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Physiological Stress Response in a Simulation Exercise of Demonstration Security "Research of Pulse Dynamics, α-amylase Level, and Salivary Cortisol Level at Various Conditions of Working Climate and Methods of the Resting Phase"

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Abstract

This research aimed to evaluate whether the exercise pattern was still in the normal range of the body tolerance and assessed the effectiveness of the restingmethod during the simulation exercise of demonstration security by digging deeper on physiological stress response (pulse, α-amylase, and salivary cortisol), and to know the effect of working climatic conditions. The method used was a quasi-experimental (modification of pretest and posttest control group design)applied to 33 people (total sample)divided into 3 groups where each group consisted of 11 people. Those groups were group A (treatment: not given a resting phase during the simulation exercise of demonstration security), group B (control 1: method of sitting when resting phase), and group C (control 2: methodof standing when resting phase).

Simulation exercise of demonstration securitywas carried out in two working climatic conditions (simulation time), those were the first day at 08:10 to 10:40 am, and two hours later at 12:15 to 03:15 am.

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Measuring pulse dynamics, α-amylase level, and salivary cortisol level was done in every model of the resting phase and working climatic conditions as well as at various observation time (before doing exercise, the first 1 hour of active phase, 30 minutes of resting phase, and the second 1 hour of active phase). Then, descriptive analysis was also donein each point of observation; Wilcoxon test was performed to determine the increase of physiological stress response for 2,5 hours of simulation exercise of demonstration security,the first and the second 1 hour of active phase, and the decrease in resting phase; Kruskal Wallis and Mann-Whitney U test were conducted to prove the difference in the increase of physiological stress responses for 2,5 hours of simulation exercise of demonstration security due to the differences in working climatic conditions and to prove the differences in the increase of psychological stress response due togivethe phase and the resting method; Spearman correlation test was doneto determine the dynamicsrelationship of α-amylaseand salivary cortisol levelswith the dynamic of pulse.

Findings of the research are: (1) Descriptive analysis shows that in both working climatic conditions and the resting phase methods, the dynamics of psychologicalstress response is fluctuated but still in normal limit. (2) The Wilcoxon test to the dynamicsof the psychological stress response shows that after the first 1 hour of active phase, after the second 1 hour of active phase, and after 2,5 hours, it increases significantly ($p<0,05$); after 30 minutes of resting phase, it decreases significantly ($p<0,05$) in each group.

It is also known that sitting rest method is more effective than the standing rest method in decreasing the physiological stress response. (3) Kruskal Wallis and Mann-Whitney U test to the difference in the increase of the psychological stress response shows that at the various methods of the resting phase, the increase response of pulse, level of α-amylase, and level of salivary cortisol are higher in the day simulation timethan in the morningby showing significant differences ($p<0,05$). (4) From Spearman correlation test and multiple linear between the levelsof α-amylase and salivary cortisol to the pulse, it indicates that the pulse is affected by thelevels of α-amylase and salivary cortisol independently, where the level of salivary amylase-α is influenced stronger than the level of salivary cortisol.

Keywords: exercise simulation of demonstration security; physiological stress response (pulse, α-amylase, and salivary cortisol; working climate

1. Introduction

Demonstration is part of the society's dynamics towards the democratization with varying level of perception. There are some people assume that democracy means "permissive" including "may ignore the laws and regulations". Demonstration is an activity done by one people or a group of people to express their aspirations in public. The demonstration itself can be done orally, written, or other means to convey support, protests, or demands safely and orderly. There is difference in importancetowards the implementation of the demonstration between the police and the demonstrators. The police want the implementation of the demonstrationruns peacefully without interrupting the orderliness publicwhile the demonstrators try to voice their aspirations in any way to be heard, even to be an anarchist if necessary. This difference is then led to the clashes between the police and the demonstrators.

If it is faced to an increasingly heavy workload and complex as well as the stronger community demands to the performance and professionalism improvement of the police on the one hand, associated with thelimited aspects from the infrastructure and budget support on the other hand, the police are expected to be able to accommodate the demands from the society, including in the service in demonstrating.

Demonstration occurring in Jakarta and elsewhere in the jurisdiction of Polda Metro Jaya done either by the university students or other elements of the society increases in frequency and leads to theanarchism actions. They do that thing in the hope that they will get much attention so the ideas voiced will be delivered to policy makers. The increased frequency of demonstration in quantity and quality in the capital city makes Jakarta to be a major barometer of security and stability in Indonesia. Among university students and other elements of the society, demonstration is seen as the best way to speechthe demands if the formal channel has blocked. Besides, demonstration is also seen as a tactical way to bring up the public awareness of the issues raised.

To form the police personnel who can control the crowd in a professional manner and in accordance with the procedure, then crowd control practice and the use of power in police action exercise is absolutely necessary. This kind of exercise is done with a certain pattern (in the morning or in the daylight by using clothes like facing the demonstrators), and during the exercise also with a particular method of resting (break in a sitting position and in a standing position). In one session of exercise,the maximum time is 2 hours 30 minutes and resting time given is 30 minutes. This kind of exercise can certainly act as a physic workload andpsychological for mass control police personnel, especially if it is conducted on the climatic conditions of hot work.

Physical workload in the various activities is often defined as the use of physical ability and can be assessed from the high energy consumption and the severity work of the heart and lungs [1]. Physical workload can also be assessed by measuring the changes ofthe heartbeat, oxygen debt, VO_2 max, blood pressure, body temperature, and the presence of urine metabolites and blood markers [2]. Physical workload is also influenced by the working climatic conditions and work clothes. Work environment with extreme temperatures (too cold or too hot) will increase the burden of physical work so it requires the setting hours of working and resting to ensure that workers remain healthy and productive [3]. So does the work clothes, beside the aesthetic function, work clothes also serves as the personal protective equipment. To meet the aesthetic aspect, work clothes should follow the local norm, whereas to fulfill the aspect as personal protective equipment, the work clothes must follow the rules of safety [4]. Work clothes of mass controlpolice personnel when serving the real demonstration and the training is made to be able to face the threat of a risky task to the blunt and sharp object. However, it seems tight and heavy so it will increase the physical workload for wearing that. Up to now, relevant research data related to the Physiological Stress Response in Simulation Exercise of the Demonstration Security have not been found.

2. Research Method

2.1. Research Design

This research used a quasi-experimental design with pretest and posttest control group design modifications.

2.2. Material

Salivary α-amylase assay kit (α-amylase substrate, α-amylase control, α-amylase diluent), and salivary cortisol EIA kit (cortisol standards, cortisol controls, wash buffer concentrate, assay diluent, cortisol enzyme conjugate).

2.3. Tool

Scales up, the meter gauge height, sphygmomanometer mercury, stethoscope, Step Harvard (height 45 cm), stop watch, metronome, WBGT (Wet Bulb Globe Temperature), tube saliva and equipment, and manual simulation exercises of demonstration security.

2.4. Method of Sampling

1. Calculation of the Body Mass Index (BMI): BMI calculation was done to obtain theresearch subjects with normal BMI category (18,5 to 22,9). Body Mass Index (BMI) is a standard ratio of weight to height (primary data).
2. Heart-lung capability assessment by Harvard Step Test: Harvard Step Test was done to obtain the ability value of the heart-lung from the research subjects whose BMI is normal or classified as average (65-79). With the reason that from the total research population, most of them have value of Harvard Step Test as an average and no one has a good or an excellent value (primary data).

2.5. Measurement of WorkingClimatic Condition

The tool used was WBGT (Wet Bulb Globe Temperature) in ^{0}C. This tool takes the contribution factor of air temperature, air movement speed, heat radiation from the hot objects, and the cooling effect of sweat evaporation into account. To read the results accurately, it takes 20 minutes. The formula used to calculate WBGT in the open workplace is: WBGT = 0,7 x wet thermometer temperature + 0,2 x globe thermometer temperature + 0,1 dry thermometer temperature (primary data) [5].

2.6. Saliva Sampling and Laboratory Checkup

1. Saliva sampling time: Before the simulation exercise of demonstration security (to either the treatment group or the control group), there were no eating, no drinking, no smoking, and no brushing teeth. At least 1 hour before taking sample, saliva was submitted in the morning (the first day in sampling) and in the afternoon (the second day in sampling). After the simulation exercise of demonstration security for an hour to the treatment group, they were given resting time. After taking a rest for 30 minutes and after the simulation exercise of demonstration security finished (to either the treatment group or the control group), the research subjects can drink water.
2. The way to collect saliva specimen (Vining RF, McGinley RA, 1987): Collect saliva according to the schedule that had been set. When it was difficult to produce saliva, it could be stimulated by pressing the tip of the chin hard. Open the tube cover to collect saliva then spit into the tube. Fill the tube up to ± 2 ml and close the tube again. Label and glue it. Fill the request form along with the date and time of saliva collection.

3. Delivering and storing specimens of saliva: Saliva specimens were brought to the laboratory. Hormones in saliva were stable at temperatures of minus 20 °C for 6 months. In the laboratory, the specimen was kept at the temperatures of minus 20ºC until the time of checkup.

4. Laboratory checkup: Checking the saliva samples up to determine thelevels of salivary α- amylase and salivary cortisol hormone in the laboratory of Research & Esoteric Prodia, Jl. Kramat Raya No. 150 Jakarta 10430. It could be obtained directly from the respondent (primary data).

2.7. Data Analysis (data analysis was done by using SPSS version 23)

1. To illustrate the dynamics of increased pulse rate, levels of α-amylase and salivary cortisol during the simulation exercise of demonstration security for 2,5 hours at the Unit of Mass Control Polda Metro Jaya, a descriptive analysis was conducted at each point of observation.

2. To know the increase of pulse rate, the levels of α-amylase and salivary cortisol of simulation exercise of demonstration security were measured for 2,5 hours. The first 1 hour of active phase, the Wilcoxon test was used to know the decrease in the pulse rate in a resting phase; and to prove the difference increase in the pulse rate, level of α-amylase, and level salivary cortisol during the simulation exercise of demonstration security 2,5 hours due to the different working climatic conditions (simulation time), Kruskal Wallis and Mann-Whitney U test were used.

3. To prove the difference increase in the pulse rate, levels of α-amylase and salivary cortisol due to give resting phase between two active phases of simulation exercise of demonstration security and prove the difference increase in the pulse rate based on the existing of different resting method, Kruskal Wallis and Mann-Whitney U test were used again.

4. To know the dynamics relationship of the levels of salivary α-amylase and salivary cortisol with the pulse dynamics, Spearman correlation test was conducted.

3. Results and Discussion

3.1 Characteristics of the Research Subjects

In this research, the population was the Mass Control Unit of Sabhara Directorate of Polda Metro Jaya, notthe Unit Controller of Riot Brimob because the Mass Control Unit of Sabhara Directorate has the main task to give secure ofthe demonstration and to create the peaceful situation. The unit of Car Brigade will be deployed in safety demonstrations with escalation that has increased and led to chaos or anarchy.

Table 1: Characteristics of the Research Subjects

No	Variable	∑ Research Subject	Average Value ± SD	Range Value
1.	Age (years)	33	20,09 (1,42)	18 - 22
2.	Body Mass Index (kg/m^2)	33	20,54 (1,30)	19 - 23
3.	Harvard Step Test	33	71,12 (5,00)	65 - 79

In this study by using a non-random sampling, there were 33 people who met the criteria for inclusion and exclusion. As the subjects of this research, they were expected to be the representatives of the research population. That was Mass Control Unit Personnel of Sabhara Directorate Polda Metro Jaya.

Determination of the total sample of 33 people was more likely based on the justification of the researchers (that in providing security services for demonstration, at least 1 platoon or as many as 30 people were sent), not based on a calculation formula of sample size which was appropriate because there was no data found about the value of standard deviations from the relevant literature.

The average age of the subjects was 20,09 years (Table 1). This is equivalent to the age of the undergraduate students of fifth or sixth semester, who have an attitude of idealism in voicing the social problems and possibly immature emotional level. The subjects of the research had a mean of BMI amount of 20,54 (Table 1), which was classified as normal, with the hope of being able to perform the entire session of exercise training without getting obstacles with the body posture that was not ideal. The average value of Harvard Step Test subjects was 71,12 (Table 1), which was classified as average (65-79), not being selected who had a grade value of Harvard Step Test (80-89) or classified as very good (≥ 90). Because the research population was included in the Harvard Step Test as many as 60 people, none of the subjects had a value of Harvard Step Test which was classified as good or excellent. This could happen because possibility, among of the Personnel Mass Control Unit of Sabhara Directorate Polda Metro Jaya, after graduating from the Bintara Police education, they did not consistently maintain their fitness or even tent to enjoy their freedom after leaving education.

1. Descriptive Analysis of the Pulse, the Level of α-amylase, and the Level of Salivary Cortisol

Variations of pulse on all subjects during the researchwere ranged of 48-180 x/minute (Table 2). There was a subject with a 48 x/minute of pulse before doing exercise in the morning (classified as low pulse). After doing exercise for 2,5 hours, it became 80 x/minute. Then, in the day practice session, pulse before exercisewas 80 x/minute and after exercise for 2,5 hours was 120 x/minute. This likely occurred because of a mistake in counting the time before exercise in the morning. Such that argument was needed to be strengthened by the non-occurrence of health problems during the practice session took place.

From Table 2, it was found the variation in the value of the highest pulse on a subject, which was180 x/minute (simulation time in the day with the method of standing when resting phase). This value was within the tolerance limit of the maximum pulse (maximum pulse rate is 220 - age). The data in Table 1 showed that the average age of the subjects was 20,09 years, so that the maximum pulse rate was 200 x/minute. But this value pulse had exceeded the training zone, which was 70%-85% from the maximum pulse rate or 140-170 x/minute. From these data provided, an understanding can be got that simulation exercise of demonstration securityin the day session are not recommended.

In Table 2, the pulse dynamics during the simulation exercise of demonstration security, which lasted for 2,5 hours as a result of differences in working climatic conditions (simulation time) as well as the provision of a resting phase in the treatment group, increased steadily without any loss.

While in the control group, it was fluctuated, which increased in the first 1 hour of active phase, decreased after 30 minutes resting phase, and increased again in the second 1 hour of active phase. Pulsation isthe frequency of the wave of blood flowing through blood vessels as a result of a heartbeat that can be palpated on the skin surface in some certain places. Normal adult pulse rate is 60-100 beats/minute [3]. Itindicates also that the pulse among others is influenced by the intensity and duration of work, work attitude, physical factors, and psychological condition [6].

While the levelsdynamics of α-amylase and salivary cortisol follows the same pattern as the dynamics of pulse (Table 2). Salivary α-amylase level was ranged from 6,6 to 1469,4 U/mL, while the normal values are 3,1 to 423,1 U/mL. There was a unique subject in group C during the simulation time. He has a value of α-amylase varies between 497,25 to 1469,4 U/mL, far above the normal value, while his value of α-amylase in the morning exercise session was between 209,26 to 294,87 U/mL (within the normal limits). This occurred probably because this subject truly addressedthe simulation exercise of demonstration security in the dayexercise session as a stressor heavy work.

Morning salivary cortisol level in the subjects was ranging from 0,065 to 0,505 µg/dL and normal values of morning salivary cortisol level is 0,094 to 1,551 µg/dL. It meant that everything was within the normal limits. While the salivary cortisol level during the day in the subjects was ranging from 0,007 to 0,756 µg/dL and normal values for salivary cortisol during the day is ND –0,359 µg/dL. After the data was analyzed deeper, in group A (treatment: simulation exercise of demonstration security session continuously for 2,5 hours without resting) simulation time during the day, there were 6 subjects with cortisol values above 0,359 µg/dL, which meant thatsimulation exercise of demonstration security program in the daylight was really a stressor heavy work [7,8].

Table 2: Descriptive Analysis of the Research Variables

Working Climate Conditions (Simulation Time)	Method of Resting Phase	Standard Deviation				Min/Max
		Before (beginning)	The First 1 Hour of Active Phase	30 Minutes of Resting Phase	The Last 1 Hour of Active Phase	Total
		Pulse (x/minute)				
I (08.10-10.40)	A	82,9(15,9)	-	-	101,8(10,9)	48/120
	B	87,1(11,7)	98.7 (6,9)	84,4(9,2)	101,1 (8,6)	68/120
	C	95,3 (8,7)	101,5 (5,4)	92,9(3,2)	105,5 (7,9)	80/120
II (12.45-15.15)	A	98,9 (8,8)	-	-	139,1(14,8)	80/160
	B	93,8(14,9)	112,7(15,2)	100,7(16,7)	116,4(14,6)	68/140
	C	99,6 (7,3)	118,5 (9,2)	100,4 (9,2)	134,5(19,5)	80/180

		Salivary α-amylase Level(U/mL)				
I (08.10-10.40)	A	94,1 (71,8)	-	-	182,9 (84,2)	6,6/303,7
	B	141,9 (77,3)	211,1 (74,0)	143,9 (78,1)	210,2 (75,5)	37,0/311,6
	C	146,2 (66,7)	213,7 (51,7)	162,7 (50,1)	244,6 (57,6)	38,1/319,8
II (12.45-15.15)	A	125,9 (86,5)	-	-	321,4 (98,4)	12,1/451,0
	B	224,3(150,4)	395,1(250,6)	245,1(208,9)	376,4(394,1)	40,7/1469,4
	C	189,2(104,5)	287,0(116,3)	242,6 (97,2)	330,2(146,3)	66,3/703,2
		Salivary Cortisol Level (µg/dL)				
I (08.10-10.40)	A	0,132 (0,046)	-	-	0,196(0,049)	0,07/0,29
	B	0,115 (0,047)	0,219(0,134)	0,119(0,042)	0,155(0,057)	0,07/0,51
	C	0,121 (0,033)	0,172(0,057)	0,123(0,031)	0,158(0,048)	0,07/0,30
II (12.45-15.15)	A	0,128 (0,064)	-	-	0,431(0,186)	0,06/0,76
	B	0,172 (0,071)	0,246(0,091)	0,198(0,111)	0,251(0,112)	0,07/0,48
	C	0,128(0,0391)	0,184(0,061)	0,124(0,038)	0,167(0,048)	0,06/0,31

A=treatment without resting phase; B=control 1, sitting when resting phase; C=control 2, standing when resting phase; Min=minimum; Max=maximum

2. Analysis of the Pulse Rate Changes, Levels of α-amylase and Salivary Cortisol before and after Simulation Exercise of Demonstration Security for 2,5 Hours

Based on the analysis (Table 3), it can be seen that the pulse, the levels of α-amylase and salivary cortisolafterthe simulation exercise of demonstration security for 2,5 hours increased significantly ($p < 0.05$) in each group. After the Wilcoxon test was done, it showed that there was a significant increase ($p<0,05$) in each group. This meant that simulation exercise of demonstration security for 2,5 hours significantly increased the pulse rate, levels of α-amylase and salivary cortisol at various working climatic conditions (simulation time), and methods of resting [9].

In Table 3, it indicated that the increase of pulse rate, levels of α-amylase and salivary cortisol were highest in the group IIA (treatment: simulation time in the day). That was an increase of 40,2 x/minute pulse, the level of salivary α-amylase increased 195,5 U/mL, and the level of salivary cortisol increased 0,30µg / dL of the mean.

After the Mann-Whitney U test was done, it showed that there was a significant difference (p<0,05) between groups IIA and IA (treatment:simulation time in the morning);as well asbetweengroup IIC (simulation time in the daylight and standing when resting phase) was higher than the group IC (simulation time in the morning and standing while resting phase); between IIB (simulation in the daylight and sitting while resting phase) and IB (simulationin the morning and sitting while resting phase). This means that the increased response of pulse rate, levels of α-amylase and salivary cortisol are higher during daylight simulation than pulse response during morning simulation on some various methods of the resting phase [10,11,12].

Table 3: Changes in thePulse Rate, Levels of α-amylase and Salivary Cortisol Post Simulation Exercise of Demonstration Security for 2,5 Hours on Two Resting Methodsand Working Climatic Conditions (Simulation time)

Working Climatic Conditions (Simulation Time)	Methods of Resting Phase	Standard Deviation			p*
		Beginning	Ending	Changes	
		Pulse (x/minute)			
I	A(n=11)	82,9(15,9)	101,8(10,9)	18,9	<0,001
	B(n=11)	87,1(11,7)	101,1 (8,6)	14,0	0,001
(08.10-10.40)	C(n=11)	95,3 (8,7)	105,5 (7,9)	10,2	0,016
II	A(n=11)	98,9 (8,8)	139,1(14,8)	40,2	<0,001
	B(n=11)	93,8(14,9)	116,4(14,6)	22,5	<0,001
(12.45-15.15)	C(n=11)	99,6 (7,3)	134,5(19,5)	34,9	<0,001
		α-amylase Level(U/mL)			
I	A(n=11)	94,1 (71,8)	182,9 (84,2)	88,8	0,003
	B(n=11)	141,9 (77,3)	210,2 (75,5)	68,3	0,002
(08.10-10.40)	C(n=11)	146,2 (66,7)	244,6 (57,6)	98,4	0,003
II	A(n=11)	125,9 (86,5)	321,4 (98,4)	195,5	0,003
	B(n=11)	224,3(150,4)	376,4(394,1)	154,4	0,059
(12.45-15.15)	C(n=11)	189,2(104,5)	330,2(146,3)	141,0	0,003
		Salivary Cortisol Level (µg/dL)			
I	A(n=11)	0,132(0,046)	0,196(0,049)	0,06	0,003
	B(n=11)	0,115(0,047)	0,155(0,057)	0,04	0,041
(08.10-10.40)	C(n=11)	0,121(0,033)	0,158(0,048)	0,04	0,045
II	A(n=11)	0,128(0,064)	0,431(0,186)	0,30	0,003
	B(n=11)	0,172(0,071)	0,251(0,112)	0,08	0,013
(12.45-15.15)	C(n=11)	0,128(0,039)	0,167(0,048)	0,04	0,033

I=simulation timein the morning; II=simulation time in the day; A=without a resting phase; B=sitting while resting phase; C=standing while resting phase; *=Wilcoxon test

3. Analysis of Changes in the Pulse Rate, Levels of α-amylase and Salivary Cortisol Post Simulation Exercise of Demonstration Security Resting Phase for 30 Minutes after the First 1 Hour of Active Phase

Results of the analysis in Table 4 showed that in a resting phase for 30 minutes simulation exercise of demonstration security decreased in the pulse rate, level of α-amylase, and level salivary cortisol. Through the Wilcoxon test, it showed a significant result (p<0,05) in each group. This means that the provision of a resting phase for 30 minutes after the first 1 hour of active phase is effective in lowering the pulse rate, level of α-amylase, and level salivary cortisol. In the morning simulation, the highest decline day is in the group of resting phase with sitting method; whereas in the day simulation, the highest decline day is in the group of resting phase with standing method.

After the Kruskal Wallis and Mann-Whitney U test, it showed a significant difference (p>0,05). This means that to lower the pulse rate, level of α-amylase, and level salivary cortisol after the first 1 hour of active phase in thesimulation exercise of demonstration security through the resting methods, it might also be influenced by other factors, such as working climate.

In the table 4, it can be assumed that resting method while sitting is more effective than resting method while standing in lowering the pulse rate, salivary α-amylase, and salivary cortisol in thesimulation exercise of demonstration security.

Table 4: Changes in the Pulse Rate, Level of α-amylase, and Level of Salivary Cortisol Post Simulation Exercise of the Demonstration Security Resting Phase for 30 Minutes after the First 1 Hour of Active Phase on Two Methods of Resting and Working Climatic Conditions (Simulation Time)

Working Climatic Conditions (Simulation Time)	Methods of Resting Phase	Standard Deviation			p*
		Before	After	Changes	
	Pulse (x/minute)				
I	A(n=11)	-	-	-	-
	B(n=11)	98,7 (6,9)	84,4 (9,2)	14,4	0,002
(08.10-10.40)	C(n=11)	101,5 (5,4)	92,9 (3,2)	8,5	0,002
II	A(n=11)	-	-	-	-
	B(n=11)	112,7(15,2)	100,7(16,7)	12,0	0,003
(12.45-15.15)	C(n=11)	118,5 (9,2)	100,4 (9,2)	18,2	0,001
	α-amylase Level(U/mL)				
I	A(n=11)	-	-	-	-
	B(n=11)	211,1 (74,0)	143,9 (78,1)	67,2	0,003
(08.10-10.40)	C(n=11)	213,7 (51,7)	162,9 (50,1)	51,0	0,003

II	A(n=11)	-	-	-	-
	B(n=11)	395,1(250,6)	245,1(208,9)	150,0	0,003
(12.45-15.15)	C(n=11)	287,0(116,3)	242,6 (97,2)	44,4	0,003
	Salivary Cortisol Level (µg/dL)				
I	A(n=11)	-	-	-	-
	B(n=11)	0,219(0,134)	0,119(0,042)	0,10	0,041
(08.10-10.40)	C(n=11)	0,172(0,057)	0,123(0,031)	0,05	0,004
II	A(n=11)	-	-	-	-
	B(n=11)	0,246(0,091)	0,198(0,111)	0,05	0,130
(12.45-15.15)	C(n=11)	0,184(0,061)	0,124(0,038)	0,06	0,006

I=simulation time in the morning; II= simulation time in the day; A=without aresting phase; B=sitting while resting phase; C=standing while resting phase; *=Wilcoxon test.

4. The Relationship between the Dynamics of the Level of Salivary α-amylase and the Level of Salivary Cortisol with the Dynamics of the Pulse

Table 5: Correlation between the Level of Salivary α-amylase and Salivary Cortisol with Pulse

Variabel vs Variabel	Bivariate Correlation		Partial Correlation	
	Coefficient	p	Coefficient	p
Level of α-amylase vs Pulse	r=0,524	p<0,001	r=0,453	P<0,001
Level of Cortisol vs Pulse	r=0,384	p<0,001	r=0,206	P=0,016

From the table 5 above, we can see the results of the bivariate correlation test followed by partial correlation. It indicates that there is a one way linear correlation of significance (p<0,05) between the level of salivary α-amylase and pulse with a correlation coefficient of 0,453; between the level of salivary cortisol and pulse with a correlation coefficient of 0,206; and between cortisol and salivary α-amylase with a correlation coefficient of 0,259.

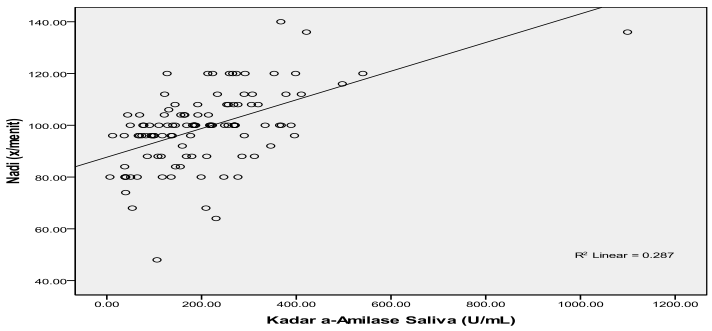

Figure 1: Scatterplot and Linear Graph between the Level of Salivary α-amylase and Pulse

From Figure 1, it can be seen that there is a linear relationship between the level of salivary α-amylase and pulse with R2 of 0,287.

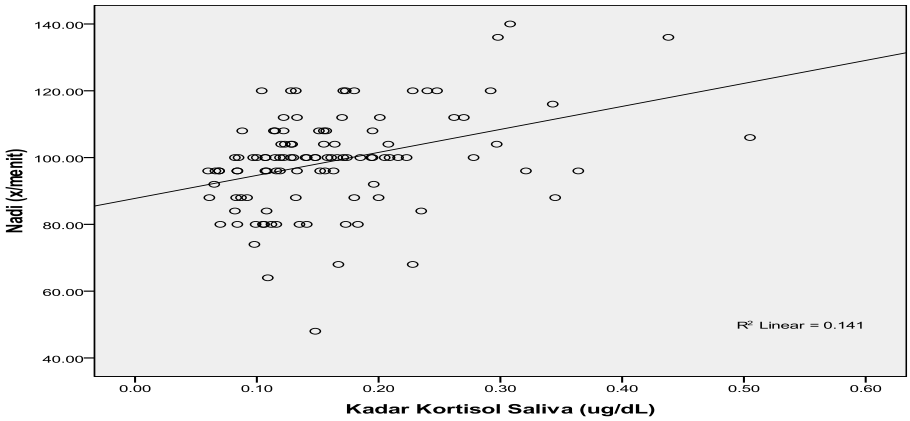

Figure 2: Scatterplot and Linear Graph between the Level of Salivary Cortisol and Pulse

From Figure 2, it can be seen that there is a linear relationship between the level of salivary cortisol and pulse with R2 of 0.141.

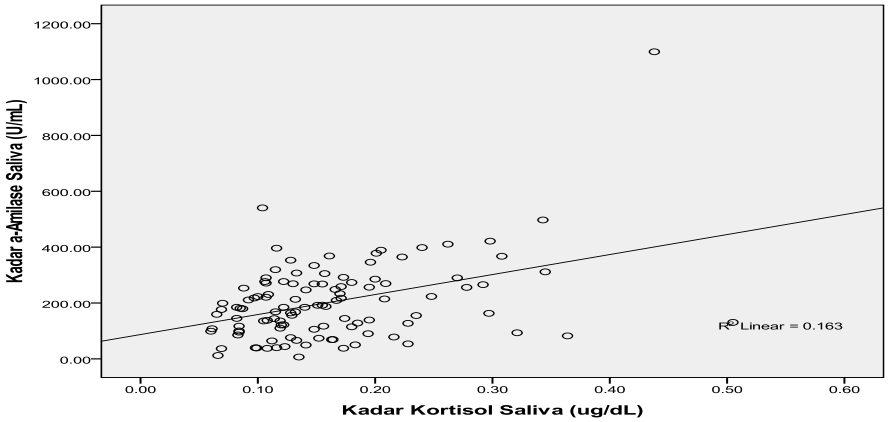

Figure 3: Scatterplot and Linear Graph between the Levels of Salivary α-amylase andSalivary Cortisol with Pulse

From Figure 3, it can be seen that there is a linear relationship between the levels of salivary α-amylase and salivary cortisol with R2 of 0,163.

From the analysis as shown in Table 6, multiple linear regression analysis between the levels of α-amylase and salivary cortisol on the pulse can be seen, which indicates that the pulse is affected by the levels of α-amylase and salivary cortisol independently, where the level of α-amylase effectsmore powerful than the level of salivary cortisol. Contribution of both to the changes in the pulse rate is amount of 30,4%.

Table 6: Summary of the Results of Multiple Linear Regression between the Levels of Salivary α-amylase and Salivary Cortisol to the Pulse

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	83.647	2.755		30.360	.000
Kadar α-Amilase Saliva (U/mL)	.047	.009	.459	5.251	.000
Kadar Kortisol Saliva (µg/dL)	34.889	16.028	.190	2.177	.032

Dependent Variable: Pulse (x/minutes); R2=30,4%

5. Conclusion

1. Dynamics of the pulse, the level of salivary α-amylase, and the level of salivary cortisol during the simulation exercise of demonstration security for 2,5 hours due to the different working climatic conditions (simulation time) as well as the provision of a resting phase in the treatment group increased steadily without any loss. While the control group was fluctuated, increased in the first 1 hour of the active phase, decreased after 30 minutes resting phase, and increased again in the second 1 hour of the active phase.
2. Increased dynamics of the pulse rate, the level of α-amylase, and the level of salivary cortisol during the simulation exercise of demonstration security for 2,5 hours due to the different working climatic conditions (simulation time) as well as the provision of a resting phase in the treatment group and the control are still within the normal limits of tolerance of the body.
3. The method of resting while sitting down is more effective than the method of resting while standing up in lowering the pulse rate, salivary α-amylase, and salivary cortisol in the simulation exercise of demonstration security.
4. The results of multiple linear regression analysis between the level of α-amylase and the level of salivary cortisol to the pulse indicate that the pulse is affected by the levels of α-amylase and salivary cortisol independently, where the level of salivary amylase-α influences stronger than the level of salivary cortisol.

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