Muscle Strength and Self Care Ability (SCA) of Post Stroke Patients through Induced Movement Therapy (CIMT) Based on Self Care Theory

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**A B S T R A C T**

Cerebral Vascular Accident (CVA) or stroke is a partial destruction of the brain that can cause residual symptoms, one of which is muscle weakness in the upper extremity that can affect the patient's self care ability (SCA). These problems could be solved by CIMT (Constraint Induced Movement Therapy). CIMT is a movement rehabilitation technique in upper limbs that improve muscle weakness by small steps activity using daily tools. The purpose of this study was to determine the effect of CIMT on changes of muscle strength in upper extremities and SCA post CVA patients. This research used pre experimental design with one group pre-post test design. CIMT was given to 14 days with a sample size of 32 respondents which taken by purposive sampling. The data analysed by Wilcoxon sign rank test with the result showed $p = 0.001$ (muscle strength) $p = 0.004$ (self care ability). There was an effect of CIMT (on upper extremity muscle strength and self care ability of post-CVA patient). An improvement of muscle strength and self-care ability before and after CIMT intervention. Improving muscle strength was sufficient category to be good category and self care ability from mild to moderate category. The other factors : age, sex, last education level, occupation, history of past disease and history of post CVA were associated with improvement of muscle strength in upper limb and self care ability after CIMT .The results of this study were expected to be the basis of CIMT as an independent and innovative nursing intervention in post-CVA nursing care.

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I. **INTRODUCTION**

CVA or stroke is a partial destruction of the brain. This happens because the arterial blood vessels are torn, damaged or leaky so that it can cause brain tissue death that can result in loss of function of brain tissue \cite{1}. Stroke is divided into two types: ischemic and hemorrhagic. Ischemic stroke is a blockage that occurs in arteries leading to the brain while hemorrhagic strokes are broken blood vessels that inhibit normal blood flow and blood seeps into an area of the brain that can damage the brain. Stroke can cause residual symptoms or known as post stroke is the patient’s condition has been stabilized and there are still some impact of memory loss, loss of response to stimuli or confusion, speech is not clear and weakening muscle strength.

WHO report data in Indonesia there are every 1000 peoples, 8 of them affected by stroke. Stroke is the leading cause of death at all ages, with a proportion of 15.4\%. Every 7 people who died in Indonesia, 1 of them due to stroke \cite{2}. The prevalence of stroke in Indonesia is based on the diagnosis of health workers by 7.0 per mile and the remaining stroke symptoms of 12.1 per mile. Thus, as many as 57.9 percent of stroke diseases have been diagnosed by nakes. Stroke appears to increase with age increase of respondents. The prevalence of stroke is similar in males and females \cite{1}. An estimated 1 in 3 people will have a stroke and 1 in 7 people will die of a stroke. According to basic hospital data in Indonesia about 63 per 100,000 population aged over 65 years of stroke. While the number of patients

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who died more than 125,000 people per year. In East Java province suffering from infarction stroke were 6,575 hospitalized patients in government B class hospital, 3,573 patients were in C class hospital, and 548 patients were in class D government hospital (1).

Stroke can cause residual symptoms or known as post stroke symptoms, it can occur because of brain function that does not improve completely. Starting from paralysis on one side of the body, decreased or loss of taste, balance disorder, coordination disorder, language disorder to mental status disorder. Coordination disorder is commonly found in recovery stages, both in the upper and lower extremities. Most post-stroke cases still showed a variety of residual symptoms in the extremities, where upper limb recovery usually develops more slowly than the lower limbs so there are still many patients who have not been able to use upper limbs who experience paralysis for functional activity even after walking (3). Based on preliminary study at Sukomoro Public Health Center on December 22, 2017 data obtained from January to November 2017 there were 100 patients with stroke diagnosis, who experienced symptoms of stroke remaining in the musculoskeletal at 20%.

Stroke is caused by lack of oxygen supply to the brain, rupture of blood vessels in the brain, the clot clot in the brain. One of the effects of stroke is a disruption of the client's level of physical mobilization, often caused by restriction of movement in the form of bed rest so that it can lead to weakening of muscle state associated with lack of physical activity usually seen within days. Patients with stroke can experience difficulty when walking due to disruption of muscle strength, balance and coordination of motion, resulting in difficulties in performing daily activities. Motion exercise accelerates the healing of stroke patients, as it affects the sensation of movement in the brain (4).

Stroke patients will generally use healthy limbs to replace the role of paralyzed limbs in daily activities, such conditions will limit the recovery of post-stroke muscle strength. So we need an exercise to increase the muscle strength of the paralyzed limbs, one of them using the CIMT method. CIMT is a therapeutic strategy of repetitive exercises in the paralyzed arm and limiting the use of non-paralyzed arms. It is important to stimulate neuroplasticity activity. The MRI imaging results prove that the size of the paralyzed hand cortical representation extends after CIMT therapy and the cortical sensorimotor cortical density increases bilaterally compared with the control group (4). The purpose of this study to determine the effect of CIMT on muscle strength of the upper extremity of post stroke patients and their self care ability.

II. METHOD

The research design used in this research is "pre-experimental design" with "one group pre-post test design". Sample size in this study were 32 respondents obtained by purposive sampling. The inclusion criteria in this study were: 1) Post-stroke patients with partial muscle weakness with a muscle strength test of at least 3-4 in the upper extremity, 2) post stroke patients for more than 3 months and less than 2 years after stroke, 3) patients with the first attack after a stroke. The exclusion criteria include: 1) post hepatological stroke patients, 2) patients undergoing other therapies to improve physical mobility, 3) stroke patients with cardiac complications, other neurologic and DM. The independent variable in this study was CIMT and the dependent variable were muscle strength and self care activity. Post stroke patients will be measured muscle strength and self care ability before being treated CIMT (pre-test). Afterwards, CIMT treatment is given for 2 hours every day for 2 weeks. After giving CIMT day to 6 weeks to 2 patient measurement of muscle strength as data (post-test).

III. RESULTS

General Data

General data on this study include: gender, education level, occupation and history of disease. Sex data shows that almost all 62% of respondents have male sex. Based on the level of education: almost 69% of all respondents have elementary education background. Based on the work of most entrepreneurs as much as 44%. The history of the disease showed that almost all respondents 63% had...
a history of hypertension and almost half of 37% had a history of diabetes mellitus. Long post stroke data showed that most (50%) had post stroke for 7-10 months.

**Specific Data**

1. Identify muscle strength in the upper extremities of post stroke patients before the CIMT

   Table 1 Distribution of muscle strength frequency in post stroke patients before CIMT

<table>
<thead>
<tr>
<th>Level Of Muscle strength</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>less</td>
<td>10</td>
<td>31.2</td>
</tr>
<tr>
<td>enough</td>
<td>22</td>
<td>68.8</td>
</tr>
<tr>
<td>good</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>100</td>
</tr>
</tbody>
</table>

   From table 1 it is known that the frequency distribution of muscle strength before given CIMT intervention in post stroke patients shows less muscle strength as much as 31.3%, muscle strength is quite as much as 68.8% and no one has good muscle strength.

2. Identify muscle strength in the upper extremities of post stroke patients after the CIMT intervention

   Table 2 Distribution of muscle strength strength after CIMT intervention in post stroke patients

<table>
<thead>
<tr>
<th>Level Of Muscle strength</th>
<th>Frequency</th>
<th>Post Test %</th>
</tr>
</thead>
<tbody>
<tr>
<td>less</td>
<td>6</td>
<td>18.8</td>
</tr>
<tr>
<td>enough</td>
<td>8</td>
<td>25.0</td>
</tr>
<tr>
<td>good</td>
<td>18</td>
<td>56.2</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>100</td>
</tr>
</tbody>
</table>

   From table 2 it can be seen that the frequency distribution of muscle strength after giving CIMT intervention in post stroke patient showed less muscle strength as much as 18.8%, muscle strength is enough 25% and good muscle strength 9%.

3. The effect of CIMT muscle strength of upper extremities on post CVA patients

   Table 3 Results of muscle strength pre and post CIMT on post CVA patient

<table>
<thead>
<tr>
<th>No</th>
<th>Muscle strength</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td>F</td>
</tr>
<tr>
<td>1</td>
<td>Less</td>
<td>10</td>
<td>31.2</td>
</tr>
<tr>
<td>2</td>
<td>Enough</td>
<td>22</td>
<td>68.8</td>
</tr>
<tr>
<td>3</td>
<td>Good</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jumlah</td>
<td>32</td>
<td>100</td>
<td>32</td>
</tr>
</tbody>
</table>
From table 3 and 4 shows the results of analysis of muscle strength change in upper limb post stroke patients by using wilcoxon test. From the above calculation, it is known that the number of respondents is 16 people, before the CIMT intervention gets the mean value 1.6875, standard deviation 47871, minimum 1.00 and maximum 2.00 while after the intervention CIMT changed to mean 2.3750, standard deviation 80623, minimum 1.00 and maximum 3.00. From the above calculation, it is known that p value (0.001) <α (0.05) then H1 is accepted so it can be concluded that there is influence of CIMT (constraint induced movement therapy) on muscle strength in extremities on post stroke patient.

4. Identify Self Care Ability post stroke patient before CIMT intervention

Table 5 Distribution of Self Care Activity Activities before CIMT intervention

<table>
<thead>
<tr>
<th>Self care ability</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>20</td>
<td>62.50</td>
</tr>
<tr>
<td>Medium</td>
<td>10</td>
<td>31.25</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
<td>6.25</td>
</tr>
<tr>
<td>Jumlah</td>
<td>32</td>
<td>100</td>
</tr>
</tbody>
</table>

From table 5 it is known that the frequency distribution of self-care activities before CIMT intervention is given to most (62.5%) in the low category

5. Identify Self Care Ability in post stroke patients after CIMT intervention

Table 6 Distribution of Self Care Ability after CIMT intervention in post stroke patient

<table>
<thead>
<tr>
<th>Self Care Ability</th>
<th>Frequency</th>
<th>Post Test %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>10</td>
<td>31.25</td>
</tr>
<tr>
<td>Medium</td>
<td>18</td>
<td>56.25</td>
</tr>
<tr>
<td>High</td>
<td>4</td>
<td>12.50</td>
</tr>
<tr>
<td>Amount</td>
<td>32</td>
<td>100</td>
</tr>
</tbody>
</table>

From table 6 it can be seen that the frequency distribution of self care activities ability after giving intervention shows most of respondent (56,25%) in medium
The effect of CIMT on changes in Self Care Ability post CVA patients

Table 7 Distribution of frequency of self-care ability before and after CIMT intervention

<table>
<thead>
<tr>
<th>No</th>
<th>Self care ability</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>1</td>
<td>Low</td>
<td>20</td>
<td>62,50</td>
</tr>
<tr>
<td>2</td>
<td>Medium</td>
<td>10</td>
<td>31,25</td>
</tr>
<tr>
<td>3</td>
<td>High</td>
<td>2</td>
<td>6,25</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>32</td>
<td>100</td>
</tr>
</tbody>
</table>

P value : 0.004

From table 7 shows the results of analysis of changes in self-care activities in post stroke patients using wilcoxon test known p value (0.004) <α (0.05) then H1 accepted so it can be concluded that there is influence CIMT to self care ability post stroke patients.

IV. DISCUSSION

1. Category of muscle strength in the upper extremity of post stroke patients before CIMT

Based on the result of the research, it was found that post stroke response before the intervention of respondent included less category that is 31,2% respondent, enough category 68,8% responder and good katehori 0%. While in the group after the intervention CIMT respondents with less category as much as 18.8%, enough category as much as 25% of respondents and the good category as much as 56.2% of respondents. The result of analysis using wilcoxon test using computer system that is known value p value (0.001) <α (0.05) then H1 accepted. Judging from the above statement can be interpreted there is influence of CIMT (Constraint Induced Movement Therapy on muscle strength change in upper limb post stroke patients in work area Sukomoro Public Health Center

According to dr. Iskandar Juanaiidi, 2012 (5). Risk factors for stroke that are age, Incidence of stroke increases with age. After the age of 55 years the risk of ischemic stroke increases 2-fold every decade. The older a person, the greater the risk of stroke. In the sexes, men were more likely to get strokes higher than women, with a ratio of 3: 1, except in the elderly men and women were almost no different. A 45-year-old man who survives up to 85 years is 25 percent likely to have a stroke, while the risk for women is 20 percent. Men tend to have an ischemic stroke whereas women are more likely to suffer subarachnoid haemorrhage and death twice as high as men. Hypertension plays a role in the process of atherosclerosis through the effects of emphasis on endothelial cells / layers in the artery didnding which result in faster vascular plaque formation.

From the above facts and theories mentioned above, the researchers argue that muscle strength with average category results is sufficient, this may be due to factors that trigger the onset of muscle weakness in the stroke patient, where the factor is owned by the respondent, for example can be affected by age, obtained by the age of 41-50 years as much as 45.5%, it happens because the younger the respondents the cell regeneration / growth of new cells faster so that will affect muscle strength. And found most 72.7% were male, it is because men are prone to stroke because it has a habit that is less good for health such as smoking. Smoking can lead to stroke, reconnect with cigarette smoke containing some harmful substances such as nicotine and carbon monoxide are often referred to as oxidizing agents. The level of education of most of the respondents at the primary education level of 72.7%, the higher the level of education the higher the science, if someone more knowledgeable about stroke it will be easier to recognize the signs of symptoms and stroke risk so it can anticipate the occurrence of stroke, eg with a healthy lifestyle and regular exercise. The work of
the respondents is mostly 72.7% as farmers, this may be due to the high ekomi requirement while the results received slightly, so it can be a high stressor that can lead to hypertension that leads to stroke. In addition, based on previous disease history showed 63.6% (7 respondents) had a history of hypertension, it is similar to the results of research Ramadhanis, 2012 states that hypertensive patients have an opportunity of 4.117 times suffer a stroke than non hypertensive patients. And most of the history of post stroke length of 7-10 months 36.4% (4 respondents), the longer after the stroke samakin difficult in improving the ability of muscles due to muscle that decreased function will even lead to atrophy in muscle, but in this study obtained the opposite result, so that the muscle strength of respondents is still good enough in the development to increase muscle strength.

2. Muscle strength in the upper extremities of post stroke patients after CIMT intervention

Based on the results of the study, after being given CIMT on the upper limb post stroke sufferers changes in muscle strength with most good category as much as 56.3%. According to Meidian.AC research, Sutjana.DP, Irfan, 2014(6,7). In his research stated that various training, approaches, methods and techniques in the field of physiotherapy have been developed to complement and enrich the scientific treasures in overcoming physical and functional problems for patients with stroke that is training Constraint Induced Movement Therapy (CIMT). The training has a scientific basis to date that is still being developed and researched by physicians and physiotherapists who concentrate on clinical management for stroke patients to restore physical capacity and functional abilities including of course the function of upper limbs (AGA) who experience weakness due to central nervous neurological

Lewis, 2007, argues that should exercise on stroke sufferers done several times a day to prevent complications, the earlier the rehabilitation process begins, then the chances of suffering the deficit of muscle ability will be smaller (8). CIMT is a treatment method for hemiparese stroke patients, patients are strongly encouraged to use a weak arm. One way to do this is to limit movement to the healthy arm. This treatment is intended to help patients cope with learning of unutilized motion members (9). This rehabilitation technique is defined as a behavioral technique in which the movement is carried out in small steps and increasingly difficulty including verbal feedback. The exercises are similar to the technical training commonly used by physiotherapists and therapeutic work, but the rehabilitation task is quantitative and repeated over and over so that small improvements in functional activity can be measured and systematized. CIMT is a multifaceted neurorehabilitation technique that aims to improve motor function and increase the use of upper limbs that experience hemiparesis in real world activities (10).With this condition is expected CIMT treatment can help post stroke sufferers in order to achieve the goal in improving muscle strength.

Based on the facts and theories mentioned above, the researcher believes that changes in muscle strength can be done using CIMT treatment. Then from the respondents who experienced muscle weakness with enough category can turn into muscle strength with good category, it can be influenced by several factors such as age, sex, occupation and education level. At an age, the younger the age of cell regeneration is faster so that changes in muscle strength to become better can be achieved, in contrast to older age changes in muscle strength are difficult to achieve because of cellular degeneration. While in the gender, most of the respondents are male and most of the respondents are farmers who have a habit of doing heavy work so that in changing muscle strength of respondents easy to change muscle strength for the better. A high level of education also determines in acceptance to perform CIMTs that function in increasing the muscle strength of these respondents. With the results obtained, the researchers stated that the respondents were pleased with the better change in muscle strength of the upper extremity of post stroke patients, so that the respondents were able to do CIMT treatment.

3. The effect of CIMT on changes in muscle strength in extremities on post stroke patients

Based on the research results, the effect of CIMT on the change of muscle strength on the extremity of post stroke patient in the work area of Puskesmas Sukomoro of Nganjuk Regency
showed that the result of the analysis using wilcoxon test using computer system is p value (0.001) <α (0.05) then H1 is accepted. Judging from the above statement can be interpreted there is influence between CIMT to changes in muscle strength in extremities over post stroke patients.

CIMT can help increase weak muscle strength in the musculoskeletal system through structural changes associated with neurochemical changes of neurotransmitters that will affect the increase of electricity between neurons and neuroreceptive reception and neural plasticity resulting in regeneration of the nerves in the brain, especially on the upper extremities at the time of living daily living stages associated with fine motor function and coordination in everyday activities in the form of ATP (adenosine tri phosphate) process derived from the oxidation of carbohydrates and fats, the interaction between actin and miosin requiring ATP so muscle contraction. With this condition is expected CIMT can help to achieve the goal, especially on the strength of upper limb muscle client post stroke patients (11). CIMT (Constraint Induced Movement Therapy) is a rehabilitation program that enhances the skills and abilities of extremities that have disruption of use (the sick side) for activities after a stroke, especially in everyday life situations (12). The reason researchers apply CIMT is as an effort to overcome the muscle weakness in the upper extremity of post stroke sufferer so that the respondent can perform daily activities independently.

Based on the above facts and theories mentioned above, the researchers concluded that the change in muscle strength in the upper extremity of post-stroke sufferers from muscle strength with the average category is sufficient to strength muscle with average category can either be done by using CIMT treatment. All respondents were given CIMT treatment interventions from the results obtained in the previous discussion, this research reinforces the results of previous studies by training the mirror neuron system similar to the training of constraint induced movement therapy in improving the functional ability of the limbs members of stroke patients (7). Success in the provision of CIMT therapy there are several factors that support from clients such as age, gender, and duration of post. At the age of 41-50 years the average respondent who can experience changes in muscle strength is good, it is because the younger the respondent's age the higher the recovery rate of muscle strength of respondents, whereas in the gender results obtained from studies that have been done on average type kemin men and jobs as farmers, it is because daily activity in doing heavy work can be a factor that affects the changes in muscle strength for the better. History of post stroke duration may also affect the result of changes in muscle strength of respondents because the longer the respondent experiencing post stroke the more difficult to make changes in increasing muscle strength it can be affected by loss of function of muscle. In the research that has been done also can be influenced by cooperative respondents in the provision of CIMT therapy. The environment also affects in the treatment of CIMT and in the implementation of the respondent's family also supports in the treatment of CIMT treatment.

There are some limitations found by the researchers when giving intervention to the respondents ie the time of therapy and place. At the time of CIMT administration some of the less cooperative respondents in following CIMT therapy sessions may be due to the saturation of time in the treatment process. However, researchers have anticipated it by minimizing the time and not convoluted when delivering the procedure because this CIMT therapy takes approximately 2 hours per day. While the problem place, researchers every day must come home respondents who distance the respondent one with another far, so it takes time to travel to the home respondents.

4. Self Care Ability Post Stroke Patients Before CIMT Intervention

In post stroke patients there are nursing problems of physical mobility obstacles in accordance with nursing assessment according to Dorothea Orem. According to Orem's Theory, health as a physical, mental, and social state of an individual, is not only free from disease and disability (11). It can be concluded that a person is entitled to health, including physical, mental and social, and not only avoid food ailments can be avoided from disability such as the ability to perform activities, from that understanding clients who have problems of physical mobility barriers are entitled to nursing actions to overcome the problems experienced. In this case, Orem's view in nursing sees nursing as an art of how a nurse provides assistance to clients with disabilities. Nursing includes nursing actions
aimed at individuals or groups with a view to maintaining or changing their condition and environment (12). Nursing theory developed by Orem is the theory of Self Care according to the level of dependence in providing comprehensive nursing care (14). The model system used in the respondents is the supportive educative nursing system where nurses provide educational support, direction and assistance to clients who need it to be studied in order to be able to perform self-care such as support and teaching about innovation methods CIMT with daily equipment so that clients can do therapy independently to deal with the physical mobility barriers that clients After 1 week implementation (3x meetings) and evaluated based on CIMT, the majority of respondents experience movement capability, can perform some tasks well although it takes time to complete the task, such as opening the lid of the jar perfectly.

5. Identify Self Care Activities Post Stroke Patients After CIMT Intervention

The system model used in the respondents is the supportive educative nursing system where nurses provide educational support, direction and assistance to clients who need it to be studied in order to be able to perform self-care such as support and teaching on innovation method of CIMT - days so that clients can do therapy independently to handle the physical mobility barriers experienced by respondents. After implementation for 1 week (3x meeting) and evaluated based on CIMT that has been done got the respondents experience peninggkatan ability of motion little and not too significant, only some duty which increase.

6. The Influence of CIMT on Self Care Ability

According to Dorothea E. Orem theory the majority of respondents are given innovation therapy CIMT with daily equipment for 1 week with 3x meeting result of his client can apply what have been taught, client always train independently according to schedule which have been made, client can do duty well, there is a significant increase in motor motion. The success of CIMT innovation therapy due to the high motivation to recover and family support in doing therapy is essential in the process of care, willingness and commitment is indispensible for the therapeutic process. In addition, education and information factors also affect the success of therapy, the client is an elementary school graduate but many clients are exposed to education information from health services and participation in posyandu lansia on a regular basis. While some of respondent has a disruption in motion activities but the client feels resigned to its condition, depending on the needs of activities to the family, some activities are assisted. Furthermore, according to the theory of Dorothea E. Orem , all of the respondent were given CIMT innovation therapy with daily equipment for 1 week with 3x meeting result respondents can apply therapy performed, increase of limb is not significant, just increase some task items, client still assisted for daily activity, less success in case II happened because the lack of motivation to recover to the client, the lack of spirit, other factors that can influence the respondent's education is elementary and lack of exposure to health education information, rarely follow posyandu elderly. This is consistent with the theory of Dorothea E. Orem that defines nursing done with the belief that everyone has the ability to care for oneself so as to help the individual meet the needs of life, nourish his health and well-being(17). From both cases above can be concluded that the application of model concept of model orem nursing theory can be applied to the client directly with the help of supervision from the family.

The advantages of Orem's nursing model concept and theories are, effective to support, client independence, teach clients get therapy or nursing action according to the level of needs and dependence of clients so as to achieve Self Care. In this case the nursing system used is the supportive educative nursing system, as for the assistance, the lessons and the teaching given is in the form of innovative methods of CIMT with everyday equipment aims to independence clients perform therapy independently to reduce the mobility barriers experienced.
V. CONCLUSION

Mayority of respondents has muscle strength with sufficient category before CIMT intervention and good category after given CIMT. It means that CIMT could increase muscle strength on post stroke patients. Most of respondents have Self Care Ability with enough category before given CIMT and good catagory after CIMT intervention. CIMT could improve the ability of Self Care ability on post stroke patients.

VI. REFERENCES


