

## Effects of Physical-Cognitive Therapy (PCT) on Critically ill Patients in Intensive Care Unit

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### ABSTRACT

*The condition of Critically ill patients in Intensive Care Unit (ICU) can make heavier impairment physical and cognitive functions. The research objective is to prove that physical-cognitive therapy affects towards increasing physical and cognitive functions to critical patients in ICU. The research design was Randomized Controlled Trials (RCTs). The samples were critical patients in ICU of Kediri Baptist Hospital as many as 64 critical patients according to inclusion and exclusion criteria. The research has got ethical clearance from Commite Ethic Medical Faculty of Diponegoro University. The research instrument used Physical Function ICU Test (PFIT) Indonesian Version and Mini-Mental State Examination (MMSE) Indonesian Version. Differential test used Independent t-test on physical function and Mann-Whitney test on cognitive function towards intervention group and control group. The results showed that physical-cognitive therapy significantly affected increasing physical function ( $p = 0,000$ ) with mean increased of 3.2 points and cognitive function ( $p = 0,000$ ) with mean increased of 7.3 points. The difference test of influence between the intervention group and the control group was done by testing the posttest data on physical function ( $p = 0,000$ ) and cognitive function ( $p = 0,000$ ) in both groups. Effect size  $> 0.8$  (Physical Function: 3,2; Cognitive Function: 1,9). In conclusion, there was affecting physical-cognitive therapy towards increasing physical and cognitive functions to critical patients in ICU.*

**Key words:** Critically ill patient, Intensive Care Unit, Physical-cognitive therapy.

Critically ill patients are at risk of reversible dysfunction in one or more life-threatening organs and require care in the Intensive Care Unit (ICU).<sup>1,2</sup> Critical patients in the ICU prevalence continue to increase each year. The World Health Organization (WHO) in 2016 reports that deaths from critical illness to chronic illness in the world increase by 1.1 to 7.4 million people and there are 9.8 to 24.6 critically ill patients and treated in ICU per 100,000 population.<sup>3</sup> The prevalence of critical patients is large along with the various problems in the ICU to be resolved. Critically ill patients have various health risks that can arise during the results of preliminary study based on Medical and Medical Record Installation Data Baptist Hospital Kediri obtained the average of critically ill patients treated at ICU Baptist Hospital Kediri in

May-August 2016 as many as 75 patients and 56 patients (74.7% ) survive and exit ICU.<sup>4</sup> The results of previous research studies in ICU Baptist Hospital Kediri in July 2016 found 41 critically ill patients with 11 patients (26.82%) impairment physical function and accompanied by signs of tardive dyskinesia syndrome. Tardive dyskinesia syndrome is a collection of symptoms caused by bed rest response, immobilization and the provision of medical therapy and sedation. Patients had a decreased physical function of rapid movement of the arms and legs and 34 patients (82.92%) had cognitive impairment and poor sleep quality.<sup>5</sup>

Critically ill patients with impaired physical function have a picture of weakness of muscle quadriceps femoris, decreased strength and decrease in daily activities. Critically ill patients will experience

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mechanical unloading and decreased neuromuscular activity. Patients critical during ICU neuromuscular activity. Patients critical during ICU will lose 20% of muscle volume, and 70% of protein for 1 week are admitted to ICU. The study also found 476,862 patients (60% -80% of the total critical patients in ICU) with 30% of them unable to return to work (nonproductive) due to loss of muscle strength of 1% -2% each day after patient out of ICU.<sup>7-16</sup> Critically ill patients with decreased physical and cognitive functioning are caused by various treatment measures and the accompanying illness. Patients with physical and cognitive impairment were caused by a history of using a mechanical ventilator (33%), infection or sepsis (50%), patients receiving treatment 2 days up to > 1 week in ICU (> 50%), delirium and critical illness or sepsis (70%), coronary heart disease (36.6%), CHD Unstable Angina (UA) (41.5%), Hypertension (19.5%), Supraventricular Tachycardia (SVT) (2.4 %).<sup>5,7,8,17</sup> The main causal factors causing it are long-term care ( $\geq 2$  days) and minimal mobilization. Other causative factors include previous medical history (health status and previous disease history), acute illness, critical illness (delirium, hypoxia, hypotension, glucose dysregulation, respiratory failure, shock, CHF (Congestive Heart Failure), sepsis and others), severity diseases, inflammation, loss of muscle strength, sedation, and anxiety levels (communication dissatisfaction, sleep disturbances).<sup>10,12,18-20</sup> Critically ill patient decline in physical and cognitive functioning if not promptly prevented during ICU treatment may have an impact on increasing health problems when treated in the ICU and when out of the ICU. Critical patients with reduced physical and cognitive functioning if not promptly prevented during ICU, may have the effect of aggravating and weakening the function of other organs.

## METHODS

This type of research is an experimental research with Randomized Controlled Trials (RCTs) research design. The intervention provided is physical-cognitive therapy. The intervention group received physical-

cognitive therapy intervention, while the control group was not given physical-cognitive therapy. The sample criteria determinants are very helpful for the researcher to reduce the bias of the research result, especially if there are variables (control or confounding) which in turn have influence of the variables studied. Inclusion criteria include Patients who have been treated in ICU  $\geq 24$  hours, RASS -5 to +1, No visual disturbance, and hearing. Exclusion criteria include RASS +2, +3, and +4, Patients who change RASS values to +2, +3 and +4 when intervened or different days, Patients screening scores change during intervention, Patient forcibly return home or refer to another hospital, Patient dies, Initial assessment or ongoing intervention in patients is found with Cardiac Surgery, Neurodegenerative disease, Post cardiac arrest with suspected anoxic brain injury, Unstable fracture, long bones and open abdomen, Psychotic disorder. The population in the study were all critical patients treated at Kediri Baptist Hospital. Based on ICU RS. Baptist Kediri in May-June 2017 there were 267 patients treated in ICU. The samples were critical patients in ICU of Baptist Hospital Kediri as many as 64 critical patients according to inclusion and exclusion criteria. Independent variable in this research is physical-cognitive therapy. Dependent variable in this research is physical function and cognitive function. The research tool in this research is physical function measurement tool (PFIT) and cognitive function (MMSE). Data collection has been done after completing the research proposal. Researcher get ethical clearance from KEPK Medical Faculty of Diponegoro University, and Researcher apply research permission from Diponegoro University Semarang to Director of RS. Baptist Kediri. The Wilcoxon test was used to determine differences in cognitive-physical function before and after physical cognitive therapy in each group, whereas the Mann Whitney test was used to determine the posttest of cognitive-physical function between the intervention group and the control group. The value of confidence interval applied is 95% with significance level 5% ( $\alpha = 0,05$ ).

## RESULTS

Table 1. Respondent Characteristic

Characteristic	Group		Z	p Value (N=64)
	Intervention (n=32)	Control (N=32)		
<b>Gender</b>				
Male	19 (59,4%)	16 (50%)	0,74	0,455
Female	13 (40,6%)	16 (50%)		
<b>Age</b> ( $\bar{x} \pm SD$ )	59,9 $\pm$ 10,94	48,03 $\pm$ 11,4		0,000
12-16-Year-old	-	1 (3,1 %)	3,78	
26-35-Year-old	-	2 (6,4 %)		
36-45-Year-old	4 (12,5 %)	10 (31,3 %)		
46-55-Year-old	7 (21,9 %)	11 (34,4 %)		
56-65-Year-old	11 (34,4 %)	7 (21,9 %)		
> 65-Year-old	10 (31,3 %)	1 (3,1 %)		
<b>Diagnose</b>				
CHD -UA	5 (15,6 %)	10 (31,3 %)	1,01	0,312
CHD- OMI	11 (34,4 %)	7 (21,9 %)		
decomp cordis phase class III-IV	7 (21,9 %)	7 (21,9 %)		
HHF	3 (9,4 %)	3 (9,4 %)		
Pneumothorax	2 (6,3 %)	-		
Acidosis metabolic	1 (3,1 %)	-		
DKA	1 (3,1 %)	-		
COPD	1 (3,1 %)	-		
Asthma Attack Emergency	1 (3,1 %)	-		
Observation Ileus	-	2 (6,3 %)		
Stroke Hemorrhagic	-	1 (3,1 %)		
GEA	-	1 (3,1 %)		
Hyperglycemic	-	1 (3,1 %)		
<b>RASS</b>				
+1	1 (3,1 %)	3 (9,4 %)	2,06	0,039
0	16 (50,0 %)	19 (59,4 %)		
-1	-	4 (12,5 %)		
-2	10 (31,3 %)	6 (18,8 %)		
-3	4 (12,5 %)	-		
-4	1 (3,1 %)	-		
<b>Sedation</b>				
Yes	23 (71,9 %)	22 (68,8 %)	3,07	0,002
No	9 (28,1 %)	10 (28,1 %)		

Notes: <sup>a</sup>: Chi Square test, <sup>b</sup>: Mann-Whitney test; Z: Z count (Z table: 1,96); CHD: Coronary Heart Disease; UA: unstable angina; OMI: old myocardia infarct; HHF: Hypertension heart failure; DKA: diabetic ketoacidosis; COPD: chronic obstructive Pulmonary Disease; GEA: gastroenteritis acute.

Subjects in the intervention group were more than 50% male, while in the control group had a balanced amount between male and female sex. The subjects of the study in both groups had an average adult age to early elderly. Research subjects in the intervention group of less than 50% had diagnoses of OMI

CHD while in the control group were CHD. Research subjects in the intervention group and control group found that more than 50% had a calm and alert awareness level (RASS 0). Majority subjects received sedation in the intervention group (71.9%) and control group (64%).

**Table 2.** Physical Cognitive Therapy Effect on Physical Function of Intervention Group and Critical Patient Control Group (n = 64)

Group	Negative Ranks		Positive Ranks		Z	p value
	Mean rank	Sum of Ranks	Mean rank	Sum of Ranks		
Intervention	0,00	0,00	32	528,00	-4,971	0,000
Control	4,50	36,00	0,00	0,00	-2,640	0,008

Description:  $\rho$  value: Wilcoxon test, significant (0,05), Z table = 1,96

The result of negative ranks test control group in mean rank is 4,50 and intervention group is 0,00, with each sum rank is 36 and 0,00. The result of positive ranks test result

control group in mean rank is 0,00 and intervention group is 32, with each sum rank is 0,00 and 528.

**Table 3.** Differences of Physical Function Test Results between Intervention Group and Critical Patient Control Group (n = 64)

Group	Mean Rank	Sum Rank	U	$\rho$ value
Physical Function			13,00	0,000
Intervention	48,09	1539,00		
Control	16,91	541,00		

Description:  $\rho$  value: Mann Whitney test, significant (0.05); U table: 105.

The result of the test result is the mean rank of the control group is 16,91 and the intervention group is 48,09, with each sum rank is 1539,00 and 541,00. The mean rank result is known that the physical function in the intervention group is better than the

control group. The value of U arithmetic is (13 <105) with the significance of  $\rho$  value (0,000), which means that there is a significant influence difference between the physical function in the intervention group and the control group.

**Table 4.** Results of Differences in Cognitive Function Assessment of Intervention Groups and Critical Patient Control Groups (n = 64)

Group	Mean Rank	Sum Rank	U	$\rho$ value
Cognitive Function			89,00	0,000
Intervention	45,72	1463,00		
Control	19,28	617,00		

Description:  $\rho$  value: Mann Whitney test, significant (0.05); U table: 105.

The result of test result is control group mean rank is 19,28 and intervention group is 45,72, with each sum rank is 1463,00 and 612,00. The mean rank result is known that cognitive function in the intervention group is better than the control group. The value of U arithmetic is (13 <105) with significance  $\rho$  value (0,000), which means that there is a significant effect difference between the cognitive function in the intervention group and the control group.

## DISCUSSION

Physical Cognitive Therapy significantly affects physical function in critically ill patients in the ICU. The subjects of the study intervention group increased physical

function after intervention with a mean difference of the increase in the intervention group of 3.2, whereas in the control group decreased physical function with a mean of 0.2. The intervention group increased physical function because of physical exercise that is done properly and regularly. Physical exercise at each joint can increase the activity of mechanisms neuromuscular critical patients during bed rest. Physical activity done regularly prevents apoptosis activity. The control group decreased physical function due to a decrease in neuromuscular muscle debilitating up until the occurrence of cell apoptosis. Improved physical function occurs along with increased functionality and functional use of aid mobilization, step, shoulder strength, and the strength of the

knee. Physical-cognitive therapy is expected to be physiologically capable of activating mechanical neuromuscular patients, it is supported by the theory that in principle, the physical exercises to stimulate muscle nerves to recognize that when the patient bed rest does not happen mechanical unloading and decreased neuromuscular activity. The results of research supported by the theories Margaret that moment activity neuromuscular becomes better, it will inhibit the complex adaptation response (protein synthesis), protein degradation and apoptosis of muscle cells.<sup>7-14</sup> Mechanisms that occur are the main contributor muscle atrophy, loss of muscle strength in critically ill patients during bed rest. Physical-cognitive therapy is expected to increase muscle metabolism which further increases the formation of protein to energy solution for patient immobilization or bed rest. Physical-Cognitive therapy can improve physical function declined over the patient in the ICU, it was supported by the results of research Thomsen stated that ambulation and early mobilization in critically ill patients in the ICU were able to improve the patient's physical function and also decrease the use of sedation.<sup>21</sup> Critical patients in ICU should be done as soon as possible physical mobility exercises to improve muscle metabolism and does not activate a response or apoptosis mechanism. The results of research supported by Elliott in the prevention of damage to physical function after discharge from the ICU who stated that early mobility can mitigate the negative impact of critical illness and improved its physical function.<sup>22</sup>

Physical-cognitive therapy significantly impact on improving the cognitive functions of critical patients in ICU. These results correspond with the results of a study that critically ill patients in the ICU can experience mental health disorders such as anxiety and them have cognitive impairment and poor sleep quality.<sup>5</sup> Improved cognitive function was not affected characteristics of the study subjects from the intervention group. The decline in cognitive function is influenced also by gender in accordance with the statistical results and strengthened by the results of cognitive function decline Wreksoatmojo are motivated by a variety of risk factors that cannot be avoided such as age and gender, as well as some physical conditions and diseases.<sup>23</sup> The decline in cognitive function can slow recovery in patients. The research subjects in the control

group was restless anxiety and pain scale settled on the first day to the third day.

The results also showed increased cognitive function occurred in all sub domains variable orientation, regression, attention-calculation, recall and language. Research shows that physical-cognitive therapy can improve the function of any existing variables. The results of research supported by the results of studies that suggest that cognitive therapy is able to change the perception of self in patients with heart problems.<sup>24</sup> Research subjects most heart problems with a variety of conditions and consciousness and care in the ICU. The subjects of the study intervention group experienced an increase in all indicators of cognitive function. Cognitive function has several major functions which work is recertify function, memory function, the function of thinking and repressive function. This repressive function involves the ability to make the selection process, clarify and integrate the information provided. Researchers on the provision of physical-cognitive therapy provide the stimuli of orientation, registration, attention-calculation, recall until the language with the hope of the study subjects were able to do the selection process to integrate more complex information. The research subjects control group decreased cognitive function have a significant relationship to independence in accordance with the results of research conducted by Balquis.<sup>25</sup> Subjects have been unable to carry out compliance activities of daily needs, and also experience pain in mild to moderate level. It also can affect the patient's condition, especially the condition of his illness. Based on the results that research subjects have the most control group cognitive impairment in moderate time in the ICU.

The research subjects in the control group with a decline in cognitive function may occur and demonstrate emotional response after discharge from the ICU such as anxiety, depression, fatigue, reflection and solitude in accordance expressed by Strahan.<sup>21</sup> cognitive decline will worsen and weaken the function of other organs if not prevented in treatment in the ICU. <sup>26</sup> These results are also supported by another theory which states that the impact of decline in cognitive function for patients in ICU that increase the treatment time, a decline in cognitive function, physical function (organs, muscle contractility, functional capacity and

pain, vitality, fatigue), and worsening mental health (anxiety), emotional responses, depression, reflection, loneliness, inability to perform the activity and the use of instruments in everyday life. Condition of patients with worsening cognitive function for patients in ICU should be prevented to maintain the patient's quality of life and function as whole human beings with various functions in carrying out daily activities. Approach to symptom management theory indicated expected any problems can be overcome by a specific patient. Specific nursing interventions applied and overcome specific problems as well. The results also were able to study the possible factors that need to be improved in the provision of interventions, so as to provide maximum benefit to patients on the signs and symptoms of health problems in critically ill patients in the ICU.

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