A RESEARCH ON PSYCHOTECHNICAL TESTS USED IN HUMAN RESOURCES PRACTICES

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ABSTRACT

Psychotechnical tests are used in many areas such as the recruitment of employees, their placement in the appropriate job, and the evaluation of their performance in human resources practices. And with the use of these tests, it helps organizations to employ the right people for the job and to increase the performance of their employees and therefore organizations. One of the most used methods in psychotechnical evaluation is the Vienna Test System (VTS). Determination Test (DT) and Cognitrone Test (COG), two of the most used tests in VTS, were used as measurement tools in this study. While the COG test fundamentally measures attention, DT measures the speed and quality of response to stimuli. The aim of this study is to determine the success of the employees in the COG and DT, according to their educational status and age, and to determine whether there is a difference between them. For this purpose, tests were applied to 3222 blue-collar employees working in Kocaeli and Istanbul in Türkiye. According to the results obtained, as the education level of the employees increases, their success in these tests increases, and as their age increases, their success decreases. In line with these results, some suggestions were presented to managers and researchers.

***Keywords**: Psychotechnical Tests, Human Resource Practices, Vienna Test System, Cognitrone Test, Determination Test*

INTRODUCTION

In today's ever-growing intense competition conditions, the most important strategic success factor of organizations is seen as "human". With the changes in the globalizing business environment, the demands and expectations of both internal and external customers are increasing, and institutions are forced to strengthen themselves strategically and maintain their competitive advantage by constantly renewing themselves. The quality of the workforce they employ and their adaptation to the job are very important for organizations to maintain their competitive advantages.

In human resources management, hiring the "right people for the right job", adapting the hired people to the business processes, providing rotation to the employees in line with their skills, abilities and training are critical factors for increasing the success of the companies. The people who make up the organization perform differently from each other in line with their skills, knowledge, interest and attention to work. Due to the rapidly changing ways of doing business and customer expectations, companies must accurately define their way of doing job. In addition to this, they should recruit individuals with the personality, intelligence, abilities, and skills appropriate to the jobs they describe (Yalçınay, 2000). Psychotechnical tests are of great importance for the successful realization of these processes. According to Telman (1998); in line with psychotechnical tests, employees who are suitable for the requirements of the job can be recruited, and thus companies provide significant gains. While hiring the unsuitable employee costs the businesses very expensive and it can cause the businesses to face various problems (Kutaniş and Elçi, 2006).

Psychotechnical tests uses sensitive, standard and objective test systems to measure cognitive and psychomotor abilities of individuals such as attention, perception, reasoning, coordination (Amado et al.,

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2015). Psychotechnical assessment methods provide information to the observer by measuring the physical and psychological adaptation of individuals against standardized tasks in a computer environment and ranking them in age and education level categories (Özkan, 2002). In addition, by means of psychotechnical evaluation tests, organizations can shorten the time required for personnel procurement by making objective evaluations of the personnel suitable for their needs and saving time (Almeida, 2018).

The aim of this study is to measure the success of the employees according to their age and educational status with the Cognitrone Test and the Determination Test, which are two of the most used tests in the Vienna Test System. It is believed that this research will make two important contributions to the literature. First: Although significant contributions of the use of psychotechnical tests to the organizations, it is seen that there are not many studies conducted in the organizations in Türkiye regarding the "Vienna Test System" (VTS), which is very frequently used in psychotechnical evaluation. For this reason, it is believed that this study will contribute to the related literature. Second: In this study, it is investigated whether the success in the DT and COG tests, which are two of the most used tests in VTS, varies according to education and age. While the DT test measures attention in general, the COG test measures response speed and quality. Because of the high level of dopamine in the female brain, they are more attentive than men. In addition, attention deficit more often diagnosed in males than females (2–9 fold more prevalent in males) (Andersen and Teicher, 2000). For this reason, the issue of “attention” becomes a more important factor for male employees. Therefore, only male employees were chosen for this study. In this respect, it is believed that the study will contribute to the literature.

LITERATURE REVIEW

Vienna Test System

The Vienna Test System (VTS) is a valid and reliable instrument developed by Schucfried, which includes numerous tests (Ong, 2015). There are four special versions of the Vienna Test System (VTS) produced for the application areas of Human Resource, Neuro, Traffic and Sport. The human resources part of VTS includes personnel selection, personnel development and career counselling. Many tests include various forms of varying difficulty and length. It is designed to be used with specific groups (e.g. children, gifted individuals) or for specific measurement purposes (e.g. screening) (Schucfried, 2012). Because of this feature, the same test can be used in very different contexts.

Cognitrone Test (COG)

This test is based on Reulecke's (1991) model, which sees concentration as a state that can, in principle, be defined by 3 variables. These three variables are energy, function and precision. 1. Energy: the concentration state is demanding and consumes energy; 2. Function: the function of concentration in performing a task; 3. Precision: the quality of task performance. In the test forms with unlimited working time the variable “Energy” as defined by Reulecke (1991) is measured by the time taken at a pre-set level of precision and function.

In the COG test, attention and concentration are evaluated by making comparisons according to the congruence of the figures. This test can be applied to people older than 4 years old. This test has an animated instruction phase and an error-sensitive execution phase. In test forms where the working time is adjusted according to the user, what the respondent has to do is to compare the figure she/he sees on the screen with the model and decide whether the two are the same. If the figure below matches the one above, it is expected to press a key, and if it does not, a different key is expected to be pressed. Once the answer has been entered the next item follows automatically. It is not possible to skip a question or go back to the previous one (Schucfried, 2012).

There are six test forms with free working time and two test forms with a fixed working time of 1.8 seconds per item. The test usually takes between 5 and 20 minutes (Schucfried, 2012).

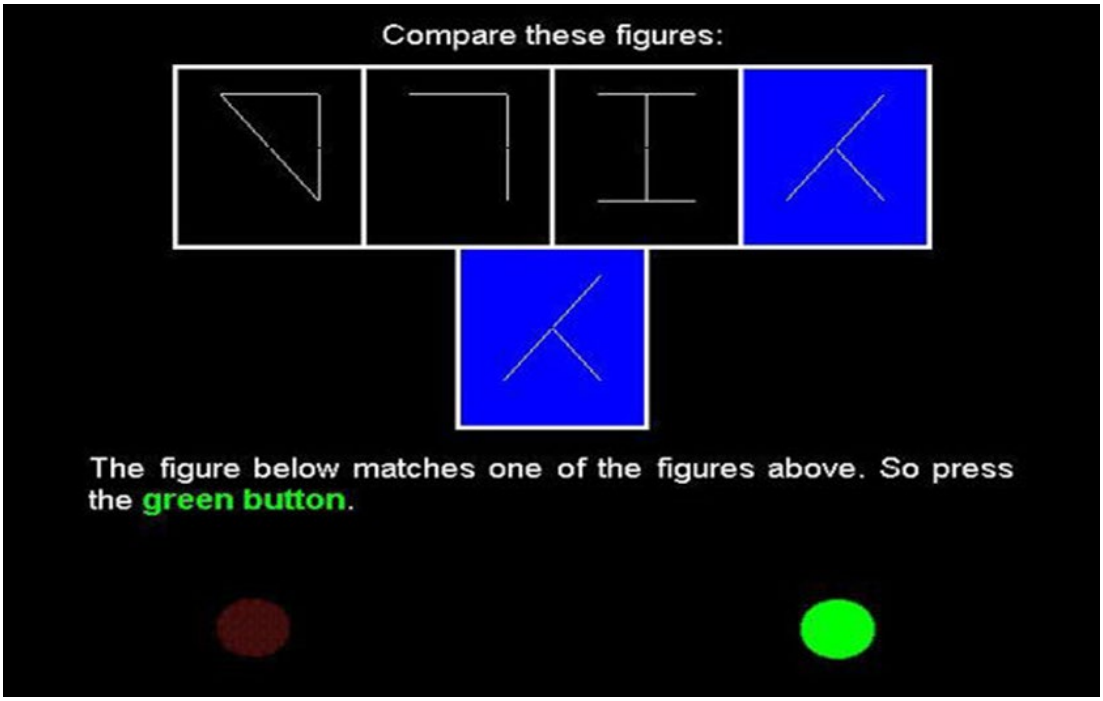

Figure 1: Visual "correct yes" for the Cognitrone test

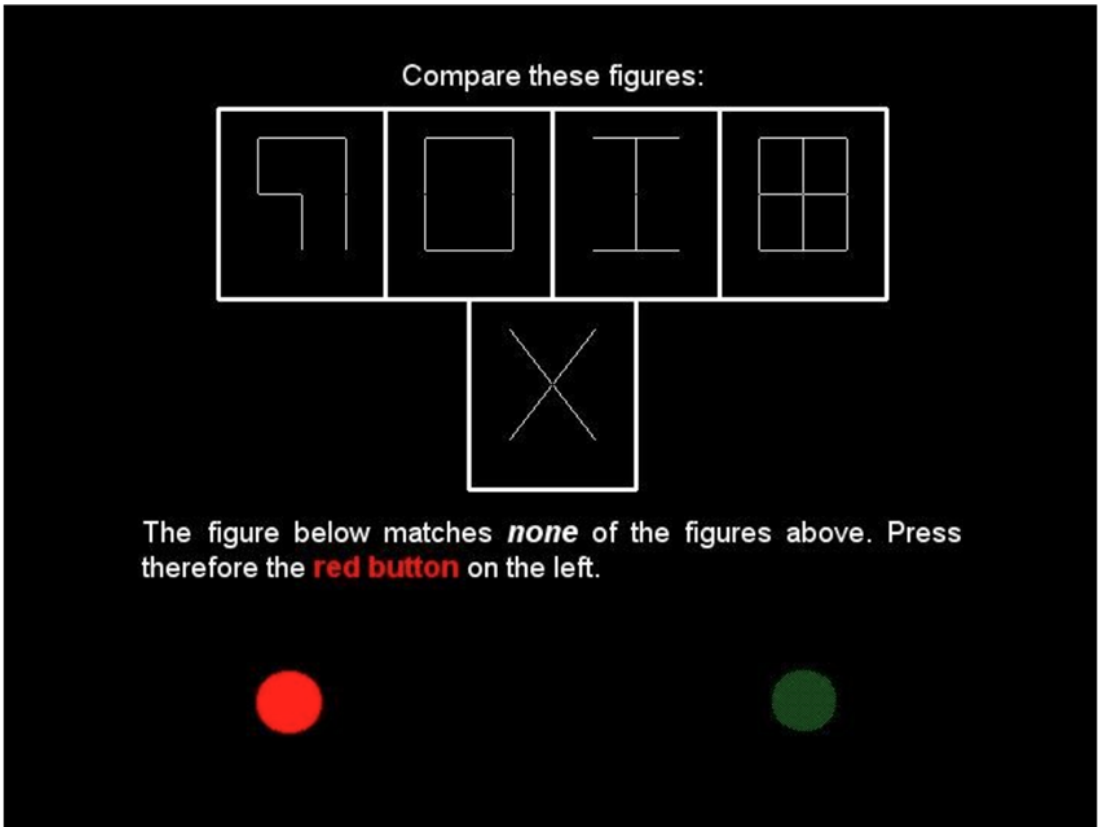

Figure 2: Visual “correct no” for the Cognitrone Test

Determination Test (DT)

The DT Test is used to measure response speed and quality and stress tolerance. The test requires the respondent to use his cognitive skills to distinguish different colours and sounds, to memorise the relevant characteristics of stimulus configurations, response buttons and assignment rules, and to select the relevant responses according to the assignment rules laid down in the instructions and/or learned in the course of the test. The difficulty of this test arises from the need to give continuous, rapid and varied responses to different rapidly changing stimuli (Schucfried, 2012).

There are 6 different test forms that vary according to the reaction mode, length and stimulus material. The duration of the test, which varies according to different forms, is between 6 and 15 minutes on average (Schucfried, 2012).

Figure 3: Stimulus visual of DT test

HYPOTHESES DEVELOPMENT

The Relationship Between Attention and Age & The Relationship Between Attention and Education

The Cognitrone Test is used to measure selective attention and speed processing. Due to their physical weakness, the psychomotor performances of the elderly, such as speed processing and selective attention, are affected (Irandoust and Taheri, 2017). While attention is defined as the concentration of limited mental effort on sensory or physical events, it can also be called giving up on some stimuli in order to better deal with others (Bayraktar, 2017). It has been determined that there is a relationship between attention and age. Attention skill continues to develop in childhood and adolescence, and then this ability is negatively affected depending on age (Yang et al., 2020). In a study conducted in a group with an average age of 42 years, it was observed that the success in attention tests differed statistically

between the young group and the elderly group, and age had a negative effect on attention skills (Vetter, 2018).

In addition to this, education level is one of the factors that increase attention (Goldstein, 2013). In a study conducted on machinists, in which selective attention was discussed, it was found that the success in the selective attention test was positively related to the level of education (Tabai et al., 2017). In a study conducted on drivers, it was found that as the education level of the drivers increased, the number of correct answers to the test increased. And, it is thought that attention is important in order to create a safe traffic environment, and the level of education plays a decisive role in improving attention skills (Amado et al., 2004). In line with these information:

H_1: There is a negative relationship between the age of the employees and their success in the Cognitrone tests.

H_2: There is a positive relationship between the education level of the employees and their success in the Cognitrone tests.

The Relationship Between Response Speed and Quality and Age & The Relationship Between Response Speed and Quality and Education

The response speed and quality is the state of being ready to take action against external stimuli. While the response speed is called the response given in the shortest time from the moment the stimulus comes, response quality means that the stimulus responds in accordance with psychomotor maturity skills (Erdemir, 2018). Vienna Determination test is a complex psychomotor skill measurement test that can send more than one stimulus at the same time and respond to these stimuli by pressing the appropriate button on the button connected to the system on the computer (Duman and Tuzgöl, 2019). In the Determination Test, participants are expected to respond quickly and accurately to existing stimuli (Ong, 2017). Age is negatively associated with success in the computer-generated simple and optional reaction test (Ball et al., 1999). Because, as people's age increases, their reaction speed to stimuli decreases (Hoffmann et al., 2014). Age was found to be negatively correlated with response speed and quality (Amado et al. 2004), and in a study conducted among young, middle and elderly groups, it was observed that reaction time and age were negatively related (Der and Deary, 2017). In another study on drivers, participants were divided into four different age groups. And when the relationship between the tests of determination (the response speed and quality test) and their age was examined, it was revealed that the response speed and quality changed negatively as the age increased (Duman and Tuzgöl, 2019).

Also, education level is one of the factors that improve perception and decision making skills. The higher the education level, the faster people respond to stimuli (Ng and Chan, 2012). In a study examining behavior in the traffic environment, it was found that there were significant differences in the speed and quality of the response to stimuli with the level of education (Amado et al. 2004). In the study carried out by Özkan (2002), psychotechnical tests such as monotonous attention test, selective attention test, coordination test and reaction time test were applied to 128 drivers. According to the results obtained, it was observed that as the education level increases, the response speed and the number of correct responses increase. In line with these information:

H_3: There is a negative relationship between the age of the employees and their success in the Determination Test.

H_4: There is a positive relationship between the education level of the employees and their success in the Determination Test.

METHODOLOGY

Sampling

Attention deficit is seen 2-9 times more prevalent in men than in women (Andersen and Teicher, 2000). For this reason, attention may be more important in male employees. Therefore, it was decided that the sample of this study would be men. All of these participants, with a total of 3222 people, are blue-collar workers. The data was collected in the Marmara Region, where the most intense industrialization in

Türkiye. Most of the industrialization in this region is in the cities of Istanbul and Kocaeli, and our participants also work in these cities.

When the age distribution of the participants is examined; it was determined that 30.9% were between the ages of 35-45, 25.9% were between the ages of 25-35, and 25.9% were between the ages of 45-55. Considering their educational status, the majority of them are primary school graduates with 38.9%. 28.5% of our participants are high school graduates and 23.7% of them are secondary school graduates. The rest are vocational high school graduates or university graduates. The majority of our participants work in the transportation sector (47%). 23% of the participants work in the logistics sector, 7% in the metal sector and the rest work in different sectors such as metal and tourism.

Validity and Reliability

For the Cognitrone Test**,** many studies of different aspects of validity (content validity, convergent and discriminant validity, construct validity, criterion validity) have been carried out; all these studies indicate that the test is valid. And in all the reliability studies conducted for this test, the reliability coefficient was found above .95 (Schucfried, 2012).

The Determination Test was found to be valid in all studies performed. And, for all test forms the internal consistencies for the main variables lie between r=0.98 and r=0.99 (Schucfried, 2012).

Hypotheses Test

First, ANOVA analysis performed to determine whether there was a significant difference between the groups. According to the results of the analysis, it was determined that the variances were not equal because the Levene's test value was less than 0.05. Therefore, ANOVA analysis with Welch correction was then performed. The four ANOVA analyzes performed were also applied with the same method. According to all ANOVA analysis results obtained; it was found that there was a difference between the groups ($p<0.05$) (As seen in Tables 1,2,3 and 4).

After determining that there is a statistically significant difference between the groups, the Tamhane test, which is used in cases where the variances are not equal, was applied to determine between which groups there was a difference.

As seen in Table 1; first one way ANOVA model is significant ($F=22,737$; $p<0.05$). According to the results; employees between the ages of 18-25 are statistically more successful in the COG test than employees between the ages of 45-55 (mean difference: 4,118) and employees over the age of 55 (mean difference: 10,625). And, employees between the ages of 25-35 are statistically more successful in the COG test than employees between the ages of 45-55 (mean difference: 5,975) and employees over the age of 55 (mean difference: 12,482). Finally, employees between the ages of 35-45 are statistically more successful in the COG test than employees between the ages of 45-55 (mean difference: 4,405) and employees over the age of 55 (mean difference:10,911). According to these results it is said that there is a negative relationship between the age of the employees and their success in the Cognitrone tests. In other words, as the age of the employees increases, their success in the COG test decreases. So, H1 hypothesis is supported.

Table 1: One way ANOVA results showing the relationship between the age of the employees and their success in the Cognitrone Test

Factor	Age	Mean	Std. Deviation	F	P	Tamhane Test Result	Mean Difference
Success in the COG	a) 18 – 25	180,89	17,402	22,737	,000	a > d	4,118*
						a > e	10,625*
	b) 25 – 35	182,74	13,516			b > d	5,975*
						b > e	12,482*
	c) 35 – 45	181,17	17,294			c > d	4,405*
						c > e	10,911*
	d) 45 – 55	176,77	19,764				
	e) 55 +	170,26	26,419				

As seen in Table 2, second one-way ANOVA model is significant (F=101,969; p<0.05). According to the results; employees who are primary school graduates are statistically more unsuccessful in the COG test than secondary school graduates (mean difference:-5,685), high school graduates (mean difference:-11,480), vocational high school graduates (mean difference:-13,588) and university graduates (mean difference: -15,732). And, employees who are secondary school graduates are statistically more unsuccessful in the COG test than high school graduates (mean difference: -5,795), vocational high school graduates (mean difference: -7,903) and university graduates (mean difference: -10,047). Finally, employees who are high school graduates are statistically more unsuccessful in the COG test than vocational high school graduates (mean difference: -2,108) and university graduates (mean difference: -4,252). According to these results, it is said that there is a positive relationship between the education level of the employees and their success in the Cognitrone tests. In other words, as the education level of the employees increases, their success in the COG test also increases. So, H2 hypothesis is supported.

Table 2: One way ANOVA results showing the relationship between the education levels of the employees and their success in the Cognitrone Test

Factor	Education	Mean	Std. Deviation	F	P	Tamhane Test Result	Mean Difference
Success in the COG	a) Primary School	173,64	21,451	101,969	,000	a < b	-5,685*
						a < c	-11,480*
						a < d	-13,588*
						a < e	-15,732*
	b) Secondary School	179,32	18,496			b < c	-5,795*
						b < d	-7,903*
						b < e	-10,047*
	c) High School	185,12	11,624			c < d	-2,108*
						c < e	-4,252*
	d) Vocational High School	187,23	8,680				
	e) University	189,37	9,141				

As seen in Table 3, third one-way ANOVA model is significant (F=276,795; p<0.05). According to the results; employees between the ages of 18-25 are statistically more successful in the DT test than employees between the ages of 35-45 (mean difference: 44,036), 45-55 (mean difference: 117,873) and employees over the age of 55 (mean difference: 183,744). And, employees between the ages of 25-35 are statistically more successful in the DT test than employees between the ages of 35-45 (mean difference: 38,407), 45-55 (mean difference: 112,243) and employees over the age of 55 (mean difference: 178,114). Employees between the ages of 35-45 are statistically more successful in the DT test than employees between the ages of 45-55 (mean difference: 73,836) and employees over the age of 55 (mean difference: 139,707). Finally, employees between the ages of 45-55 are more successful in the DT test than employees over the age of 55 (mean difference: 65,871). According to these results, it is said that there is a negative relationship between the age of the employees and their success in the Determination Test. In other words, as the age of the employees increases, their success in the DT decreases. So, H3 hypothesis is supported.

Table 3: One way ANOVA results showing the relationship between the age of the employees and their success in the Determination Test

Factor	Age	Mean	Std. Deviation	F	P	Tamhane Test Result	Mean Difference
Success in the DT	a) 18 – 25	374,74	90,539	276,795	,000	a > c	44,036*
						a > d	117,873*
						a > e	183,744*
	b) 25 – 35	369,11	94,086			b > c	38,407*
						b > d	112,243*
						b > e	178,114*
	c) 35 – 45	330,71	98,789			c > d	73,836*
						c > e	139,707*
	d) 45 – 55	256,87	104,716			d > e	65,871*
	e) 55 +	191,00	94,735				

As seen in Table 4, fourth one-way ANOVA model is significant (F=129,914; p<0.05). According to the results; employees who are primary school graduates are statistically more unsuccessful in the DT test than secondary school graduates (mean difference: -56,812), high school graduates (mean difference:-90,738), vocational high school graduates (mean difference:-107,509) and university graduates (mean difference: -109,334). And, employees who are secondary school graduates are statistically more unsuccessful in the DT test than high school graduates (mean difference: -33,926), vocational high school graduates (mean difference: -50,698) and university graduates (mean difference: -52,523). Finally, employees who are high school graduates are statistically more unsuccessful in the DT test than vocational high school graduates (mean difference: -16,772) and university graduates (mean difference: -18,597). According to these results, it is said that there is a positive relationship between the education level of the employees and their success in the Determination Test. In other words, as the education level of the employees increases, their success in the Determination Test also increases. So, H4 hypothesis is supported.

Table 4: One way ANOVA results showing the relationship between the education level of the employees and their success in the Determination Test

Factor	Education	Mean	Std. Deviation	F	P	Tamhane Test Result	Mean Difference
Success in the DT	a) Primary School	266,08	111,523	129,914	,000	a < b	-56,812*
						a < c	-90,738*
						a < d	-107,509*
						a < e	-109,334*
	b) Secondary School	322,89	106,986			b < c	-33,926*
						b < d	-50,698*
						b < e	-52,523*
	c) High School	356,82	98,765			c < d	-16,772
						c < e	-18,597
	d) Vocational High School	373,59	95,081				
	e) University	375,42	90,652				

Conclusion and Discussion

This research was carried out to compare the success of the employees in the DT and COG tests, which are two of the most used tests in psychotechnical tests, according to their education level and age. According to the results of our research; as the age of the employees increases, their success in both tests decreases. However, as the education level of the participants increases, their success in both tests increases. In other words, it can be stated that younger employees can work more carefully at the workplace, respond more quickly and accurately to stimuli from their managers or colleagues, and manage their stress better than elderly employees.

The first of the findings we obtained in this study; There is a negative relationship between the age of the employees and the attention they display at work. This result is compatible with other studies in the literature (Yang et al., 2020; Vetter, 2018). Our second finding; there is a positive relationship between the education levels of the employees and their attention levels in the workplace. This result is also compatible with the studies in the literature (Tabai et al., 2017, Amado et al., 2004). Our third finding; the age of the employees and the speed and quality of their reaction to the stimuli in the workplace have a negative relationship. This result also supports other studies in the literature (Amado et al. 2004; Duman and Tuzgöl, 2019). Finally, we found that the education level of the employees and the speed and quality of their response to stimuli in the workplace were positively related. This, like our other results, is consistent with the literature (Ozkan, 2002).

In line with the results of this research, some suggestions can be made to the managers. First of all, in today's intense and competitive working conditions, managers must make use of psychotechnical tests in line with their needs in order to employ the right people for the right jobs. Because the employment of unsuitable people can bring very serious negative consequences to organizations. If employee who are not suitable for the job are hired, there may be a decrease in performance, the person may not be able to adapt to the corporate culture (Güler and Özdemir, 2017), the dissatisfaction with the job and the intention to leave the job may increase, and the motivation of both the employee and other employees may be adversely affected (Temiz and İnan, 2016). When the employees is in harmony with their work and environment, their productivity increases, the morale of the employees rises, and the employees' commitment to the organization increases (Bingöl, 2016).

Moreover, we can also make some more specific suggestions in line with the area of specialization of our work. Managers may prefer younger employees rather than older employees for jobs that require intense attention, in recruitment processes or rotation processes in the workplace. In addition, it is seen that the education level of the employee is also very important in such jobs. Likewise, in jobs where there are many stimuli and it is very important to react quickly and accurately to these stimuli, young and highly educated employees can be benefited. In addition, employees can be regularly subjected to attention tests after they pass a certain age, and if there is a decrease in their attention, the organization can carry out studies to improve the attention of these employees. Also, older employees can contribute to the organization by taking a greater role in jobs that require more knowledge and experience.

Our research has some limitations, as in all scientific research, and these limitations can be a guide for future research. First of all, we selected male employees as the participants of this study, as women's attention level is higher than men in general, which may be more critical for businesses. However, future research can evaluate whether there is a significant difference between them by applying these tests (DT and COG) to both male and female employees. In addition to this, we conducted these tests on blue-collar workers in organizations such as factories where attention, time, speed and mass production are very important. However, in some white-collar jobs, these factors can be of great importance in business processes (accounting, banking, medicine, etc.). Therefore, we suggest that white-collar employees should also be investigated in future studies. Finally, our study was conducted in Istanbul and Kocaeli, two cities in the Marmara Region. Conducting studies in different cities and regions is important for the generalizability of the results.

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