

Effect of Singing Dancing on Mental Workload to *Pencantingan* Task of Batik *Buketan* Motive

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Abstract

Pencantingan task on the Batik process include physical, mental task, art and creativity, one of the task is *Pencantingan isen-isen* associated with mental activity is need cognitive process to be creative. The level of difficulty of *isen-isen* and completion schedule making mental workload have increased along with the increased stress condition, in an effort to reduce the Mental Workload is high needed a touch of relaxation, Singing dancing is the new treatment combinations of elements that exist on *Biodanza* and Choir Singing, used as a solution to address the issue of physical and mental relaxation simultaneously. The purpose of this research is to examine the effect of Singing dancing (Jig while Singing) on Mental Workload to *Pencantingan* task of Batik. To achieve these objectives, total 16 females have been participated in this research. Those are employees at Batik's industry in the area Malang-East Java-Indonesia. The characteristics of demographic consist of: age: 24.44 ± 0.79 years; Height: 152.25 ± 1.27 cm; Weight: 44.00 ± 1.13 kg; Body Mass Index (BMI): 19.00 ± 0.48 (m/kg²); Batik experience: 3.63 ± 0.68 years, research strategies include: Stretching and Singing dancing each for 10 minutes (5 minutes Stretching and Singing dancing, five minutes rest) held twice a day at 10 a.m. and 2 p.m.; without rest break; batik motive: *buketan*; amplitude of music: medium (70 dB); beat: dynamic/joyous; music: *dangdut*. Measurement Mental Workload obtained from Subjective Workload Assessment Technique (SWAT) score. The Results have found mental workload on singing dancing provide a most positive influence than Stretching and Control. Mental Workload after singing dancing decreased by 54.41% and 44.13% (11 a.m. and 3 p.m.) against Stretching.

Keywords: Rest break, Stretching, Singing dancing, Mental Workload, SWAT, Batik

1. Introduction

Batik (wax-resist dyeing) by UNESCO since 2 October 2009 has been recognized as masterpiece of the oral and intangible heritage of humanity (Prasetyo 2010), since it have grow Small and Medium Enterprises (SME) each province to expose specific motives.

The issue now not only enough encourage to grow SME each province but also to think about how to create a healthy work system, so that workers can feel at ease, relaxes and productive work. Ergonomics factors which can result in the risk of the development of Cumulative Trauma Disorder (CTDs) are grouped into 3 factors include: Working Condition (Physical, Repetition, Force, Awkward posture, Contact stress, Vibration, Temperature extreme), Work Organization (Stressful conditions), and Personal issue (Off-the-job activities, Physical condition, other diseases) (MacLeod 1995). Most outstanding ergonomic risk on *pencantingan* task if observed lies with the work condition factor for awkward posture (e.g. the position of the right hand and forearm hanging Form the angle of $< 90^\circ$, positioning the stomach distress because the foot bent to form corners $< 90^\circ$), and repetition (for example: at the time of taking the liquid wax with canting to the right body position leaning a bit and swirls around 30° , this is done over and over again revolves around every 10-20 seconds). Results of the survey of body parts that are complaining about is parts: neck, a back the loin and leg, if this last long and does not give to rest break, then can cause the risk CTDs as tendonitis (Macleod 1995).

From the aspect of Mental Workload for activity *Pencantingan isen-isen* cognitive processes required to explore creativity with regard to shape, size *isen-isen* and placement matched with extents are available on each ornament motive, this activity is carried out simultaneously at the time of *pencantingan* because of the *isen-isen* is not provided in the batik patterns, associated with the level of difficulty of the form, placement and volume that must be completed in addition to the pressure of schedule completion (Hjortskov et al. 2004) can cause stress and Workload became increasing feelings, (Hughes et al. 2005) sure it will be effect not only on the job but also at the level of the Mental Workload of workers. (Basahel et al. 2012) increased physical and Mental Workload intensity resulting in lower accuracy and increase the long response time.

Rest Break is one essential factor for creating a healthy work system, some researchers provide a rest break or rest period (Savage & Pipkins 2006), the rest of schedule (Beynon et al. 2000), Work rest schedule (Van diene, 1998), a Micro break (Balci & Aghazadeh 2003), Frequent short rest breaks (Dababneh et al. 2001). Short break and long break (Kakarot et al. 1993). In principle it can be said that Rest break gives a positive influence on the

recovery of muscle so as not fatigue and strain, treatment provides rest break has a weakness that is only focused on the recovery factor physic, so the muscle still feels stiff and focused only on physical tasks.

Stretching and Exercise were the development of a rest break, some researchers gave the treatment stretching and exercise during the rest break include: Stretching on a work station (Moore 1998), short term programs exercise (<10 days) (Fenety et al. 2002), Stretching and joint mobilization exercise (Lacaze et al. 2010). In general it can be said that the Stretching and Exercise to provide flexibility and muscle Range of Motion (ROM), reduce musculoskeletal discomfort and fatigue levels, but Stretching and Exercise still has weaknesses, which is still focused on the physical task, it hasn't been touched for mental task.

Listening to music is one effort to meet the needs of mental task and the needs of psychosocial some researchers of them: the effect of music listening on work performance (Lesiuk 2005), variation amplitude (Staum et al. 2000), aromatherapy massage and music (Davis et al. 2005), effects of choir singing or listening (Kreutz, et al. 2004), feeling of relaxation between *Biodanza* with yoga (Stuck et al. 2009). In principle listening to music give a positive influence on relaxation, arousal, anxiety, the mood, emotion, and stress, here more focused on mental task and psychosocial, not in physical task. On choir singing more focus on psychosocial, *Biodanza* focus on physical and psychosocial but done in nature free not at work as well as a profession of participants vary. Now the problem is how give treatment jointly by combining physical task and mental task in the workplace.

In this research will combine elements existing in *Biodanza* and choir singing as a new treatment to address the needs of physic and mental called with Singing dancing. Singing dancing will be adjusted to characteristic of Indonesian people, music used in singing is *dangdut* and dancing is *joget* (Weintraub 2012).

2. Method

2.1 Subject

Subject or participants is Batik maker who worked on SME existing in the area Malang-East Java-Indonesia, of results of the survey was four SME would have employees around 5-20 the workers of *Batik*, in this taken one SME with 16 the workers of *Batik* (the agreement with SME). 16 the workers of *Batik* chosen is the workers not having impaired health: hypertension, heart disease, diabetes. The characteristics of demographic consist of: age: 24.44 ± 0.79 years; height: 152.25 ± 1.27 cm; weight: 44.00 ± 1.13 kg.; Body Mass Index (BMI): 19 ± 0.48 (m/kg²); experience: 3.63 ± 0.68 years.

2.2 Material

2.2.1 *Pencantingan* Equipment

Consisting of: Several kinds of *canting* to *klowong*, *isen-isen* and *nembok* used to traced wax liquid to surface cloth; *gawangan* used to spread and hang cloth when the process of *Pencantingan*; a chair used to seating at the process of *Pencantingan*; a stove used to heat the wax; a skillet as scone liquid; wax is material paraffin, or micro wax or *gondo rukem* or resin or beeswax used for covering to keep white color, in research is using wax from paraffin; white cloth patterned or without patterns (105-106 centimeters x 225-265 cm); *ijuk* (palm fiber) to open the orifice beak *canting* if clogged (Setiawati 2004; Samsi 2007).

2.2.2 Music Equipment

Music equipment consists of a set of sound system consists of a TV, DVD and compact disk sound. To the tune of *dangdut* collected in 10 DVDs, each DVD contains 20 songs from 1990-2011, to the singer familiar (e.g.: *Rhoma Irama*, *Ike Nurjana*, *Ayu Tingting*, *Meggi Z.*, *Mansyur*, *Dewi Persik*, *Fitri Karlina*, *Saiful Jamil*).

2.2.3 Cloth

There are 2 types of white fabric: patterned (see Figure 1) that is white cloth has been given a specific pattern so that the pattern is batik instantly *Pencantingan* follow the pattern motifs. The size of the white cloth used 105 cm x 225 cm, divided into 32 specimens each measuring 25 cm x 25 cm. Motif used the motif of *Buketan*, containing 5 kinds of ornament (see Figure 2) consists of: flowers, Trunk, Leaves, Butterflies and Stars.

2.3 Measuring instrument

For measuring Mental Workload SWAT score based on scale development combining with all possible 3 level to each 3 dimensions that contains 27 cards, any operator should to sort, next event-scoring is actual rating workload to an assigned duties, the final step is every 3 dimensions being converted into numeric score among 0-100 (Rubio et al. 2004); numeric score between 0-100 will grouped into five groups: very light (0-20); light (21-40); quite heavy (41-60); heavy (61-80); very heavy (81-100).

2.4 Experiment

Research Strategies include: without a rest break (control condition); 5 minutes to Stretching refers to Subaru-Izuzu an automotive plant (Moore 1998), adapted for 5 minutes to stretching and a 5 minute rest every day done 2 times around 10 a.m. and 2 p.m. Singing Dancing as well as equal to the stretching that is 5 minutes to Singing

dancing and 5-minute rest every day done 2 times around 10 a.m. and 2 p.m.. Performed during 3 days (3 treatment; 1 motives of each 1 day); Amplitude of music: medium (70 dB) (Staum and Brotons 2000); Beat: dynamic/ joyous; Music: dangdut (Weintraub 2012), this is confirmed by the results of the initial research, the kind of music that is interested by the worker, turned out to be *dangdut* music occupies ranks first. Break prayer and lunch at 12-13 p.m., with working hours from 7 a.m.-16 p.m.

Stretching carried out twice a day held at work with a standing position for 5 minutes and 5 minutes rest, Without music while doing six movement stretching include movement to the neck, backs, fingers, hands, waist and feet (see Figure 3): flexibility of the neck (1) (2) (3) (4) (5) (6): move your neck to the left and right, to the front and back as well as turning heads to the left and right, for 50 seconds; the flexibility of the back (7) (8) (9) (10): twisting of the hand with bent position from front to back, then vice versa as well as moving to the left and right, for 50 seconds; the hand flexibility (11) (12): the position of hands straight and parallel moved to the front and back and to the left and right, for 50 seconds; the flexibility of the fingers (13) (14) (15) (16): the position of the hand bent in parallel shoulder while the fingers are moved, then left right hand put together while driven front and back, for 50 seconds; the flexibility of the waist (17) (18) (19) (20): position of the hand left and right at the waist then body is moved bend and back upright, this movement is continually repeated over 50 seconds, the flexibility of the foot (21) (22) (23) (24): walking in place, then continued a raised left and right foot with hand alternately, for 50 seconds, so the total 5 minutes to stretching.

Singing Dancing done 2 times during the day, carried out in any place of work while standing at the time of Singing Dancing for 5 minutes and 5 minutes rest, each jig or sways while singing (following the music be heard from the sound system) with the free movement, foot, hand, hip, and other members of the body to perform relaxation according to the needs of each (see Figure 4): Singing Dancing has elements of flexibility movement of the neck (1) (2) (3) (4) (5) (6); the flexibility of the back (6) (7); the flexibility of the hand (8) (9) (10); the flexibility of the fingers (11) (12) (13); the flexibility of the waist (14) (15); the flexibility of the foot (16) (17) (18) (19) (20) (21), in total for 5 minutes to Singing Dancing.

Each worker carried out the process of *Pencantingan* as much as 21 specimens, starting for control conditions as many as 21 specimens once completed, next day continued with stretching as much as 21 specimens, the next after stretching is completed, the next day continued with the Singing dancing as much as 21 specimens. The measurement of mental workload held twice 2 times in 1 day which is that every an hour after treatment has been completed, i.e. at 11 a.m. and 3 p.m.

2.5 Data processing

The 27 cards are sorted by the participants and then the results are used as input on software Subjective Workload Assessment Technique (SWAT), version 3.1., in 1996, Dayton, Ohio to getting event scoring. Mental Workload (SWAT Score) is obtained from event scoring with the way carry out interview to getting each 3 dimensions of the task, held twice a day at 11 a.m. and 3 p.m.

Pencantingan task covering 5 activity consist of: take wax liquid from a griddle (act.1); blowing the beak *canting* (act.2); *klowong*: traced wax liquefied from *canting* on the whole pattern that is in a cloth (act.3); *pencantingan isen-isen* appropriate form of ornament *isen-isen* done after the activity of *klowong* completed (act.4); *nembok*: shut down all of its surfaces the cloth which is willed fixed white with wax liquid (act.5).

3. Results

Figure 5 showed that measurement of 5 activities for treatment Stretching and Singing dancing as measured at 11 p.m. have the mental workload lower than without a Rest Break (control). The greatest control in act.4 (93.96), for Stretching on act.4 (70.33) also Singing and dancing in act.3 (33.28), activities that have the Mental workload is highest is located on activity 4 (act.4).

Figure 6 showed in the condition of without rest break (control), mental workload on at 3 p.m. Average the workers have the experience very heavy > 81 , especially on activity 4 (act.4 = 92.53), after treat stretching or singing dancing, mental workload decreasing in stretching be quite heavy between 41 - 60 (act.3 = 51.73; act.5 = 55.46) and heavy between 61 - 80 (act.4 = 66.54). Singing dancing also decreasing in becomes light between 21-40 on the activity 5 (act.5 = 36.86) and quite heavy between 41- 60 on the activity 3 and activity 4 (act.3 = 41.56; act.4 = 47.14).

Figure 7 showed average mental workload declining on stretching and singing dancing at 11 a.m. and 3 p.m. with respect to control condition, the largest decrease on singing dancing of 54.41 % (11 a.m.) and 44.13 % (3 p.m.) against stretching. Results the mental workload on stretching of 35.20 % (11 a.m.) and 38.36 % (3 p.m.) against control condition. ANOVA single factor no differences average mental workload between at 11 a.m. and 3 p.m. ($F(1,5) = 0.001153, p > 5$). Significantly difference average mental workload between the control condition, stretching, and singing dancing ($F(2,5) = 314.06, p < 0.05$).

4. Discussion

The purpose of this research is to examine effect singing dancing during rest break against mental workload on condition control, stretching and singing dancing. The result showed that mental workload on singing dancing give impact that significant against stretching and control. Treatment singing dancing giving the biggest results on the mental workload of 54.41 % and 44.13 % (11 a.m. and 3 p.m.) against stretching.

Figure 5 and 6 showed each activity has different levels of difficulty so that the Mental Workload is also different. Activity 4 (act.4) is *Pencantingan* of *isen-isen* have the highest difficulty level (Nair et al. 1997) so have workload feeling higher than the other activities. The Workers beside carry out *Pencantingan* task also to appear creativity simultaneously on form of *isen-isen* is match with the shape of ornament and able to put *isen-isen* correctly adapted to the space available, the number of volume of *isen-isen* and target schedule completion making the condition more stress and mental workload is higher. This was supported with the research conducted by Hughes et al. 2005 that the high time pressure and high workload result an increase in activity muscle and speed but otherwise causing a decline in the performance and workload feels increased overall, as well as growing mental workload then make SWAT Score is increasing. (Wahlstrom et al. 2002) worked on condition of stress (time pressure and verbal provocation) will have an impact on the physical reaction and psychology. (Basahel et al. 2012) worked on condition of stress will be increasing the intensity of physical and mental workload, and cause the decrease of the level of accuracy and time response is longer.

Figure 7 showed the trend of decreasing means that there is a positive influence stretching and singing dancing to a decrease in mental workload on *Pencantingan* Task compared with the condition of control (without rest break). Singing dancing having decrease of the mental workload is the highest by 54.41 % (11 a.m.) and 44.13 % (3 p.m.) against stretching, mental workload on stretching of 35.20% (11 a.m.) and 38.36 % (3 p.m.) toward the control condition. This was confirmed from the ANOVA single factor for each treatment ($F(2,5) = 314.06$; $p < 0.05$) means there is a real difference average mental workload between the control condition, stretching, and singing dancing, and no significant difference the average mental workload between at 11 a.m. and 3 p.m. as results ANOVA ($F(1,5) = 0.001153$; $p > 0.05$).

Pertaining to singing dancing that gives the influence of a decrease in most are treatment between music, combining elements a song, sing and motion into one whole in treatment in fact provides benefit for workers, become more relaxed made the atmosphere work be uncomfortably (not stress), and give a chance to do recovery physical or mental this was confirmed by research (Kreutz et al. 2004) choir singing give an effect on emotional state and emotional stress, singing increase positive mood, lowering negative mood and improve of secretory immunoglobulins A, with the increase S-IgA the more feel relaxed. (Stuck et al. 2009) *Biodanza* exert stronger in the long run to changes in S-IgA compared with yoga intervention. (Lim 2008) listening to music decrease tension arousal; singing and rhythm tapping increase energy arousal, lowering arousal tired. An interpretation based on previous studies, stretching more leads to the flexibility to prevent muscle a strain thus the workers having the power of more than a control condition. Singing dancing referring to *Biodanza* and choir singing, not only function as do flexibility as it is to stretching but by doing singing dancing workers can feel more relax make diminution taste stress, and workers become more concentrated, eventually get lower mental workload.

Total participants 16 female in area Malang-East Java-Indonesia with demographic characteristics consist of: age: 24.44 ± 0.79 years; Height: 152.25 ± 1.27 cm; Weight: 44.00 ± 1.13 kg; Body Mass Index (BMI): 19.00 ± 0.48 (m/kg²); experience of Batik: 3.63 ± 0.68 years. Mental Workload can vary heavily influenced by (Nair et al. 1997) variation in age and experience, the older more experienced does not guarantee a lower workload, requiring more effort compared to the younger, In this research age of the participants are young and the experiences are enough so that does not vary on the mental workload.

Related music *dangdut* used in this research, reflecting the character types of music interested most Indonesians (Weintraub 2012). (Young 2003) effects of music on task performance, participants who hear music appropriate options can do perform better than no music, and no music do perform better than listening to music which not liked, in general that listen to music give positive impact on task performance. (Labbe et al. 2007) Research related to coping with Stress: The effectiveness of Different Types of Music, the results show that listening to music chosen by themselves significantly reduce the negative emotional state. According this research the most music interest is *dangdut*, beat dynamic/joyous.

The Effect of Music Amplitude on the Relaxation Response (Staum et al. 2000) to know the relaxation response by changing the variation of amplitude: amplitude loud (80-90 dB), medium (70-80 dB), soft (60-70 dB) using Continous Response Digital Interface (CRDI), the results showed a tendency of men to prefer loud music, generally termed as softer music can be summed up (60-70 dB) support for the purpose of relaxation. In this study used is the amplitude of the medium (70 dB) so that it is appropriate for the purpose of relaxation so not noisy.

5. Conclusion

Stretching and Singing dancing provide a positive influence on Mental Workload, but Singing dancing (singing while jig accompanied by the music *dangdut*) influence greater than stretching, because singing dancing can make the workers more relax, muscle flexibility and more positive on mood, perception and endurance.

The increased Mental Workload describes working conditions increasingly stress it is influenced by the level of difficulty of the work and schedule the completion of the work, which will ultimately result in a decrease of performance.

The future research recommended with continue the research relating to the development of new treatment that combines singing dancing with eyes relaxation or can do to develop experimental design of the development of the elements of singing dancing.

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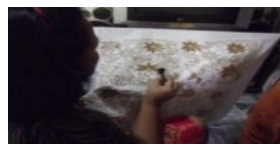


Figure 1. Motives Buketan and white cloth patterned Buketan.







					
Buketan motives (5 ornament)	Ornament 1. Flowers	Ornament 2. Trunk	Ornament 3. Butterfly	Ornament 4. Star	Ornament 5. Leaves

Figure 2. Five Ornaments of a motives Buketan.



Figure 3. Six Movement Stretching



Figure 4. Singing dancing (Jig while singing)

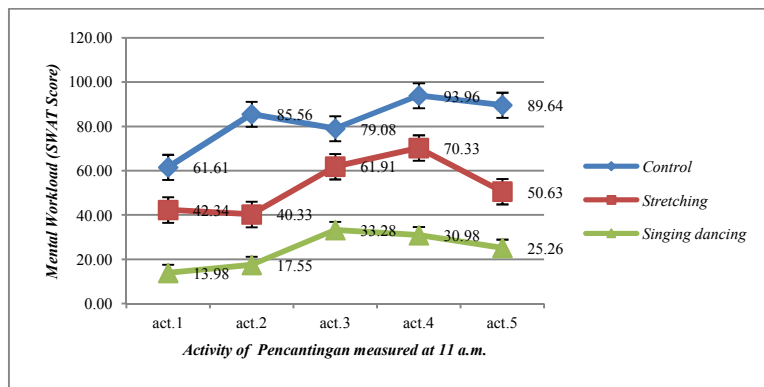


Figure 5. Mental workload for each activity at 11 a.m.

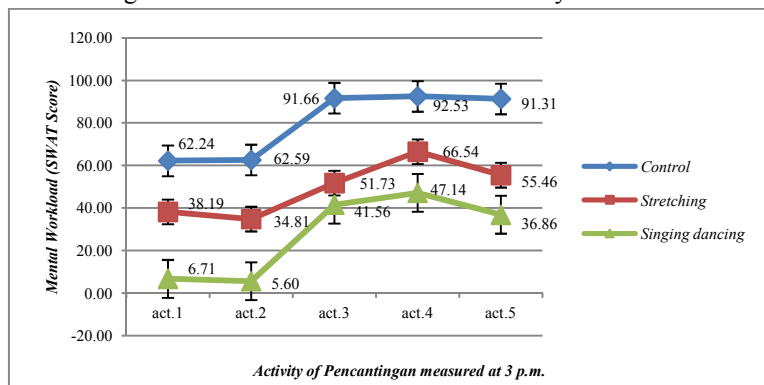


Figure 6. Mental workload for each activity at 3 p.m.

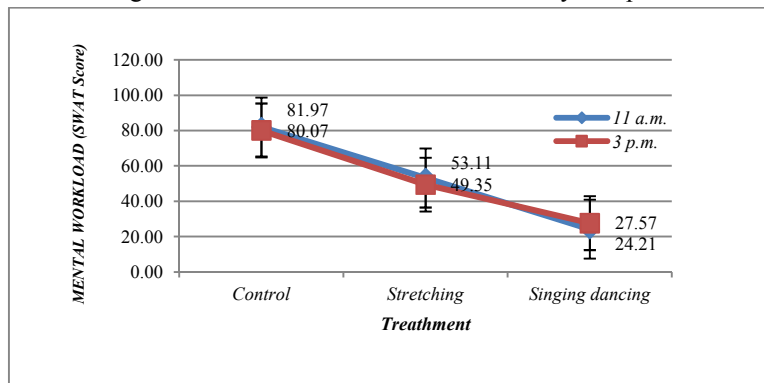


Figure 7. Mean of Mental workload for each treatment.

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