

Situation Awareness Viewed from Sense of Direction and Choice of Navigation Direction

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Abstract: The purpose of this study was to examine the effects of sense of direction, map or verbal direction and gender on situation awareness. One hundred and sixty five (165) students, consisting of 120 females and 45 males, participated in the study. Their ages between 18-19 years old. One-way anova was used to analyse data. It was found that the choice of direction (map, verbal or both combination) had influence on situation awareness level 1 and 3. However, sense of direction did not affect situation awareness. Participant gender was found to influence the level 3 situation awareness but not of level 1 and 2. Women showed higher situation awareness of level 3 than men.

1 INTRODUCTION

Every day people are adventurous in this world, either on foot or using a vehicle, walking through familiar routes or in unfamiliar areas. Some people enter a new spatial location with anxiety about being misdirected or lost, some people are even happy and trying to find experiences to find a new location with the help of directions such as maps and verbal instructions, and some others instead just enjoy the sensation of environmental spatial awareness and body orientation in the environment.

Sense of Direction is operationalized as the ability to position themselves and self-orientation in the environment (Hegarty, Richardson, Montello, Lovelace, & Subiah, 2002), and there is predictive evidence from the use of self-report measurement of sense direction in this psychological construct. Previous research has shown that sense of direction self-report is positively correlated with smoothness in: (1) distance estimation ($r = 0.00-0.480$, $n = 24-286$; Hegarty et al. 2002; Ishikawa & Montello, 2006); (2) direction estimation under various conditions ($r = 0.36-0.45$, $n = 22-25$; Hegarty et al., 2002; Ishikawa & Montello, 2006; Montello & Pick, 1993); (3) giving, following and remembering directions (Hund & Padgit, 2010); (4) managing

orientation accuracy in complex environments ($r = 0.51-0.82$, $n = 12-31$; Sholl, Kenny, & DellaPorta, 2006); and perhaps most importantly, (5) accuracy of finding locations (Hund & Padgit, 2010; Kato & Tekeuchi, 2003).

This study examines the correlation between sense of direction and choice of directions with situation awareness. Situation awareness is defined as the perception of environmental elements in the volume of time and space, the arrangement of meaning and the projected status of these elements in the near future (Endsley, 1988). This definition is similar to the definition of "spatial awareness" explained by Klippel, Hirtle, & Davies (2010), which states that situation awareness is part of survey knowledge and is defined as the ability to plan new routes, shortcuts, and detours in an environment. This ability requires directional sensitivity as defined by Kozlowski & Bryant (1977) as awareness of location or orientation, especially where a person knows where he is while he moves around an environment.

Situation awareness is a theoretical concept and measurement paradigm that arises from applied research in individuals with certain expertise (eg air traffic control officers) who are tasked with managing constant vigilance in dynamic complex environments (Endsley, 1995; Endsley, Roth,

Ridpath, & Neill, 2003). Although there are a number of methods proposed to measure situation awareness, one of the most popular is the Situation Awareness Global Assessment Technique (SAGAT), which involves simulations of "freezing" and the submission of different types of questions relating to current conditions and the near future. A level 1 situation awareness check is proposed to measure perceptions of elements of an environment in a time and space framework, a level 2 situation awareness check is proposed to measure an integrated "meaning" understanding in the environment, and a level 3 situation awareness check is proposed to measure projections for the near future then (Endsley, 1995; Endsley et al., 2003). Measurement of this situation awareness is generally applied for study conditions on dynamic object tracking (eg Pylyshyn & Strom, 1988) and static visual working memory (Luck & Vogel, 1997; Vogel, Woodman, & Luck, 2001; Fournie, Asplund, & Marois, 2010).

Situation awareness measurements are designed around the domain of special expertise, for example in the air traffic controls officers, military commands and other controlled tasks. Situation awareness measurements are often designed to evaluate technology as well as humans to determine whether the system supports the user's ability to understand different levels and situations. However, situation awareness measurement can also be used to measure individual achievement, as was done in this research (Endsley et al., 2003). This makes this research perhaps the first research that measures the general awareness of an individual's situation in terms of direction sensitivity, and choice of directions in navigation.

This study is designed to test the situation awareness measurement procedures with hypotheses: (1) there are differences in situation awareness in terms of sense of direction, (2) there are differences in situation awareness in terms of individual direction choices, (3) there are differences in situation awareness in terms of gender.

2 RESEARCH METHOD

2.1 Participants

Participants were invited to the participants of basic psychology courses of the psychology Faculty of a State University in Yogyakarta totaling 165 people, 120 female and 45 male. Ages between 18-19 years old.

2.2 Measurement

2.2.1 Situation Awareness Test

Situation awareness tests are found in The Psychological Experiment Building Language Test Battery Version 0.14 (Mueller, 2010). A complete source of this situation awareness test can be downloaded at <http://pebl.sf.net>, the version used in this research is a version that has been translated into Indonesian. This situation awareness test has been used to measure the attention load caused by heat stress and places of dynamic attention (Mueller, Simpkins, Price, Weber, & McClellan, 2011), and has been shown to detect cognitive weakness due to these pressures. This situation awareness test has also been used to detect cognitive weakness for obsessive-compulsive patients (Tumkaya et al. 2013).

Situation awareness tests are designed to measure the same basic factors as the Situation Awareness Global Assessment Technique (Endsley & Garland, 2000). This situation awareness test takes the form of a dynamic visual footprint. Participants were asked to monitor the location, identity and movement of a set of target animal images, consisting of 5 animals that move around a quadrilateral area. The target animal image consists of three insects (a fly, a spider and an ant) and two lizards (one yellow and one blue-green). The motion simulation is this: for each insect target, a destination location is uniformly sampled in space, and for each lizard, an insect target is determined. For each circle of the simulation (screen display), each target's is uniformly determined in space, and for each lizard, a target is chosen. At each round of the simulation (screen display), each target goal is determined by uniform sampling from the direction of 12.5 degrees on each side of the direction from the target of the destination. Each target move with a uniform distance from the target for its destination (at a speed of 100pixels / s). This scheme gives the impression of a biological movement that leads to general goals but with some deviations. Furthermore, each lizard moves towards an insect, while each insect moves to the target location without being influenced by other targets. Whenever a predator lizard comes in a small threshold for a target insect, (1) the insect is eaten, (2) a new location and destination is chosen for the insect, and (3) a new insect target is chosen for the lizard. Between the dynamics of the simulation, the target

screen was changed and one interruption of the three situation awareness interruptions was given. This situation awareness test takes the form of a dynamic visual footprint. Participants were asked to monitor the location, identity and movement of a set of target animal images, consisting of 5 animals that move around a quadrilateral area. The target animal image consists of three insects (a fly, a spider and an ant) and two lizards (one yellow and one blue-green). The motion simulation is like this: for each insect target, a destination location is uniformly sampled in space, and for each lizard, an insect target is determined. For each circle in the simulation (screen display), each target's target is uniformly determined in space, and for each lizard, an insect target is chosen. At each round of the simulation (screen display), each target goal is determined by uniform sampling from the direction of 12.5 degrees on each side of the direction from the target to the destination. Each target moves with a uniform distance from the target to its destination (at a speed of 100pixels / s). This scheme gives the impression of a biological movement that leads to general goals but with some deviations. Furthermore, each lizard moves towards an insect, while each insect moves to the target location without being influenced by other targets. Whenever a predator lizard comes in a small threshold for a target insect, (1) the insect is eaten, (2) a new location and destination is chosen for the insect, and (3) a new insect target is chosen for the lizard. Between the dynamics of the simulation, the target screen was changed and one interruption of the three situation awareness interruptions was given.

A level 2 situation awareness interrupts participants to click on the location of the five targets. A small red circle is placed at the location of the click, and there is no chance of not clicking. Level 2 situation awareness interruptions ask participants to identify the type of target. Interruptions in a location are given (which is the actual location of one of the targets), and five target images are displayed below the quadrilateral area. Participants are asked to click on the target's identity at the location of the interruption. Two interruptions were given for each trial. This type of interruption requires the integration of knowledge about the target's identity with the location, which involves concurrent attention to the animal that is chasing and being chased after the screen. Finally, a level 3 situation awareness interrupts participants to identify the direction of the head of a specific target that is moving, and click on target spot on the screen to position the animal's head direction. Participants are

free to adjust the direction of the target head by clicking, after that click the button that says "ok". Instructions are given on the screen for the test. The following instructions are given before each block's task and the interrupt picture for each block.

1. Exercise Block

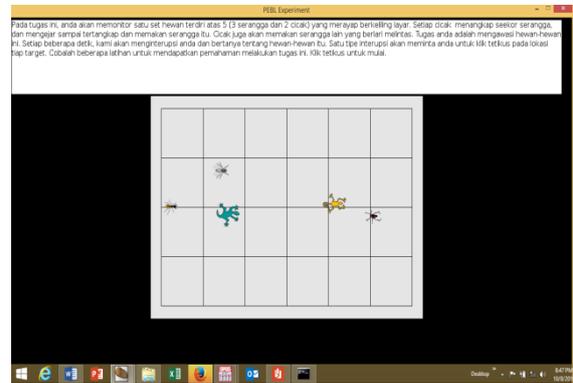


Figure 1: Instructions.

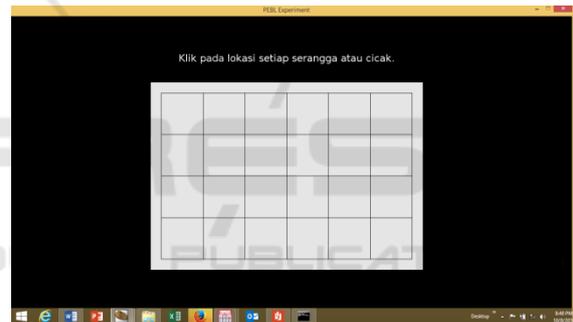


Figure 2: Interruptions 1.

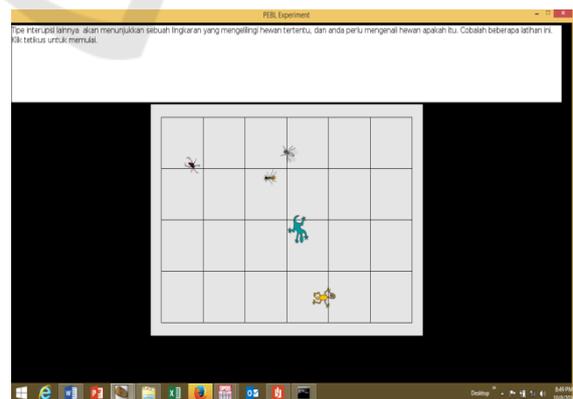


Figure 3: Instructions 2.

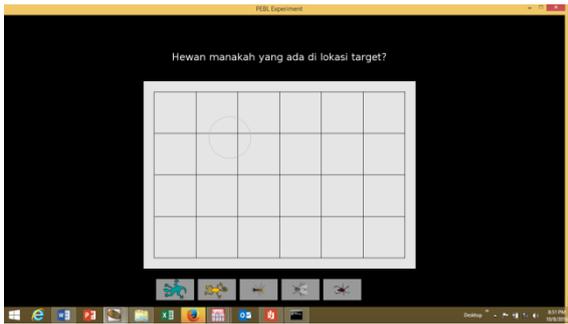


Figure 4: Interruptions 2.

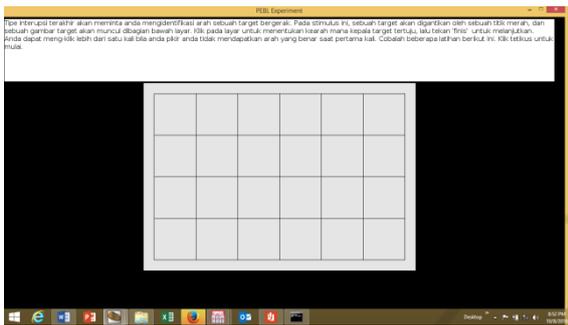


Figure 5: Instructions 3.



Figure 3: Interruptions 3.

- **Test Block Instructions**
 Interrupt 1: now, you will do a long block of the first type of interruption. In this trial, you only need to monitor the location of the animals. Click the mouse to start.
 Interrupt 2: now, you will do a long block of the second type of interruption. In this trial you will identify the types of animals at the location of the interruption. Click the mouse to start.
 Interrupt 3: now, you will do a long block of the third type of interruption. In this trial you will identify the direction of the animal's head. Click the mouse to start.

- **Mixed Block Instructions**
 Finally, you will work on a block where one of the three interruptions will appear. Click the mouse to start. Thank, you can proceed with the next test.

2. **Santa Barbara Sense of Direction Scale**
 This scales of 15 items a Likert scales adapted to the self-report scale of environmental spatial ability (Hegarty et al., 2002). Each item is a self-report statement from several aspects of environmental spatial cognition; participants responded by circling numbers from 1 (strongly agree) to 7 (strongly disagree). These scale items contain half positive statements and half negative statements. One example of a positive item is "I am very good at assessing distance"; and an example of a negative item is "I have trouble with direction". Positive item scoring is reversed and the highest score indicates better sense of direction. The total number of 15 item scores were used for analysis. Internal reliability of this test is 0.88.

The directions selection questionnaire contains one item with a statement that says " When I get lost in a new location, I will look for directions that are compelling":

Map : never 1 2 3 4 5 6
 7 Always
 Verbal instructions : never 1 2 3 4 5 6
 7 Always

The choice of directions is determined based on the choice of the highest number scoring between maps or verbal instructions. If the subject circles the same number, the choice of subject directions is called both map and verbal instructions.

- **Procedure**
 Participants are invited to participate in research in basic psychology classes. Participants who register then are given a schedule to follow the implementation of data collection of a computer laboratory. First the participants fill out and sign informed consent. After that the participants carried out the situation awareness task contained in The Psychology Experiment Building Language (PEBL) Test Battery software, version 0.14 (Mueller, 2010). Then the participants filled out the Santa Barbara Sense of Direction scale that had been adapted to Indonesian and the directions selection questionnaire.

Researchers see hierarchy of situation awareness as a way to examine different types of information about a situation. In our

implementation, level 1 situation awareness interruptions only recover location objects; situation 2 level awareness interruptions provide a location (and do not involve retrieval of information) and only require a reassignment. Level 3 situation awareness interruptions do not ask for identity and position, only ask for the direction of the target animal's head.

The process of situation awareness task performance takes place through a number of blocks. First, three short training blocks are given; one block for each level of situation awareness interruption. Then, three pure block tests are given, one block test for each situation awareness level (sequential from levels 1-3), with 15 trials per block. Finally, one mixed block was given, containing 15 trials from each interruption, for a total of 45 trials in the block. In the mixed block, participants are not aware of the next level of situation interruption awareness requested (Level 1, level 2 or level 3). Thus, data onto mixed blocks used in analysis and participants are free to direct attention compared to pure block tests where participants' attention is only directed towards one goal (Endsley et al., 2003). The situation awareness performance lasts 22.5 minutes. Participants are permitted to rest between blocks

- **Analysis**
Data were analyzed using SPSS, version 15.0 for Windows (SPSS Inc., Chicago, IL, USA). Level 1, level 2, and level 3 situation awareness scores were compared to the group average with categorized direction sensitivity scores, choice of directions and gender using ONE-WAY ANOVA or also called one-way variant analysis.

3 RESULT

The results of the analysis of research data onto the form of a statistical summary of the three choices of directions in navigation are listed in table 1 below. For example, a description of level 1 situation awareness, participants who choose maps as directions are a mean of 0.4879 with a minimum of 0.30 and a maximum of 0.87. Level of confidence 95% or a significance of 5%, the mean awareness of the situation are at 0.4594 to 0.5163. And so on.

Table 1: The Situation Awareness Description is Viewed from the Choice of Directions (Descriptive).

	N	Mean	Std. Deviation	% Confidence Interval				
				Lower Bound	Upper Bound	Minimum	Maximum	
Kesadaran S peta	59	.4879	.10918	.01421	.4594	.5163	.30	.87
petunjuk verbal	62	.5394	.11763	.01494	.5095	.5693	.30	.80
Peta dan Petunjuk	43	.4762	.12092	.01844	.4389	.5134	.28	.76
6	1	.3500	.	.	.	.	.35	.35
Total	165	.5033	.11841	.00922	.4851	.5215	.28	.87
Kesadaran si peta	59	.3175	.10820	.01409	.2893	.3457	.13	.63
petunjuk verbal	62	.2957	.12679	.01610	.2635	.3279	.03	.63
Peta dan Petunjuk	43	.3481	.12179	.01857	.3106	.3856	.10	.57
6	1	.4330	.	.	.	.	.43	.43
Total	165	.3180	.12010	.00935	.2995	.3364	.03	.63
Kesadaran si peta	59	66.7119	17.64208	2.29680	62.1143	71.3094	34.00	119.00
petunjuk verbal	62	76.8710	17.07888	2.16902	72.5337	81.2082	33.00	110.00
Peta dan Petunjuk	43	65.3023	21.05383	3.21068	58.8229	71.7817	31.00	116.00
6	1	56.0000	.	.	.	.	56.00	56.00
Total	165	70.0970	18.99462	1.47873	67.1772	73.0168	31.00	119.00

The assumption test results of ANOVA in table 2 show that the results of the Levene Test calculate situation awareness levels 1, 2, and 3 with a probability of 0.338; 0.570; 0.121 > 0.05, then all three variances is the same. The assumption of variance similarity with the ANOVA Test has been fulfilled.

Table 2: Test the Situation Awareness Data Assumptions Based on the Choice of Directions.

	Levene statistic	Df 1	Df2	Sig.
Situation awareness level 1	1,091	2	161	0,338
Situation awareness level 2	0,563	2	161	0,570
Situation awareness level 3	2,141	2	161	0,121

The results of the analysis of the variance in the one-way situation awareness in terms of the choice of directions are shown in table 3 below. Level 1 situation awareness, based on F arithmetic 3,743, degrees of freedom 3 and a significance level of 5%, the F values in the table obtained 2.66. F counts 3.743 with a probability of 0.012 < 0.05. The conclusion of the mean level 1 situation awareness in the three groups of direction choices is indeed different. Level 2 situation awareness with an F counts 1.952, a degree of freedom 3 and a significance level of 5%, the F values in the table obtained 2.66. F counts 1.952 > F table 2.66. So, F counts with a probability of 0.123 > 0.05. Conclusion level 2 situation awareness in the three groups of direction choices there is no difference. Situation awareness level 3, based on F counts 4,640, degrees of freedom 3 and a significance level of 5%, the F

values in the table obtained 2.66. F counts 4.640 with a probability of $0.04 < 0.05$. In conclusion there is a difference in the mean level 3 situation awareness in the three groups of direction choices.

Table 3: ANOVA.

		Sum of squares	df	Mean square	F	Sig.
Kesadaran situasi	Between groups	.150	3	.050	37.43	0.12
	Within groups	2.150	161	.013		
	Total	2.300	164			
Kesadaran situasi	Between groups	0.83	3	0.28	19.52	.123
	Within groups	2.283	161	0.14		
	Total	2.366	164			
Kesadaran situasi	Between groups	4708.309	3	1569.436	46.40	.004
	Within groups	54462.139	161	338.274		
	Total	59170.448	164			

T tests results from comparing the choice of higher directions in level 1 awareness, in table 4 below. In the group that choose the map, the mean 0.4879 and the group that chose the verbal instructions, the mean 0.5394. The results of one-tailed t test for independent samples of table 5, seen $0.014 / 2 = 0.007 < 0.005$, there is a significant difference, the choice of map directions higher than verbal instruction.

Table 4: Group Statistical T-Test.

	Petunjuk arah	N	Mean	Std. deviation	Std. Error Mean
Kesadaran situasi	Peta	59	.4879	.10918	.01421
	Petunjuk verbal	62	.5394	.11763	.01494

Table 5: Independent Sample T-Test between Map and Verbal Instruction.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	g. (2-tailed)	Difference	Std. Error Difference	Lower	Upper
Kesadaran situasi	Equal variances assumed	.776	.380	-2.493	119	.014	-.05151	.02066	-.09241	.01060
	Equal variances not assumed			-2.498	18.929	.014	-.05151	.02062	-.09234	.01067

T-test results to compare the higher direction choices of level 1 situation awareness, in table 6 below. In the group that chose verbal instructions, mean 0.5394 and groups that chose map and verbal instructions, mean 0.4762. The results of the one-tailed t test of independent samples of table 7, seen $0.009 / 2 = 0.0045 < 0.005$, there is a significant difference between the choice of map directions and verbal instructions. Verbal instructions mean 0.5394 are higher than map directions and verbal instruction mean of 0.4762.

Table 6: Group Statistical T-Test.

	Petunjuk arah	N	Mean	Std. deviation	Std. Error Mean
Kesadaran situasi	Petunjuk verbal	62	.5394	.11763	.01494
	Peta dan petunjuk verbal	43	.4762	.12092	.01844

Table 7: Independent Samples Test.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	g. (2-tailed)	Difference	Std. Error Difference	Lower	Upper
Kesadaran situasi	Equal variances assumed	.423	.517	2.678	103	.009	.06322	.02361	.01639	.11006
	Equal variances not assumed			2.664	88.868	.009	.06322	.02373	.01607	.11038

T-test results to compare the higher direction choices of level 1 situation awareness, in table 7 below. In the group that chooses map directions, the mean is 0.4879 and the group that chooses map instructions and is verbal, the mean is 0.4762. The results of the one-tailed t test of independent samples of table 8, seen $0.610 / 2 = 0.305 > 0.005$, there is no difference between the choice of map directions and map directions and verbal.

Table 8: Group Statistical T-Test.

	Petunjuk arah	N	Mean	Std. deviation	Std. Error Mean
Kesadaran situasi	Petunjuk verbal	59	.4879	.10918	.01421
	Peta dan petunjuk verbal	43	.4762	.12092	.01844

Table 9: Independent Samples Test.

		Levene's Test for Equality of Variances		t-test for Equality of Means		Confidence Interval of the Difference	
		F	Sig.	t	df	(2-tailed)	Lower Upper
Kesadaran situasi	Equal variances assumed	2.181	.143	.511	100	.610	-.01172 1.33733
	Equal variances not assumed			.503	5.009	.616	-.01172 1.34571

T tests results from comparing the choice of directions higher in level 3 awareness, in table 10 below. In the group that chose maps, the mean 66.7119 and the group that chose verbal cues, mean 76.8710. The results of one-tailed t test for independent samples of table 11, seen $0.001 < 0.005$, map directions higher than verbal instruction.

Table 10: Group Statistical T-Test.

	Petunjuk arah	N	Mean	Std. deviation	Std. Error Mean
Kesadaran situasi	Peta	59	66.7119	17.64208	2.29680
	Petunjuk verbal	43	76.8710	17.08888	2.16902

Table 11: Independent Samples Test.

		Levene's Test for Equality of Variances		t-test for Equality of Means		Confidence Interval of the Difference	
		F	Sig.	t	df	(2-tailed)	Lower Upper
Kesadaran situasi	Equal variances assumed	0.018	.893	.218	119	.002	1.59105 1.93838
	Equal variances not assumed			.216	119	.002	1.59111 1.9332

T tests results from comparing the choice of directions higher in level 3 situation awareness, in table 12 below. In the group that chose verbal instructions, mean 76.8710 and group that chose

verbal and map directions, mean 65.3023. The results of one-tailed t test for independent samples of table 13, seen $0.002 / 2 = 0.001 < 0.005$, there is a significant differences, verbal instruction higher than map direction.

Table 12: Group Statistical T-Test.

	Petunjuk arah	N	Mean	Std. deviation	Std. Error Mean
Kesadaran situasi	Petunjuk verbal	62	76.8710	17.07888	2.16902
	Peta dan petunjuk verbal	43	65.3023	21.05383	3.21068

Table 13: Independent Samples Test.

		Levene's Test for Equality of Variances		t-test for Equality of Means		Confidence Interval of the Difference	
		F	Sig.	t	df	(2-tailed)	Lower Upper
Kesadaran situasi	Equal variances assumed	0.676	.058	3.100	103	.002	1.56864 1.68556
	Equal variances not assumed			2.986	7.911	.004	1.56864 1.35462

T tests results from comparing the choice of directions higher in level 3 situation awareness, in table 14 below. In the group that chose map directions, mean 66.7119 and groups that chose map and verbal directions, mean 65.3023. The results of the one-tailed t test of independent samples of table 15, seen $0.714 / 2 = 0.357 > 0.005$, there was no significant difference between the choices of verbal instruction and map and verbal instruction.

Table 14: Group Statistical T-Test.

	Petunjuk arah	N	Mean	Std. deviation	Std. Error Mean
Kesadaran situasi	Peta	59	66.7119	17.64208	2.29680
	Peta dan petunjuk verbal	43	76.8710	17.08888	2.16902

Table 15: Independent Samples Test.

		Levene's Test for Equality of Variances		t-test for Equality of Means		Confidence Interval of the Difference	
		F	Sig.	t	df	(2-tailed)	Lower Upper
Kesadaran situasi	Equal variances assumed	2.961	.088	.367	100	.714	1.40954 1.20820
	Equal variances not assumed			.357	80.685	.722	1.40954 1.44547

The results of the analysis of research data onto the form of a summary of direction sensitivity statistics in navigation are in table 16 below. Suppose a description of level 1 situation awareness, participants who have a good sense of direction are the mean 0.4939 with a minimum of 0.30 and a maximum of 0.87. Level of confidence 95% or a significance of 5%, situation awareness at 0.4406 to 0.5472 and so on.

Table 16: Descriptive.

	N	Mean	d. Deviat	Std. Error	Confidence Interv			
					Mean	Boupper	BouMinimum	
Kesadaran baik	23	.4939	.12319	.02569	.4406	.5472	.30	.87
sedar	122	.5057	.12049	.01091	.4841	.5273	.28	.80
burul	20	.4997	.10410	.02328	.4509	.5484	.34	.78
Total	165	.5033	.11841	.00922	.4851	.5215	.28	.87
Kesadaran baik	23	.3086	.13459	.02806	.2504	.3668	.13	.60
sedar	122	.3213	.11459	.01037	.3008	.3418	.03	.63
burul	20	.3083	.14011	.03133	.2428	.3739	.10	.60
Total	165	.3180	.12010	.00935	.2995	.3364	.03	.63
Kesadaran baik	23	57.9130	17.19385	3.58517	60.4779	75.3482	34.00	119.00
sedar	122	59.7951	19.66410	1.78030	66.2705	73.3197	31.00	116.00
burul	20	74.4500	16.82565	3.76233	66.5754	82.3246	38.00	103.00
Total	165	70.0970	18.99462	1.47873	67.1772	73.0168	31.00	119.00

The assumption test results of ANOVA in table 17 show that the Lavene Test results to calculate situation awareness levels 1,2, and 3 with a probability of 0.566; 0.961; 2,012 > 0.05 then all three variances are the same. So the assumption of variance similarity the ANOVA Test has been fulfilled.

Table 17: Assumptions Data Test.

	Lavene statistik	Df 1	Df2	Sig.
Situation awareness Level 1	0,566	2	161	.569
Situation Awareness Level 2	0,961	2	161	.385
Situation awareness Level 3	2,012	2	161	.137

The results of the analysis of the variance between one-way situation awareness in sense of direction are shown in table 18 below. Level 1 situation awareness, based on an F count of 0.106, a degree of freedom 2 and a significance level of 5%, the F values of the table is 3.05. F counts 0.106 < F

table 3.05 with a probability of 0.899 > 0.05. The conclusion of the mean situation awareness level 1 in the three groups of direction sensitivity was no difference. Situation awareness level 2 with an F counts of 0.179, a degree of freedom 2 and a significance level of 5%, the F values in the table is 3.05. So, F counts with a probability of 0.836 > 0.05. Conclusion situation awareness level 2 in the three groups sense of direction there is no difference. Situation awareness level 3, based on an F counts of 0.690, a degree of freedom and level of significance 5%, the F values in the table is 3.05. So, F counts 0.690 < F table 3.05 with probability 0.503 > 0.05. The conclusion of the mean Situation awareness level 3 in the three groups of sense of direction no difference.

Table 18: One Way Anova.

		Sum of squares	df	Mean square	F	Sig.
Kesadaran situasi	Between groups	.003	2	.002	.106	.899
	Within groups	2.297	162	.014		
	Total	2.300	164			
Kesadaran situasi	Between groups	.005	2	.003	.179	.836
	Within groups	2.360	162	.015		
	Total	2.366	164			
Kesadaran situasi	Between groups	499.795	2	249.898	.690	.503
	Within groups	58670.653	162	362.165		
	Total	59170.448	164			

The results of the analysis of research data onto the form of a statistical summary of the sexes are in table 19 below. Description of situation 1 level awareness, female participants with a mean of 0.5094 with a minimum of 0.32 and a maximum of 0.80. With a confidence level of 95% or a significance of 5%, mean the situation awareness level 1 female participants were at 0.4888 to 0.5301.

Description of Situation awareness level 1, male participants with a mean of 0.4871 with a minimum of 0.28 and a maximum of 0.87. Level of confidence 95% or a significance of 5%, the mean situation awareness level 1 male participants were at 0.4484 to 0.5259.

Table 19: Descriptive.

	N	Mean	d.	Deviasi	Confidence Interv:			
					Std.	Erro	Boupper	Bou
							Minimum	Maximum
Kesadaran peremp	120	.5094	.11418	.01042	.4888	.5301	.32	.80
laki-lak	45	.4871	.12898	.01923	.4484	.5259	.28	.87
Total	165	.5033	.11841	.00922	.4851	.5215	.28	.87
Kesadaran peremp	120	.3180	.12113	.01106	.2961	.3399	.03	.63
laki-lak	45	.3178	.11868	.01769	.2821	.3534	.03	.60
Total	165	.3180	.12010	.00935	.2995	.3364	.03	.63
Kesadaran peremp	120	72.8000	18.02594	1.64554	69.5417	76.0583	33.00	119.00
laki-lak	45	52.8889	19.82219	2.95492	56.9336	68.8441	31.00	109.00
Total	165	70.0970	18.99462	1.47873	67.1772	73.0168	31.00	119.00

The assumption test results from ANOVA in table 20 show that the Levene Test results to calculate situation awareness levels 1,2, and 3 with a probability of 0.299; 0.500; 0.242 > 0.05 then both variances are the same. So the assumption of variance similarity in the ANOVA Test has been fulfilled.

Table 20: Assumption Test.

	Levene statistic	Df 1	Df2	Sig.
Situation awareness level 1	1,084	1	163	0,299
Situation awareness level 2	0,457	1	163	0,500
Situation awareness level 3	1,376	1	163	0,242

The results of the analysis of variance in one path of situation awareness by sex in table 21 below. Situation awareness level 1, based on the F counts 1.161, degrees of freedom 1 and a significance level of 5%, the F values in the table obtained the number 3.90. F calculates 1.161 > F table 3.90 with a probability of 0.283 > 0.05. The conclusion of the mean level 1 situation awareness in the two sexes is no difference. Level 2 situation awareness with an F count of 0,000, a degree of freedom 1 and a significance level of 5%, the F value in the table is 3.90. F calculate with a probability of 0.989 > 0.05. Conclusion situation awareness level 2 in the two sexes there is no difference. Situation awareness level 3 on F counts of 9,365, degrees of freedom 1

and a level of 5%, the F value of the table is 3.90. F calculated 9,365 > F table 3.90 with a probability of 0.003 < 0.05. There are significant differences in Situation awareness level 3 between the sexes. This difference is supported by the data onto table 19, the mean of women 72.8000 is higher than the mean of men 62.8889.

Table 21: One Way Anova.

	Sum of Squares	df	Mean Square	F	Sig.
Kesadaran Situa: Between Group	.016	1	.016	1.161	.283
Within Groups	2.283	163	.014		
Total	2.300	164			
Kesadaran situas: Between Group	.000	1	.000	.000	.989
Within Groups	2.366	163	.015		
Total	2.366	164			
Kesadaran situas: Between Group	3214.804	1	3214.804	9.365	.003
Within Groups	55955.644	163	343.286		
Total	59170.448	164			

4 DISCUSSION

The situation awareness tasks to involve interruptions in the middle of a screen for the computer screen, where participants are asked to recall or reproduce different types of information. Situation awareness level 1 interruptions only require identification of the target location (ignoring identity), this is interpreted by the author as an initial perception of the sense media. Situation awareness level 2 interruptions require identification of targets of specific locations, this is interpreted by the authors as integrating and understanding information, pattern recognition and the ability to distinguish relevant and irrelevant information (Soliman, 2010; Wright, Taekman, & Endsley, 2004). Interference level 3 situation awareness is interpreted by the authors as anticipation and projection of conditions in the near future then based on current condition information to make decisions and actions. Furthermore, situation awareness tasks include one task test blocks where only one information is the focus and multiple task test blocks, where level 1, level 2 and level 3 situation awareness information needs to be managed during the trials (this data is analyzed).

The results of the analysis of situation awareness in terms of directions provide evidence of differences in situation awareness level 1 and level 3. Situation awareness level 1 as a level of perception is related to landmark knowledge that becomes a stimulus from the environment for individuals to identify the location of a building,

signs or other environmental property. This level of perception of situation awareness is influenced by the choice of individuals that prefer to use visual directions also in the form of a map, verbal instructions and both choices (Brunye & Taylor, 2008; Meilinger & Knauff, 2008; Lerik, Hastjarjo, & Dharmastiti, 2016). These three choices of directions when compared were found to be the highest choice of verbal instructions, this is supported by the results of the study of Brunye & Taylor (2008) which states that when individuals get verbal instructions to follow a route to a location, verbal instructions form mental spatial models or commonly known as cognitive maps.

Situation awareness level 3 as a level of anticipation or prediction of conditions in the near future then also gets influence from directions that utilize the choice of map directions, verbal cues and both. This is supported by Hirtle, et al. (2010) that states situation awareness as spatial awareness is part of survey knowledge that provides opportunities for individuals to plan new routes, shortcuts, and detours. Situation awareness level 2 which is an integration of the environmental situation was found not to be influenced by the choice of map directions, verbal instructions or both. The cause of this situation is not yet known, further research needs to be done.

The analysis shows that situation awareness is not influenced by individual sense of direction. This may occur because self-sensitivity reports as individual potential are associated with the performance of navigation tasks in previous research (Hegarty, Montello, Richardson, Ishikawa, & Lovelace, 2006; Hund & Nazarczuk, 2009; Labate, Pazzaglia, & Hegarty, 2014). In contrast to this research that links the sense of direction with the situation awareness virtually. Therefore, further research is needed.

Situation awareness level 3 based on gender found differences. These results are consistent with the situation awareness theory which states that situation awareness is a hierarchical level where level 3 includes level 2 and level 1, and level 2 includes level 1 (Endsley, 1995).

5 CONCLUSION

The choice of directions in the form of maps, verbal instructions and choice of map directions and verbal instructions when navigation affects individual differences in situation awareness at level 1 and level 3. The choice of directions turns out to be

found no difference in individual level 2 situation awareness. There was no apparent difference in direction sensitivity in individuals in situation 1, 2 or 3 level awareness. Gender was significantly different in level 3 situation awareness, women were higher than men.

Further research that looks at sense of direction and choice of directions is very important to do by linking the scale of self-reports to the performance of behaviors in the real environment. Experimental research is needed to measure situation awareness variables related to route knowledge in an effort to find a location.

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