participants. The first was the Wayfinding Questionnaire, which measures subjective statements and complaints regarding navigational abilities and the Rosenberg Self-esteem Scale which measures levels of self-esteem among participants.

Our results indicated that perceived navigation ability was not related to levels of self-esteem, regardless of the participants' gender or age. Those results could suggest that the subjective estimation of navigation ability is conceptually different from the subjective estimation of personal and social value and thus no association was identified between those concepts.

On the other hand, the similar reported levels of self-esteem demonstrated in the current study, could be the result of cultural differences or changes of females to the socioeconomic roles of modern societies.

Introduction

Navigation is a fundamental cognitive ability for day-to-day functioning and independent living (Aguire & D'Esposito, 1999; Wolbers & Hegarty, 2010; Van der Ham et al., 2013; Claessen, Visser – Meily, de Rooij, Postma, & van der Ham, 2016). While humans can navigate relatively in familiar places, it is also essential that they can maintain their ability to also find their way in complicated surroundings, to map out faraway places, and to be able to return home after shopping (Wolbers & Hegarty, 2010). Even though navigation ability is an essential aspect of everyday life, as it enables a sense of direction and position while strolling around in the surroundings, it is an overly complicated one (McCusker et al., 1999). It involves a multisensorial task in which data are constantly being processed over time and space (Wolbers & Hegarty, 2010).

Apart from the sensory inputs processed by the brain, navigation ability is a complex mental process and, relies on various higher order cognitive factors to be executed successfully (De Rooij, Claessen, van der Ham, Post & Visser-Meily, 2019; Claessen & van der Ham, 2017; Wolbers & Hegarty, 2010). More specifically, according to the existing research, mental transformation, distance estimation, orientation and sense of direction are indicative cognitive processes that are important for establishing navigation strategies and enhancing the ability to navigate through space (Brunsdon, Nickels & Coltheart, 2007; Wiener, Büchner & Hölscher, 2009; van der Ham et al., 2020). The purpose of the present study was to examine the relationship between navigation ability and self-esteem, and the probable effects of age and gender on the aforementioned relationship.

As for every mental process which may rely heavily on attentional recourses, navigation ability can be dependent on various psychological and demographic factors. Stress can be a psychological factor that affects at a great extent navigational ability. Along this vein, Lawton (1994) introduced the term of "spatial anxiety" (SA) or anxiety about environmental navigation as a prominent emotional feature related to navigation behavior and has henceforth been considered as a distinguishing factor between men and women. SA indicates a subjective feeling of anxiety linked to executing navigation tasks (Lawton, 1994; 1996) and the consecutive stress from the probability of becoming lost (Schmitz, 1997). According to the literature, higher SA levels have been related to more navigation errors (Walkowiak et al., 2015; Hund & Minarick, 2006).

Apart from psychological associations, several individual characteristics, such as age and gender can also affect the final outcome of navigational abilities. There is growing evidence that navigation ability is negatively affected by advanced age, indicating that aging has been associated with navigational ability decline (Ghisletta, Rabbit, Lunn & Lindenberg, 2012; Anguera et al., 2013; Lindenberger, 2014; Coutrot et

al., 2018; Wolbers & Hegarty, 2010 ; Moffat, 2009). On the other hand, numerous studies have also reported that aging has been related to an attenuation of working memory function (e.g. Wang et al., 2011; Meneghetti, Borella, Carbone, Martinelli, & De Beni, 2016). Working memory refers to the ability of processing information while holding them on short-term memory (Baddeley, 2012; 1986). Navigation ability relies at a great extent on working memory, as it requires the parallel processing of spatial information along with the final destination objective (Meneghetti, Labate, Toffalini & Pazzaglia, 2019; Garden, Cornoldi & Logie, 2002; Labate, Pazzaglia & Hegarty, 2014). A decline in working memory indicates a decreased number of perceived information, lessened absorbed data as well as a decreased number of encoded data. As most literature points towards to decline in hippocampal volume to explain the attenuation of encoded information, the working memory decline is thought to be more of a related simultaneous effect, rather than a cause of this (Therrien & West, 2009). Van der Ham et al., (2020), reported advanced age as an important factor for noticeable decline in landmark knowledge, egocentric and allocentric location knowledge, as well as path knowledge regarding route finding and topography. The aforementioned results confirm the hypothesis that navigation ability is one of the first primary cognitive abilities that seem to decline with age due to relative loss of neuronal cells in the hippocampal area.

As mentioned earlier, another demographic factor that seems to effect at great extent navigation ability is gender. According to the literature, gender differences have been reported in various aspects of wayfinding behavior (Lawton, 2010). More specifically, males seem to outperform females as they need less time to find their destination and tend to choose shorter routes overall (Malinowski & Gillespie, 2001; Silverman et al., 2000). In addition,, males, in relation to females, tend to persist in following a specific direction, make less stops pause less while navigating, and barely revisit former locations targets (Munion et al., 2019). It is important to note that men are suggested to utilize different wayfinding strategies than women (Lawton, 2010), which may serve as a possible explanation for differences in performance on the specific task design. Females, on the other hand, are characterized as ‘object visualizers,’ showing greater preference for topographical strategies, for example the utilization of object properties like shape and color as cues (Kozhevnikov et al., 2005; Munion et al., 2019; Lawton & Kallai, 2002). On the contrary, men prefer navigational orientation strategies and thus are defined as ‘spatial visualizers’; they utilize more spatial properties as cues, taking under account locations and spatial relations ((Kozhevnikov et al. 2005; Munion et al. 2019; Lawton & Kallai,2002; Hund & Minarik, 2006). Finally, when women navigate, they tend to use less cardinal directions, and they tend to showing greater reliance to the use of instructions incorporating referring to a right-left position; the opposite tendency was observed in men (Saucier et al., 2002).

As previously mentioned, gender has been shown to be related to spatial anxiety, which could explain navigation differences to some extent (Lawton, 2010). In particular, gender differences were observed in spatial anxiety measurements as females appeared to have more spatial anxiety than males (Claessen et al., 2016; Coluccia & Louse, 2004; Saucier & Green, 2002; Castelli et al., 2008). Associations between spatial anxiety and performance in navigational tasks have also been shown other studies (Prestopnik & Roskos-Ewoldsen, 2000; Lawton, 1994; Lawton, 1996) where females demonstrated worse navigation performance due to their greater spatial anxiety level and uncertainty (Lawton & Charleston, 1996). This observation could serve as a probable indicator for exhibiting lower self-esteem when confronted with navigational tasks.

Thus, one of the main objectives of the present study was the association of navigation ability to self-esteem taking under account several demographic factors. Self-esteem is generally regarded as an evaluative facet of self-consciousness that reflects the percentage to which people are fond of themselves and consider themselves competent (Brown, 1998; Tafarodi & Swann, 1995). Although many people have the desire to succeed in specific tasks, they are often less confident in their abilities and thus report low self-esteem (Campbell, 1990; MacFarlin & Blascovich, 1981). The level of self-esteem each individual demonstrates is not uniform and is dependent on various social and demographic factors, such as age and gender with contradictory results. According to some studies, self-esteem gradually escalates throughout adulthood and reaches its zenith in the 60s (Robins et al., 2002; Huang, 2010; Erol & Orth, 2011 & Gebauer et al., 2013), while other studies report a lower mean self-esteem level after age 65 (Robins et al., 2002 & Shaw et al., 2010) - attaining its peak level in the 30s (Pullmann et al., 2009). On the other hand, previous studies regarding gender differences in self-esteem have also shown inconsistent results. In a large-scale cross-cultural examination study of gender differences in self-esteem, males demonstrated higher self-esteem than females (Bleidorn et al., 2016). The same pattern was also observed in a large and globally diverse sample of individuals between the ages of 10 to 30, where females showed lower self-esteem than males from ages 10 to 30. However, from the age of 30 to the age of 80, not significant gender differences were found across the self-esteem trajectory (Helwig & Ruprecht, 2017). According to this notion, However, Zeigler, Hill & Myers, (2012), did not establish statistically essential differences between genders, whereas Marcic & Grum, (2011), reported that males and females did not differ in self-esteem. The inconsistencies mentioned above may be apparent due to the fact that girls have more unstable self-esteem than boys (Chabrol et al., 2006; Marcic & Grum, 2011). Nonetheless, it is essential to mention that cultural gender differences and age consequences on self-esteem are linked to a broader set of socioeconomic, sociodemographic, gender equality, and cultural value indexes (Bleidorn et al., 2016). The current study aimed to explore the association of self-esteem with the most prominent differentiative characteristics in research studies, namely

age and gender. Thus, higher age and female gender would be hypothesized to be correlated to lower self-esteem and consequently with worse navigational ability.

In light of the literature, it is shown that there is a relationship between self-esteem and cognitive functions. Self-esteem has been associated significantly with divergent thinking in middle-aged adults and elderly persons (Jaquish &Ripple, 1981). However, older people with low self-esteem can demonstrate a significant decline in age-related global cognitive functioning (Pruessner et al., 2005). According to the literature, low self—esteem is related to negative thoughts and concerns about performance and is often associated with a high level of anxiety (Sowislo & Orth, 2013). In regards to navigational abilities, the sociometer theory suggests that self-esteem is formed to track our success and failure in solving adaptive problems-such as wayfinding- whereas terror management theory proposes that self-esteem serves as a 'buffer' against the negative feelings that arise from disruptive or threatening experiences, including the 'feeling of getting lost' (Howard & Templeton,1966; Greenberg, Pyszczynski & Solomon, 1986). Self-esteem has also been associated with some specific cognitive functions and with lower performance in neuropsychological tests.

Navigation ability is a fundamental cognitive function on which we rely in our daily lives, and according to our knowledge, this is one of the first studies exploring the association between navigation and self-esteem. It would also be interesting to examine whether self-esteem level is related to navigation ability taking into account demographic factors such as age and gender. In conclusion, according to the lack of existing research studies, the current research study aimed at comparing performance on navigation tasks as well as self-esteem scores between men and women. According to the existing literature, it was hypothesized that men would outperform women on tasks assessing navigation ability and men would also report higher self-esteem in comparison to women. Another aim of the present study was the exploration of the association between the aforementioned factors, namely between navigation ability and self-esteem. Lastly, due to the high variability of self-esteem levels observed in the literature due to the age factor, one further scope of the current research was the comparison of younger and middle-aged adults on their self-esteem levels. According to existing studies investigating this relationship, it was hypothesized that younger individuals would demonstrate higher levels of self-esteem in comparison of to their older counterparts. For the purpose of exploring the objectives of the current study, a cross-sectional methodological approach was utilized. The data collection was obtained through two questionnaires, namely a) the Wayfinding Questionnaire (WQ; Van der Ham et al., 2013), which has been proposed as a self-report screening instrument for navigation-related complaints and b) the Rosenberg self-esteem scale (Rosenberg, 1965) which was designed to evaluate self-esteem.

Methods

Design

The current study had a quantitative, cross-sectional approach. Data collection was carried out by using two specific questionnaires which were completed by the participants online through Qualtrics.

Participants

The present study included 112 participants; 71 women and 41 men. The age of the participants was *M* =28.16, *SD* =8.7. All the participants met the following inclusion and exclusion criteria: (a) age range of 18 to 55 years and (b) not be suffering from any disease that can affect their neurological or mental state. People over the age of 55 were excluded from the study to avoid an accelerated effect of aging on general mental capacity (Nilsson, 2003). All the participants in the current study were from the Netherlands and were fluent in Dutch. The Psychology Research Ethics Committee approved the study (2020-07-02-Ham, dr. C.J.M. van der-V1-2503).

Measures

The measures of the present study included:

1. A demographic questionnaire included questions about demographic information, namely: a) age, b) gender, c) education level, d) ownership of active driving license.

2. The Wayfinding Questionnaire (WQ; Van der Ham et al., 2013) has been proposed as a self-report screening instrument for navigation-related complaints. The WQ was initially designed to account for the cognitive complexity that characterizes navigation behavior (Brunsdon, Nickels and Coltheart, 2007; Wiener, Büchner and Hölscher, 2009; Wolbers & Hegarty, 2010). The WQ has been proved an internally valid and reliable instrument (Claessen, Visser-Meily, de Rooij, Postma, & van der Ham, 2016, De Rooij, Claessen, van der Ham, Post & Visser-Meily, 2019). The Wayfinding questionnaire included 22 items. The questions were about navigation (e.g., "I can effortlessly walk back a route I have never walked before, the same way I walked up"), orientation (e.g., "I can orient myself well"), mental transformation (e.g., "When reading a map, I constantly turn the map into the direction that I am going"), distance estimation (e.g., "I am good at estimating distances [e.g., from myself to a building I can see]") and sense of direction (e.g., "I have a good sense of direction"). Moreover, the WQ also considered the emotional aspects of navigation behavior, that is, "spatial

anxiety," which denoted anxious feelings related to performing navigation tasks (Lawton, 1994, 1996) and worrying about getting lost (Schmitz, 1997). Items were answered on a 7-point Likert scale, where 1 means "not applicable to me at all," while 7 indicate "totally applicable to me." For items 14, 15, a score of 1 represented "not uncomfortable at all," while 7 means "very uncomfortable." A higher score in WQ would reflect higher navigation ability. Total scores were calculated by adding the participants' scores for each subscale: navigation and orientation, distance estimation, and spatial anxiety.

3. The Rosenberg self-esteem scale (RSES), developed by Morris Rosenberg (1965), is a self-esteem measure widely used in social-science research and has been tested for reliability and validity in many settings. RSES is a unidimensional scale with ten items that measure global self-worth by measuring positive and negative feelings about the self. All items were answered with a 4-point-Likert scale, where 1 is Strongly Agree, 2 is Agree, 3 is Disagree, and 4 is Strongly Disagree. The total score ranges from 0 to 40, resulting from the addition of the individual items, where higher scores indicate higher self-esteem. A score of fewer than 15 points shows significantly low self-esteem. (Nguyen, Wright, Dedding, Pham, & Bunders, 2019).

Procedure

The data collection process was carried out online. Participants were approached either individually or by posting questionnaires on social network pages related to scientific topics, professional association pages, and pages linked to the field of psychology and research. Moreover, an invitation to participate in the study was also posted on the University website. The Qualtrics was used to post the questionnaires electronically. The mean completion time was M=6.7 min, SD= 4.91 min.

The participants were informed of the study's purpose and their rights through information and an informed consent form. Before they signed it, they were also informed about completing the questionnaire and also the time required to complete it. Participants began with a demographic questionnaire and then completed the WQ and the RSES. Finally, they were informed again about the purpose of the research through a debriefing form. The latter emphasized that they could be informed about the research's overall findings when it is completed. Also, participants were informed that their engagement in the survey was voluntary. At the same time, they had the right to withdraw from the process without disclosing any reasons. Once the data collection was completed, data analysis was performed using the SPSS statistical program (IBM SPSS software, version 21).

Statistical analyses

According to our hypotheses, the dependent variables were the WQ and RSES, whereas the independent variables were gender and age. In the regression analysis, WQ score was the dependent variable while RSES score was served as the predictor variable. The WQ and RSES scores and age are interval variables, whereas gender is a nominal variable. Regarding age, this variable was initially used as a numerical variable. However, after collecting the data, this variable was analysed, and participants were divided into two age groups: a) young adults (ages 18–35 years) and b) middle-aged adults (ages 36–55). This categorization allowed the comparison of different age groups in self-esteem levels and navigation ability. It was used Analysis of variance (ANOVA) to examine the first hypothesis regarding gender differences in self-esteem levels and navigation ability.

Furthermore, Pearson r correlation analysis was conducted to examine the relationship between self-esteem and navigation ability. In order to investigate age differences in self-esteem levels and navigation ability, a Mann - Whitney analysis was conducted. Age categories (young adults and middle-aged adults) were used as the independent variables, whereas self-esteem and navigation raw mean scores were used as the dependent variables. A Pearson r correlation analysis was conducted to investigate the relationships among age, self – esteem, and navigation mean scores. The significance level that was considered as statistically significant was 0.05.

Results

Demographic Characteristics

The demographic characteristics of the participants are presented in Table 1. The sample of the present study included 71 females (63.4%) and 41 males (36.6%). 77.7 % of the participants (N= 87) has graduated from higher academic education (VWO, WO), 18.8% of the participants (N= 21) has graduated from higher vocational education (HAVO, HBO) and 3.6% of the participants (N= 4) has graduated from the middle vocational education (MAVO, VMBO, MBO). According to t-test analysis, a significant difference was observed between males and females in the variable of age. Non-significant differences were observed in education level.

Table 1. Demographic characteristics of the participants

	Males (n= 41)	Females (n=71)	*T-test*		
	Mean (SD)	*Mean (SD)*	*T*	*p*	*d*
Age	30.90 (9.37)	26.74 (8.08)	2.45	.016	2.70
Years of education	16.85 (0.53)	16.97 (0.23)	-1.63	.106	0.29

Due to the significant age differences between males and females, an analysis of covariance (ANCOVA) was carried out with the variable of age as a covariate, in order to investigate the differences in navigation ability and self-esteem after controlling for the influence of age. The results of the ANCOVA analysis are presented in Table 2.

Table 2. Differences in navigation ability and self-esteem among males and females

Variables	Males (N=41)	Females (N=71)	ANCOVA			
	Mean (SD)	*Mean (SD)*	*Df*	*F*	*p*	η^2
Navigation and Orientation	53.31 (14.35)	45.39 (13.29)	1 110	8.72	.004	.075
Distance Estimation	13.00 (3.27)	9.84 (4.55)	1 110	12.81	.001	.106
Spatial Anxiety	20.44 (8.41)	25.97 (10.35)	1 110	7.26	.008	.063
Self-esteem	26.29 (2.13)	27.32 (2.51)	1 110	3.201	.076	.029

Significant differences between the group of males and females were found in all variables regarding navigation ability. More specifically, males had a significantly higher performance in the subscales of Navigation/Orientation and Distance Estimation. Regarding Spatial Anxiety subscale, females exhibited significantly higher performance in Spatial Anxiety subscales, indicating lower levels of spatial anxiety in comparison to males. Non-significant differences were observed in self-esteem.

In order to examine the relation between self-esteem and navigation ability a Pearson r correlation analysis was conducted. The correlation analyses demonstrated that self-esteem was significantly associated with spatial anxiety (r = .216, p = .022). More specifically, a positive correlation between self-esteem and spatial anxiety was observed, indicating that higher self-esteem is related to lower levels of spatial anxiety. No significant correlations were found between self-esteem and Navigation/Orientation (r = .080, p = .403) and between self-esteem with Distance Estimation (r = .065, p = .494).

Furthermore, Pearson r correlation analyses were conducted for each gender separately. Table 3 presents the results. No significant differences were found between navigation ability and self – esteem for both males and females.

Table 3. Pearson r correlation analyses between navigation ability and self-esteem for each gender separately

	Self -Esteem			
	Males		Females	
Navigation Ability	*r*	*p*-value	*r*	*p*-value
Navigation/Orientation	.201	.208	.115	.338
Distance Estimation	.279	.077	.105	.386
Spatial Anxiety	.123	.442	.190	.113

Regarding age, the participants were divided into two age groups: a) young adults (ages 18–35 years) and b) middle-aged adults (ages 36–55). To investigate age differences in self-esteem levels and navigation ability, a Mann – Whitney analysis was conducted. A nonparametric analysis was selected due to large differences in group sizes. In order to control for gender differences between the two age groups (Young Adults = 31 Males/63 Females, Middle-aged Adults = 9 Males/8 Females) a chi-square analysis was conducted revealing no significant gender differences (chi-square = 2.49, p = 0.115). Table 4 presents the results of the Mann – Whitney analyses. Gender did not significantly differ between the two groups.

Table 4. Differences in navigation ability and self-esteem among young and middle-aged adults

	Young Adults (N=94)	Middle-aged Adults (N=17)	Mann - Whitney		
	Mean (SD)	*Mean (SD)*	*Z*	*p*	η^2
Navigation/Orientation	47.21 (13.44)	56.35 (13.65)	-2.48	.013	.056
Distance Estimation	10.64 (4.32)	13.35 (4.01)	-2.19	.029	.044
Spatial Anxiety	24.35 (9.61)	21.94 (12.31)	-1.42	.155	.018
Self-esteem	27.14 (2.02)	26.00 (3.94)	-3.15	.002	.090

According to Mann-Whitney analysis, significant differences were observed in Navigation/Orientation, Distance Estimation and Self-esteem. More specifically, middle-aged Adults had a significantly better performance than younger adults in Navigation/Orientation and Distance Estimation. On the contrary, young adults had a better performance in self-esteem, indicating higher self-esteem levels.

Moreover, Pearson r correlation analysis was conducted in order to investigate the relationships among age, self – esteem, and navigation ability raw mean scores. The results of the analysis indicated that age was significantly correlated with Navigation/Orientation (r = .232, p = .014) and Distance Estimation (r = .296, p = .002). More specifically, positive correlations between age and Navigation/Orientation as well as Distance Estimation were observed, indicating that higher age is related to higher levels of navigation ability. No significant correlation was observed between age with Spatial Anxiety (r = -.095, p = .320) and self-esteem (r = -.154, p = .106).

Discussion

The main goal of the present study was the exploration of the relationship between navigation ability and self-esteem in healthy adults. An additional objective was to evaluate the effect of age and gender, on the levels of self-esteem and navigation ability. For this study, a cross-sectional methodological approach was utilized. According to the existing literature, navigation ability as a complex cognitive process that has been shown to depend on various demographic and psychological factors to be executed successfully. For example, stressful conditions may affect in a negative way the ability to process environmental cues and consequently result in worse performance on navigational tasks (Prestopnik & Roskos-Ewoldsen, 2000; Lawton, 1994). Women have been reported to be more prone to exhibit increased levels of stress when confronted with navigational tasks (stress anxiety) and to perform on average worse on those tasks in comparison to men. On the other hand, the levels of self-esteem may have an impact on the perceived feeling of stress and consequently on the ability to complete navigational tasks successfully. Thus, demographic factors that may contribute to lower self-esteem such as age and gender could result in lower performance on navigational tasks.

According to our results, when comparing genders regarding their navigation abilities, the existence of spatial anxiety and self-esteem, men outperformed women on perceived navigational ability. In contrast, the two genders exhibited the same levels of self-esteem, while navigation ability did not have a direct relationship with self-esteem overall. Those results indicated that perceived navigational ability and spatial anxiety were independent from self-esteem levels in both men and women. On the other hand, males exhibited better performance on navigational tasks. These results could be attributed to different biological and genetic factors as well as to the different strategies men utilize to navigate through space effectively in comparison to females (Wolbers & Hegarty, 2010; Chai & Jacobs, 2009; Lawton, 1994).

Spatial anxiety and self-esteem were found to be related in our study indicating that higher levels of self-esteem were associated with lower levels of spatial anxiety. Although the effect size was relatively small, this result could be indicative of a relationship between self-esteem and stress levels for navigational tasks. According to sociometer theory (Leary & Baumeister, 2000), self-esteem relies heavily not only on an inner sense of personal value, but also on the interpretation of signs of acceptance or rejection from the outer environment. Increased levels of stress can compromise the ability to receive and interpret such cues accordingly leading to a continuous cycle of increased stress and lowering the levels of self-esteem. Thus, the addition of the concept of spatial anxiety in the Wayfinding questionnaire could prove of significant value for future research.

An additional objective of our research, apart from the exploration of the relationship between perceived navigation ability and self-esteem, was the exploration of the aforementioned variables (navigation ability, spatial anxiety, and self-esteem) in terms of age and the comparison of younger and middle-aged adults. According to our results, older adults outperformed younger adults in terms of navigation ability although younger individuals exhibited higher levels of self-esteem in comparison to their older counterparts. However, when examining the relationship among those indexes, only navigation ability was positively associated with advanced age, while the effect size between age and self-esteem was particularly low.

Overall, the results of the current study indicated that self-esteem was not related to perceived navigational ability. On the other hand, self-esteem showed to be associated with spatial anxiety, a measure that could potentially affect perceived navigational ability. Those results could be indicative on the different metacognitive strategies someone may employ to assess a perceived ability or state, as indicated by perceived navigation ability and self-esteem in our study (Kolubinski et al., 2019; Dai, Thomas & Taylor, 2018). More specifically, when asked to monitor performance on navigation ability per se, participants may employ different cues for estimating successful execution of the presented scenario than when asked to evaluate their current levels of perceived self-value. Thus, it could be hypothesized that perceived navigation ability and self-esteem are two divergent concepts that could not be directly associated. On the other hand, a factor that is thought to compromise navigation ability, namely spatial anxiety, was found to be related to the levels of self-esteem demonstrated by the participants in the current study. Those findings could serve as indicators of probable common ground between monitoring anxiety and self-esteem.

The fact that the two genders did not differ as expected in terms of spatial anxiety or self-esteem according to the findings of previous theories (Lawton & Kallai, 2002; Lawton, 1994) could be a result of cultural and topographical factors. More specifically, this finding could be indicative of current social evolution where less gender inequalities are present in modern societies, and women are gradually participating at a greater extent to professional and socioeconomical roles in their country. More specifically, social, cultural, and political factors could also have a significant contribution by acknowledging gender equality and promoting self-esteem in females and thus lowering the levels of stress in women (Elwer et al., 2013). A limitation of the current study that should be noted is the relatively small sample size that resulted in significant discrepancies on the demographic characteristics among groups. Future research could explore further the effect of self-esteem on navigation abilities by investigating in more detail larger groups of participants and how several psychological, demographic and socioeconomic factors could affect navigation ability.

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