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Self-reported wayfinding inclinations: pleasure and self-efficacy in exploring

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Introduction

Navigating the environment is an important skill in everyday life, as it allows us to explore new places, accomplish tasks and contribute to our overall well-being. Just think of the sense of frustration you feel when you get lost in a city and even in some cases the stress that is being experienced can even turn into agoraphobia. In the first chapter, therefore, definitions and models of spatial navigation will be presented and various wayfinding abilities will be illustrated.

The ability to navigate involves both cognitive and emotional aspects. In this regard, we wanted to investigate the emotional (pleasure) and motivational (self-efficacy) aspects of spatial performance, based on the role of spatial self-evaluations, like the spontaneous beliefs of people towards their orientation ability; in fact, the literature has shown that people's beliefs about their navigational skills are important and influence their navigational performance.

In the second chapter, the research carried out will be presented and the results obtained will be analyzed. In particular, the research aimed to create a new measure that specifically investigates the aspects of pleasure and self-efficacy in exploration, which were considered particularly important in analyzing spatial performance. This study was attended by 89 people ages between 18 and 55 who were administered self-assessment questionnaires by sending an online link; a retest phase was foreseen after three weeks in which a subgroup of 80 people participated, to whom the same new questionnaire was administered online.

Finally, in the fourth chapter, the results will be discussed based on the starting hypothesis.

Chapter 1. Self reported wayfinding inclinations

One of the most important cognitive skills we have in our everyday life is our orientation skills. Orientation skills involve basic perceptual and memory processes, but what makes it complex is that it is a multisensory process in which the stimuli need to be processed and manipulated over time and space. Some distinct cognitive processes are involved in this skill such as cognitive representations, working memory and attention which are used for self-localization and choice of direction to reach a desired target using those cognitive processes (Wolbers & Hegaty, 2010).

Wolbers and Hegarty (2010) defines navigation as, while exploring a complex environment, the ability to find a way around and maintain a sense of direction and location.Bates and Wolbers (2014) define spatial navigation as one's ability to know the position of self and orienting relative to the environment, which is crucial for everyday life.Continuous cues derived from sensory inputs have to be utilized in the spatial guidance of motor commands to successfully reach a goal location (Varga, et al., 2017)

Navigation enables individuals to memorize a set of place-action associations that are correlated with sensory cues and learn a sequence of landmarks, turns and changes of direction (Muffato & Meneghetti, 2020). A mental representation, or cognitive map, is created as a result of learning spatial information through navigation in an environment (Tolman, 1948). Knowing the routes between locations or landmarks is referred to as having route knowledge, an intellectual ability that not only aids in effective navigation but also enhances comprehension of the surrounding environment. The corresponding mental image can be thought of as a series of view-based (egocentric) visual images of landmarks along with instructions (Gillner & Mallot, 1998). Most people first learn routes when exploring an environment solely by navigation (for example without a map). Since views from an individual's perspective are the basis for the mental representations of the landmarks (Aginsky et al., 1997). On the other hand survey representations give a broad overview of the spatial layout based on an external frame of reference, i.e., an allocentric map-like representation (Evans & Pezdek, 1980; Hart & Moore, 1973; Kitchin, 1994; McNamara, Ratcliff, & McKoon, 1984; Siegel & White, 1975; Taylor & Tversky, 1992).

So, the allocentric perspective is based on the representation that one has created of the environment, on one's own mental map, whereas the egocentric perspective is based on exposure to a particular environment, which means that only one point of view is taken into

consideration. Therefore, navigation is an important everyday activity because it is how people understand the environment that surrounds them (Van Der Ham & Claessen, 2020).
Wayfinding is the coordination of planning and decision making in relation to both the distal and local surroundings. Several sensory modalities provide information for navigation, and several cognitive systems are involved in processing sensory and memory information (Montello, 2005). Exploration of an environment is the most important behavior when wayfinding without a specific destination. Exploration involves encountering a new and unfamiliar environment with the aim of building a mental representation of the surroundings (Weiner et al., 2009). To research spatial thinking of individual differences we can both use cognitive abilities (objectively measurable) and our inclinations (self-reported environment-related preferences) (Hegarty & Waller, 2005; Meneghetti et al., 2021).

1.1 Self-reported wayfinding inclinations

The term inclinations towards wayfinding tasks refers to a set of attitudes that an individual possesses toward spatial tasks. People's spontaneous and personal beliefs about their orientation skills, the strategies they use, and their own preferences in navigating themselves are all highlighted. These inclinations are typically examined using questionnaires that measure attitudes and orientation preferences. Navigational abilities can be measured with self-report as well as objectively. Objective measures may include performance on spatial tasks or real-world navigation tasks. By combining self-report measures with objective measures, a more complete understanding of an individual's navigational ability can be obtained (Hegarty & Waller, 2005).
Self-reported wayfinding inclinations could be divided into two; positive self-assessments (concerning a sense of direction and pleasure in exploring new environments) and negative self-assessments (spatial anxiety and a negative attitude to exploring the environment) (Meneghetti et al., 2014).

1.2 Sense of Direction

Sense of direction (SOD) is people's estimation of their own spatial orientation ability, rather than a special mental faculty. Self-reports of sense of direction were shown to reflect spatial orientation ability answering for example the question “How good is your sense of direction” (Kozlowski & Bryant, 1977).

One of the scales where the sense of direction is measured is Santa Barbara Sense of Direction (SBSOD, Hegarty et al., 2002).

Previous studies demonstrated that sense of direction (SOD) is correlated to knowledge of the environment, the capacity to one's ability to orient themselves effectively in an environment., the speed and accuracy in which new environments are learned (Kozlowsky and Bryant, 1977). In fact, Kozlowsky and Bryant (1977) conducted three experiments with 77 students to study verbal expressions of self-evaluation of their own capacity to navigate in an environment. It has been demonstrated that the self-valuations of sense of direction reflect the capacity of spatial navigation: the ones with a good sense of direction were better than the ones with a poor sense of direction in indicating targets such as local buildings. When it comes to learning a new environment subjects with a good sense of orientation demonstrated better accuracy in their representation of the area, in this case, a labyrinth, while those with a poor sense of orientation showed no improvement in performance.

Similarly, Ishikawa and Montello (2006) using the multi-item self-report survey SBSOD; reported that the accuracy and speed with which survey knowledge was acquired by participants were strongly related to their self-reported SOD: those reporting good SOD learned survey knowledge more accurately and quickly, while those who reported having poor SOD learned less quickly and accurately; moreover, the ability to use spatial information in an abstract and symbolic way was also compromised.

Lastly, Burte and Montello (2017) conduct a study with the aim of investigating whether SOD refers to the acquisition of environmental knowledge in a different way according to the intentionality of learning. Participants with good SOD more accurately learned spatial knowledge for landmark familiarity, route ordering, and direction estimation; no effect of the intentionality of learning was found and therefore no evidence was provided that SOD reflects strategies applied with effort or conscious attention to the spatial arrangement of the environment were shown as a result. Referring to learning about environments and summarizing the results, further research has shown in particular that self-reported SOD is positively correlated with the ability to: estimate distances (Hegarty et al., 2002; Ishikawa and Montello, 2006); estimate direction under various conditions (Hegarty et al., 2002; Ishikawa and Montello, 2006; Montello and Pick, 1993); giving, following and remembering directions (Hund and Padgitt, 2010); maintain accurate orientation in complex environments (Shool, Kenny, & Della Porta, 2006); and lastly accuracy of wayfinding (Hund and Padgitt, 2010; Kato and Takeuchi, 2003).

1.3 Spatial anxiety

Lawton (1994) defined spatial anxiety as anxiety about environmental navigation and is related to the fear of getting lost (Schmitz, 1997); it is characterized by feelings such as fear and apprehension when performing spatial processing tasks. Anxiety is accompanied by a set of behavioral and physiological responses which have evolved to protect the individual from harm such as avoidance, vigilance, and arousal.

Anxiety is the most studied emotion when it comes to orientation tasks for the reason that there are times when people can perceive space as dangerous, especially during high levels of stress which can lead to avoidance behaviors.

The level of anxiety is felt, regardless of the size and crowding, when the person is in an unfamiliar place, and in some cases, spatial anxiety can even progress to a pathological aggravation known as agoraphobia (Kallai et al., 2007).

The Spatial Anxiety Scale (SAS) by Lawton (1994) is the measure most used to investigate spatial anxiety, later the spatial anxiety questionnaire (QAS; De Beni et al., 2014) was also adapted from it.

Anxiety about performing spatial tasks is related to performance of the navigation tasks (Lyons et al., 2018); in particular, a high level of spatial anxiety could be decisive in the performance of tasks involving the sense of orientation (Lawton, 1994; Kremmyda et al., 2016); for this reason, it is essential to evaluate spatial anxiety to identify people who are more likely to have difficulties in daily spatial activities (Bronzaft et al., 1976; Levine et al., 2012).

Many studies have reported the effect of spatial anxiety on navigation.

Lawton (1994) reported that spatial performance is negatively affected by spatial anxiety, even in young adults in fact, according to the author there is a negative correlation between spatial anxiety and orientation strategy in environmental navigation, as very anxious individuals will be more likely to get confused as regards their position in the environment, tending to prefer egocentric orientation strategies for this. Thoresen et al., (2016) found that individuals show lower performance on mapping tasks and locating landmarks on maps of previously learned environments with high levels of anxiety.

Similarly, Muffato et al., (2017) reported a negative relationship between spatial anxiety and map learning.

Hund and Minarik (2006) state that in finding their way to new directions, participants who reported greater spatial anxiety made more navigation errors. Like so as reliance on orientation

strategies increased, navigation efficiency increased, suggesting that wayfinding strategies are related to navigation performance (Hund and Minarik, 2006).

Finally, in a study conducted by Wyllie and Smith (1996) it was demonstrated that a depressed mood has an undoubted effect on the execution of cognitive tasks and that the effect is decidedly more marked for those of a spatial type: the group with negative emotions he obtained worse performance in spatial tasks, also demonstrating a different cortical activation in the execution of these.

In general, therefore, the results demonstrate that spatial anxiety has a negative effect on spatial representations of new environments (Lawton and Kallai, 2002; Nori et al., 2009). Furthermore, spatial anxiety is associated with low levels of self-reported SOD, pleasure in exploring places, and low preference for exploration tendencies (Lawton & Kallai, 2002).

1.4 Attitude toward exploration or exploration tendency

Orientation attitudes hold significance as they can enhance our objective navigational capability.

The attitude of pleasure towards exploration, understood as the pleasure of exploring unknown places and trying new paths in familiar places, is an inclination referring to how much the individual feels pleasure in facing and choosing unknown paths. This attitude contrasts with the pleasure of navigating in known places and the fear of venturing into unfamiliar environments.

In this regard, reference is made to another type of pleasure, the inclination to orient oneself preferably in places that are better known, and which therefore transmit a high feeling of safety during one's navigation, pleasure towards the known.

In general, several studies have shown that people who like to explore places tend to have a higher level of SOD (De Beni et al., 2014) and a good performance in spatial tasks in both known environments (Meneghetti et al., 2014) and new (Muffato et al., 2016). Furthermore, He and Hegarty (2020) state that the exploratory tendency facilitates the acquisition of an environment and is related to performance in a variety of tasks such as drawing a map (Muffato et al., 2019), indicating cardinal directions (Meneghetti et al., 2014), or finding shortcuts in an unfamiliar environment (Pazzaglia et al., 2017; 2018).

1.5 Spatial self-efficacy

In the field of spatial cognition, self-efficacy represents one of the most studied motivational factors and refers to the subjective perception, expressed before the execution of the task, of being able to control and deal with the situation successfully (Bandura 1993; 1997).

Due to its specificity, the idea of self-efficacy sets itself apart from other motivational constructs like self-esteem (Covington, 1998). In fact, the given subjective evaluation only applies to that particular task in that particular situation, not to a variety of cases.

Self-efficacy was originally studied by Bandura (1977), distinguishing four elements of the concept of self-efficacy: generality (the measure of extensibility to similar situations and tasks), strength (confidence placed and degree of certainty expressed in one's perception of self-efficacy), the level (how much the subject feels self-effective) and finally the exercise of control (human agency), that is feeling of having the ability to face a specific situation and believing that one's actions produce the desired effects. In particular, this dimension encourages the anticipation of success scenarios and the achievement of positive results; on the other hand, the sense of helplessness results in the withdrawal of commitment and, as a result, ineffective learning outcomes.

Finally, the author reports three sources of self-efficacy, on which one can act to increase the level of self-efficacy. The first source is identified as having previously performed a similar task successfully: in fact, past performance and the experience of mastery can influence future beliefs about one's own effectiveness. Another source is vicarious learning, which is having seen others perform a similar task successfully. Motivational factors can also be influenced by environmental learning ability (Pazzaglia et al., 2017). Finally, self-efficacy can be influenced by verbal persuasion, such as the belief that one can be successful and can control one's stress or fatigue levels. when performing tasks; it is often conveyed by the appreciation given to the person doing the work. In this regard, one type of feedback is normative feedback which consists of providing an individual with information about their own performance relative to that of others. When the normative feedback is positive, the individual indicates above-average performance and thus can sustain subsequent performance; in fact, studies that have implemented this type of feedback by administering various types of cognitive tasks (e.g., arithmetic tasks, name recall) have shown that participants who received positive normative feedback report greater self-efficacy and better results than those who did not received feedback. Miola et al., (2021) suggested that giving positive feedback before conducting spatial-recall tasks can improve spatial self-efficacy.

In conclusion, these results seem to suggest promoting self-efficacy, positive normative feedback is an effective intervention.

In the domain of spatial cognition, self-efficacy can be considered as the perceived self-confidence in performing spatial tasks (Pazzaglia et al., 2017) and reflects the individual's beliefs about one's own abilities to successfully complete guidelines action.

It is important to emphasize that self-efficacy expectations are both situation-specific and modifiable, thus representing an important point for intervention.

It too can be measured through self-assessment questionnaires; an example is the Spatial Self-Efficacy Questionnaire (Pazzaglia et al., 2017), made up of 8 items, which investigates how much a person feels they can deal with situations characterized by unfamiliarity and environmental complexity to the best of their abilities.

Various studies have investigated the role of self-efficacy within spatial cognition.

For example, the study conducted by Pazzaglia et al., (2017) aimed to investigate whether two variables, self-efficacy in identifying the path and pleasure in exploration, were related to performance in finding shortcuts. A group of 124 university students was led on a journey through one of two virtual environments, differing only in that one contained landmarks while the other did not. Then they were asked to find a shortcut from the beginning to the end of the path they had learned, administering two questionnaires to assess their self-efficacy in finding their way and their pleasure in exploring. Results showed that spatial self-efficacy, together with exploration pleasure, predicted performance in finding shortcuts; indeed, participants with higher levels of self-efficacy found shorter paths to reach a destination, especially in complex environments (i.e., virtual environments without reference points).

Finally, Miola et al., (2021) in their study investigated the roles that self-efficacy plays in environmental learning in terms of activity-specific self-efficacy feedback, thus manipulating self-efficacy and using positive and neutral feedback. In particular, the sample consisted of 231 participants; each subject rated his or her task-specific self-efficacy prior to each environmental task, i.e., path tracing, pointing, and map completion activities. The results confirm that task-specific self-efficacy can support environmental learning; moreover, providing positive feedback can improve spatial self-efficacy before performing spatial recall tasks.

1.6 Strategies and Spatial Representations

Another inclination of orientation is represented by the preferred mode of representation of the environment. The term spatial representation refers to a strategic inclination with which a person tends to orient themself in space; it is also considered as a component of the sense of direction.

The various research conducted on this subject have highlighted considerable individual differences: people with different spatial representations have different performances in various orientation tasks.

In this regard, with reference to visuospatial preferences (Lawton, 1994; 1996; Pazzaglia and Meneghetti, 2017) individuals may generally prefer to consider spatial relationships in a given environment using a survey modality, also called orientation strategy (Lawton, 1994) or allocentric strategy (Münzer et al., 2016) in which case the information is organized on the basis of reference points and relative positions; this strategy will be successful in tasks that require having a representation of the positions of places or their distance as the crow flies. Alternatively, they may prefer a path mode, or self-centered strategy (Münzer et al., 2016) in which case the information is sequentially organized as a path viewed from one's position; this type of strategy will be successful in a task that requires navigation within a complex environment and following a pre-established itinerary.

We can also speak of cognitive style in the modality of spatial representation (Nori and Giusberti, 2003; Pazzaglia and De Beni, 2001).

According to the model proposed by Siegel and White (1975) and also, to an analysis conducted by Pazzaglia et al., (2001), people can be defined as inclined to use three styles of representation. The first style is knowledge based on landmarks or landmark style: the resulting cognitive map is made up of landmarks that have no relation to each other. The second style is path-based knowledge or route representation style; this is focused on the identification and recognition of individual landmarks and the paths that connect them. In other words, through a process of familiarization with the environment, the first relationships between the landmarks begin to be built because of a knowledge that we could define as egocentric, since knowledge of the environment is linked to the position of the subject. This representation is also based on the reference points but inserted in a path context and corresponds to the representation that one can have of a certain path through sequential navigation; this system can be compared to the map we consult when we visit a European capital and allows us to calculate the spatial relationships between any two points; consequently we are able to identify alternative routes to reach our destination, being able to choose the longer or the shorter one. The last cognitive style is the configurational knowledge or survey style: it is a representation from above that considers the relationships between the various reference points and the intersection of the paths. In fact, it is the last level of connection between the landmarks, in which the individual, in addition to providing direction information using his own body as a reference, can also use geographical coordinates and therefore resorting to an allocentric reference system. This

knowledge is therefore centered on the spatial relationships between landmarks and corresponds to the representation that can be had by inspecting a location from above or by studying a map; through it we can relate different elements of space to each other independent of intermediate steps but referring more to a global vision of space.
In other words, when we travel down a road numerous times, we get to build a map, a path that describes the various passages that allow us to get from our home, for example, to our workplace; it is a motor learning that does not require the involvement of attentional resources and a conscious control on the part of the individual. However, precisely because of its schematic and rigid aspect, it can happen that you get lost when there is a small deviation from the usual route. It is the classic case of the road interrupted for work that makes us late for work because we cannot find an alternative way to reach the same point by going from another side.
Those who generally declare themselves inclined to the latter kind of representation also declare to have an excellent sense of direction. The authors suggest that in a healthy subject, the ability to use landmarks and the route-type representation are necessary elements to be able to orient themselves correctly.

1.7 Relations Between the Various Inclinations and Orientation Tasks

Studies have shown that wayfinding inclinations are correlated (De Beni et al., 2014); in fact, the existence of reciprocal relationships between motivational and affective factors in the domain of spatial performance is supported (Bandura, 1977).
In this regard, numerous studies have been carried out with the aim of examining how orientation inclinations were related to each other.
For example, the study by Hund and Minarik (2006) obtained important results regarding the correlation between spatial anxiety and orientation strategies: in fact, they show that with the increase in spatial anxiety, navigation efficiency decreases; moreover, spatial performance improved using the cardinal points as a strategy with respect to the landmarks.
There is a relationship between spatial anxiety, pleasure attitudes towards exploration and sense of direction (He & Hegarty, 2020): those who report a higher degree of spatial anxiety have a poorer sense of direction because they are less likely to explore the environment.
Spatial anxiety and self-efficacy are also correlated: in fact, those who obtain higher scores for spatial anxiety correspond to lower scores for self-efficacy in spatial tasks and for pleasure attitudes towards exploration (Pazzaglia et al., 2018).

Furthermore, the inclination of the Sense of orientation is related to the attitude of pleasure towards exploration: subjects inclined to feel attitudes of pleasure towards exploration tend to have a good sense of orientation (De Beni et al., 2014).
In turn, attitudes of pleasure toward exploration are positively correlated with a self-reported sense of orientation, the ability to indicate cardinal directions and the search for shortcuts in a known environment (Meneghetti et al., 2014; Pazzaglia et al., 2017 Pazzaglia et al., 2018).
The inclination factors are considered differently in the different studies: in fact, many studies adopt an approach of clear distinction between positive inclination factors, i.e., sense of orientation, and attitudes of pleasure towards exploration, and inclination factors negative, i.e., attitudes of pleasure towards the known and spatial anxiety (Meneghetti et al., 2014)
In conclusion, there is therefore a relationship between spatial attitudes, visuospatial skills, and wayfinding skills (Hegarty et al., 2006; Pazzaglia et al., 2018).
For example, when wayfinding biases and visuospatial abilities were considered at the same time, both supported accuracy in navigation learning (Meneghetti et al., 2014; Muffato et al., 2019; Münzer & Stahl, 2011; Weisberg et al., 2014), with few exceptions (Fields & Shelton, 2006, found no influence of people's wayfinding inclinations). Visuospatial skills have a more evident role than orientational inclinations, however, at least in terms of values expressing relationships (Hegarty et al., 2006; Pazzaglia et al., 2018).
Briefly, the literature identifies visuospatial abilities and wayfinding inclinations as separate but related factors, and both contribute to environmental learning (Hegarty et al., 2006).
In general, a positive spatial self-assessment (characterized by a good sense of direction and taking pleasure in exploring unfamiliar places), as opposed to a negative self-assessment (characterized by feeling a strong sense of spatial anxiety or a preference for exploring familiar places) improves self-esteem and the sense of perceived self-efficacy with a consequent improvement in performance in spatial tasks (Meneghetti et al., 2014), in particular for wayfinding (Pazzaglia et al., 2017).

To sum up, it can be stated that it is necessary to have a new measure on the behavior of exploration, pleasure, and self-efficacy for navigational behavior. Although, as stated before, there are relations between the inclinations it is important to have a new specific measure for emotional and motivational components of exploration behavior.

Chapter 2. The Study

2.1. Aim

The aim is to create a new measure and investigate the validity of New Questionnaire of Pleasure and Self Efficacy in Exploration. Therefore, investigating the relationship between the new measure with other self-reported wayfinding inclination measures; of Santa Barbara Sense of Direction (SBSOD, Hegarty et al., 2002), Spatial Anxiety (Lawton, 1994), Exploration Tendency (He & Hegarty, 2020). Further test re-test reliability will be also investigated with a correlation of two test which were 3 weeks apart from each other.

2.1.1 Hypothesis

Our first aim is to create a new measure that specifically investigates the aspects of pleasure and self-efficacy in exploration, considered particularly important in analyzing spatial performance. By focusing on these aspects, we aim to provide a comprehensive understanding of the cognitive and emotional elements influencing navigation. Having a valid measure, therefore, for the New Questionnaire in Pleasure and Self Efficacy in Exploration that investigates self-ratings of one's navigational skills, is crucial. Therefore, we are focusing particularly on self-efficacy and pleasure in exploration, as their impact is considered particularly significant in assessing one's ability of orientation.

To ensure the validity of the new measure, its correlations with other internationally recognized inclinations are calculated. Additionally, we also want to make sure that we have a good re-test reliability to both test the validity and reliability of the new questionnaire.

To sum up, the general objective of the present study was to create a new measure.

2.2. Method

2.2.1 Participants

In total of 89 subjects participated to the research between ages 18 to 55 (53 female, 36 male). It is shown the age and the schooling mean of males and females in the Table 1. After a 3-week distance 80 of 89 subjects successfully participated the re-test (47 female, 33 male).

Table 1

Descriptive Statistics of Age and Schooling

	Female (N = 53)		Male (N = 36)	
	Mean	Standard Deviation	Mean	Standard Deviation
Age	33.42	12.55	32.22	12.94
Schooling	15.32	1.80	15.58	2.22

2.2.2 Materials

New Questionnaire of Pleasure and Self Efficacy in Exploration

This questionnaire has been created to measure the pleasure that is being experienced and the self-efficacy that is being perceived while exploring.

It consists of a total of 24 affirmations of which 12 of them are about pleasure/displeasure, "When I see a new road I avoid taking it because I don't know where it leads." , "I enjoy finding new roads even to reach familiar and well- known places." and other 12 of them are about self-efficacy or no self-efficacy, "I feel able to reach the location of an appointment in an unfamiliar area of the city" ; "I don't feel able to indicate in which direction places are located in relation to the position in which I am", in orientation tasks. The questions are being answered on a 7-point Likert scale, two extremes being 1 (completely disagree) and 7 (completely agree)

The scoring is the sum of all the items. The maximum score that could be reached is 168. The questionnaire has a high reliability, Alpha Cronbach = 0.91.

Spatial Anxiety Scale (Lawton, 1994)

The questionnaire measures anxiety levels during the execution of tasks that require spatial and navigational skills for everyday life. The questionnaire consists of 8 items all of which are on a 5-point scale with two endpoints of "not at all" and "very much". For each item the participants have to report a level of anxiety on a scale of 1 (not at all) to 5 (very much).

Example of item: “leaving a store that you have been to for the first time and deciding which way to turn to get to a destination” ; “finding your way out of a complex arrangement of offices that you have visited for the first time” ; “pointing in the direction of a place outside that someone want to get to and asked you for directions, when you are in a windowless room” ; “locating your car in a very large parking lot or parking garage” .

The results are calculated at the end summing the point of each element. The maximum score that could be reached is 40, higher the score is higher the anxiety felt during navigation tasks.

The questionnaire has a high reliability, Alpha Cronbach= 0.87.

Measure of Exploration Tendency (He & Hegarty, 2020)

The questionnaire measures a person’s tendency to explore environments using an 8-item scale. Scale contains four positively stated items and four negatively stated items such as “If I have a chance, I like to explore different routes to get to my destination” is an example of a positive statement, instead “I prefer to follow my daily route or the way I know before to get my destination” is a negative statement. Participants rate their agreement with the statement using a 7-point Likert-scale. The score is the sum of the items. The maximum score could be reached is 56, higher the score higher the tendency of exploring an environment.

The questionnaire has a high reliability, Alpha Cronbach= 0.81.

Santa Barbara Sense of Direction (SBSOD, Hegarty et al., 2002)

This questionnaire is a self-report measure of general spatial orientation at the environment. It consists of 15 questions which investigates navigational orientation skills or preferences. Participants are asked to respond to questions on a 7-point Likert scale; 1 being strongly disagree and 7 being strongly agree.

Example of item: “I am very good at giving directions”, “I have a poor memory for where I left things”, “I am very good at judging distances”, “My ‘sense of direction’ is very good”.

Recommended scoring procedure of the scale is to first gather the items that had been responded positively, after inverse scoring, the scores of all items are added together and then divided by the number of items (in this case total of 15 items). The maximum score that could be reached is 105, higher the score is higher the belief that an individual has a strong sense of direction.

The questionnaire has a high reliability, Alpha Cronbach= 0.83.

2.2.3. Procedure

The participants of this study have been selected according to their nationality (non-Italians) and their age (18-65). To each subject a N has been assigned to then is utilized in the re-test phase. After each subject received their Qualtrics link, they first had to fill out an informed consent form to accept their participation. After the N given by the experimenters is compiled the demographic information (age, sex, level of degree and nationality) of the participants is being asked. Then they have to complete the wayfinding questionnaires in random order: New Questionnaire of Pleasure and Self Efficacy in Exploration (Reviewed by De Beni et al., 2014 and Pazzaglia et al., 2017), Spatial Anxiety Scale (Lawton, 1994), Measure of Exploration Tendency (He & Hegarty, 2020), Santa Barbara Sense in Direction (SBSOD, Hegarty et al., 2002)

The average time that is needed to compile the entirety of the first questionnaire is 25 minutes.

Afterwards, the re-test is sent to the participants in a distance of 3 weeks. For the re-test participants were asked to fill out the questionnaire by compiling the same identified N assigned in the first administration. For the re-test participant had to compile New Questionnaire of Pleasure and Self Efficacy in Exploration (Reviewed by De Beni et al., 2014 and Pazzaglia et al., 2017) in total of 24 items. The average time that is needed to compile the entirety of the second questionnaire is 5 minutes.

2.3. Results

Initially the descriptive of the Pleasure and Self Efficacy in Exploring and the other self-evaluation of navigation ability are reported as seen in Table 2.

Table 2

Descriptive statistics of questionnaires by gender

	Female (N = 53)		Male (N = 36)	
	M	SD	M	SD
New Questionnaire of Pleasure and Self Efficacy in Exploration	104.4	21.06	113.58	18.14
Santa Barbara Sense of Direction	63.21	14.43	74.19	12.87
Measure of Exploration Tendency	31.06	8.52	35.25	6.69
Spatial Anxiety Scale	22.02	6.73	17.53	5.50

2.4 Relationship between Pleasure and Self Efficacy in Exploration and the other self-evaluation of navigation ability questionnaires

To explore relationship between Pleasure and Self Efficacy in Exploration and the other self-evaluation of navigation ability questionnaires such as, Measure of Exploration Tendency (He & Hegarty, 2020), Spatial Anxiety Scale (Lawton, 1994), Santa Barbara Sense in Direction

(SBSOD, Hegarty et al., 2002) correlations are calculated. What emerged is that there are significant correlations between pleasure and self-efficacy and all the other measures as it could be seen in Table 3.

Table 3

Correlations between Pleasure and Self Efficacy in Exploration and other wayfinding inclination questionnaires

	1.	2.	3.
1. Pleasure and Self Efficacy in Exploration	-	-	-
2. Santa Barbara Sense of Direction	0.694***		
3. Exploration Tendency Scale	0.629***	0.498***	
4. Spatial Anxiety	-0.58***	-0.47***	-0.36***

Note: *** $p<0.001$

2.5 Test re-test Pleasure and Self Efficacy in Exploration

A group of 80 participants; 47 female, 33 male, have completed the re-test phase after 3 weeks of distance to the initial questionnaire. Correlation of test re-test emerged as =0.652***
Pleasure and Self Efficacy in Exploration questionnaires re-test descriptive is reported as seen in Table 4.

Table 4

Descriptive statistics of re-test questioner by gender

	Female		Male	
	M	SD	M	SD
New Questionnaire of Pleasure and Self Efficacy in Exploration	109.09	10.86	115.38	8.73

Chapter 3: Discussion

Our primary focus was to create a new measure that investigates self-ratings of one's navigational skills, focusing particularly on self-efficacy and pleasure in exploration, as their impact is considered particularly significant in assessing one's ability of orientation. With the aforementioned objective, online self-assessment questionnaires were administered to a sample of 89 subjects who participated in the research between ages 18 to 55 (53 female, 36 male) of these, N=80 participants participated in a retest phase, in order to evaluate the reliability of the new measure.
Results will be discussed in the following paragraphs.

3.1 Relationship between Pleasure and Self-efficacy in Exploration and other Self-assessment measures used on the international scene

The result confirms the hypothesis that the new questionnaire is valid. The results show significant correlations between the measure of pleasure and self-efficacy for exploration and the measures of self-assessments, used internationally, considered in the study, that is to say, the Santa Barbara Sense of direction Scale (Hegarty et al., 2002), Exploration Tendency scale (He and Hegarty, 2020) and the Spatial Anxiety Questionnaire (Lawton, 1994). Numerous studies in the literature confirm this correlation between spatial aptitudes, such as the one conducted by, He and Hegarty (2020) in which by analyzing the relationship between spatial anxiety, attitudes of pleasure in exploration and sense of orientation, it is concluded that people who experience greater spatial anxiety have a poor sense of direction and consequently are less likely to explore the environment. In general, therefore, it seems that a positive spatial self-assessment, characterized by a good sense of orientation, by taking pleasure in exploring unknown places and by a low level of spatial anxiety, improves the perceived sense of self-efficacy with a consequent improvement in wayfinding performance as advocated by Meneghetti et al., (2014) and Pazzaglia et al., (2017).

3.2 Test re-test measure pleasure and self-efficacy in exploring

Analyzing the data relating to the subsample of N=80 people who participated in the retest phase, a significant correlation emerged ($r = 0.652$, $p < 0.001$) between the specific aspects of

pleasure and self-efficacy in exploration, demonstrating a good test validity retest of the created questionnaire.

Summarizing the relationship between the two aspects examined by this study, a link emerges between people's self-efficacy and how they navigate an environment:

The more secure and efficient people feel when navigating, the more they enjoy exploring their environment.

In other words, a specific behavior such as the tendency to explore could be supported and increased by one's beliefs of spatial self-efficacy (Miola et al., 2023).

The individual self-efficacy variables of wayfinding and a positive attitude to exploration, correlating with each other, can be used to effectively measure one's self-evaluation towards guidance tasks.

Chapter 4. Conclusion

People's beliefs about their navigation abilities, as we have seen in the results of this research, could be important for their orientation performance.

This correlational study aimed to investigate spatial self-evaluations, in particular, spatial self-efficacy and pleasure in exploration of places and the correlations between them. To achieve this goal, 89 participants were involved (of which 53 women, 36 men) who were administered a series of online self-assessment questionnaires; of Santa Barbara Sense of Direction (SBSOD, Hegarty et al., 2002), Spatial Anxiety (Lawton, 1994), Exploration Tendency (He & Hegarty, 2020). Subsequently, a retest phase took place in which a subgroup of 80 people participated after three. The results demonstrate a significant correlation between self-efficacy and spatial exploration and the other self-assessment questionnaires used on the international scene that investigate inclinations such as spatial anxiety and sense of direction, demonstrating the validity of the new questionnaire and that spatial attitudes are correlated with each other, given with specificities. Further test and re-test emerged to be highly correlated.

In summary, this study contributes to expanding information on the importance of emotional (pleasure) and motivational (self-efficacy) aspects of orientation tasks, emphasizing the importance of highlighting these aspects when testing navigation and orientation skills.

In terms of practical implications, spatial beliefs and therefore the results obtained could be an aspect to further research in training aimed at improving orientation skills with a particular interest in promoting the development of pleasure and self-efficacy in exploration.

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Appendix

Item	Text
Pleasure 1	When I see a new road, I avoid taking it because I don't know where it leads
Pleasure 2	I enjoy finding new roads to reach familiar and well- known places.
Pleasure 3	I don't like the idea of visiting faraway and unknown places because I might get lost
Pleasure 4	I feel uncomfortable if I have to reach a place in an unfamiliar city or place.
Pleasure 5	I prefer to vary the route to reach the same destinations, rather than always taking the same road
Pleasure 6	I like to find the shortest route to reach my destination
Pleasure 7	I don't like exploring and discovering new places when I am travelling or visiting a new city
Pleasure 8	I like to imagine what the view of a place would be like from above.
Pleasure 9	While I'm moving, I like to understand where I'm positioned in relation to the map of the environment
Pleasure 10	When returning from a certain place, I like to try alternative routes compared to the one I took on the way there.
Pleasure 11	I like to learn roads and routes so that I can easily retrace them later without having to consult maps or GPS.
Pleasure 12	I enjoy exploring new roads instead of retracing the ones that I already know

Self-efficacy 1	I feel able to reach the location of an appointment in an unfamiliar area of the city
Self-efficacy 2	I feel effective at finding the right way to get to my destination even in an environment that I know little about.
Self-efficacy 3	I don't feel able to indicate in which direction places are located in relation to the position in which I am
Self-efficacy 4	I feel effective at going back and finding the right way even after getting lost in an area that I know little about.
Self-efficacy 5	I don't feel effective at creating a mental map of the environment where I am.
Self-efficacy 6	I am able to understand my position by referring to the map of the environment where I am.
Self-efficacy 7	I don't feel capable of remembering landmarks and turns in the routes I take.
Self-efficacy 8	I feel effective at finding a shortcut even without using tools such as GPS or maps.
Self-efficacy 9	I don't feel effective at orienting myself in a new city or in an unfamiliar environment
Self-efficacy 10	I feel able to autonomously explore new areas of the city even without relying heavily on tools such as maps or GPS.
Self-efficacy 11	I don't feel able to easily decide the direction to take when I'm at a junction or intersection.
Self-efficacy 12	I feel effective at finding alternatives to the main road when it is blocked or too busy, even without consulting a map or GPS