

PROCEEDINGS

1st International Conference on Engineering of Tarumanagara

<u>2013</u>



1st International Conference on Engineering of Tarumanagara Urban Engineering for Future Generation"

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"Urban Engineering for Future Generation" Jakarta, 2-3 October 2013

Faculty of Engineering Tarumanagara University Jakarta - INDONESIA



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FACULTY OF ENGINEERING TARUMANAGARA UNIVERSITY JAKARTA-INDONESIA 2013

Forewords Chairman of the Organizing Committee

First of all let's pray and say thanks to God for giving us His mercy and blessings.

The development of technology nowadays is growing up so fast. It aims to meet the necessary of the community to get a better life. Technological innovation which needed to develop technology products that can help people in improving their lives. Therefore the academics are not only required to implement the learning process, but also have to do research and community service to produce innovative scientific research.

Indonesian academics today are eager to involve in research activities. Therefore we required a scientific forum for mutual discussion, exchange information about the research that has been carried out especially related to Urban Engineering.

Faculty of Engineering, University of Tarumanagara conducts the first international conference to bring the academics, researchers to develop their knowledge and exchange ideas so that the researchers can improve the results of research that has been done. The conference called the International Conference on Engineering Tarumanagara, 2013, which is held on the Auditorium at the 8th floor of M Building, Campus I, University of Tarumanagara from 2 to 3 October 2013. The ICET 2013 conference theme is Urban Engineering for Future Generations. Future generations as the frontier of national development should be prepared from now on, along with the necessary infrastructure. The role of technology is to support the enhancement of the ability of future generations. This event includes to the presentation of scientific papers by keynote speakers, parallel sessions presenting papers of academics and research poster exhibition.

The more extensive the information obtained, the more knowledge that we gained. Some papers submitted by researchers and academics from different countries such as United Kingdom, Germany, Taiwan, Singapore, Iran, Malaysia, Sri Lanka, and Japan, will enrich the science and technological development.

This conference proceedings contain the full text of all papers presented International Conference on Engineering of Tarumanagara 2013. Papers are categorized based on Engineering disciplines set by the organizing committee. Then, the presentation is divided into parallel sessions.

On this occasion I would like to thank to: Foundation of Tarumanagara, Rector of Tarumanagara University, Dean of Faculty of Engineering Tarumanagara University and Sponsors of ICET 2013, for the support and help that has been given. I also would like to thank the authors for their contributions.

Finally I would like to apologies if there are deficiencies in the activity. Thank you for all the attention.

Dr. M. Sobron Yamin Lubis

Chairman of the Organizing Committee

Forewords Dean of Faculty of Engineering

I would like to warmly welcome all participants of the International Conference on Engineering of Tarumanagara (ICET 2013). This conference is organized by Faculty of Engineering, Tarumanagara University. The main aim of this conference was to respond the problem related to urban engineering for future generation. As this conference was designed to gather scientists, engineers, practitioners, and industries in engineering related disciplines, I expect intense discussion will happen among them so that some brilliant ideas to be used to improve the quality of human life can be produced.

I hope this conference will create an international networking and collaborating, especially in engineering research and publication.

I would like to congratulate the organizing committee of ICET 2013, for their outstanding efforts. I would also like to express my gratitude to the sponsors for their contributions in making this conference a resounding success.

I wish the International Conference on Engineering of Tarumanagara (ICET 2013) a very useful and fruitful occasion.

Thank you for your attention and contribution.

Dr. Agustinus Purna Irawan

Dean of Faculty of Engineering

Forewords Rector of Tarumanagara University

Distinguished Guests, Ladies and Gentlemen,

I am delighted to have the opportunity to give a welcoming speech on this International conference where the issues of Urban Engineering for Future Generation will be addressed. And I believe these issues are crucial and important not only for our future generation but also for our planet where we live.

The progressive development in technology particularly in the 21-st century has brought the impact to human life. The way we communicate and the way we live have changed along with the development of the technology. In order to cater these needs, the natural resources are explored, buildings and industries have been built. As results of this development, the echo system is affected. In one hand, we have been successful to build our planet to cater our needs and on the other hands, gradually the stability our planet has been ruined. The question is; who is responsible or who is to be blamed on this ordeal. Despite all problems we might encounter as we go with this life, we have to protect our only planet.

In order to find the solution to these problems, many conferences and seminars have been conducted on the issues of Urban and Sustainability. Most of the time, people conceive of the programs in the last 10-15 years and anticipate for the future. Since the Kyoto Protocol in 1997 in Tokyo until the World Sustainable Building Conferences (SB11) in Helsinki in 2011, thousands of papers have been published. Many aspects of the future of the world for our future generation have been discussed. Many rating systems have been developed and yet many issues still need the attention of the scientists.

In broad, the issues can be categorized in three aspects i.e., social aspects, ecological aspects and, environmental aspects. The deterioration of these aspects can be minimized from the technical dimension. However, there is one aspect that is less discussed and considered i.e., cultural aspect. The culture and the way of life in each country might be different. For instance, those who live in the sub-tropical countries might be different from those in the tropical countries. Eventhough they are interrelated, but each of them has to be explored.

Today, we meet in this conference to exchange the knowledge and the information in many aspects of the sustainability and technology. I hope in this conference, the participants not only can share but also can learn on the sustainable issues.

Thank you.

Prof. Ir. Roesdiman Soegiarso, M.Sc., Ph.D. Rector of Tarumanagara University

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Dr. Agustinus Sutanto	Т
Dr. Danang Priatmodjo	Т
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Chairman Vice Chairman Conference Secretariat

Scientific Committee

Tarumanagara University (Chair) Osaka University Victoria University of Wellington Victoria University of Wellington Jniversiti Sains Malaysia Jniversiti Tun Hussein Onn arumanagara University, and National University of Singapore Atma Jaya Catholic University of Indonesia, and Karlsruhe Institut fur Technologie Bandung Institute of Technology **Jniversity of Gadjah Mada Jniversity of Indonesia Jniversity of Indonesia Jniversity of Indonesia Jniversity of Indonesia Jniversity of Indonesia** Jdayana University Sebelas Maret University Atma Jaya Catholic University of Indonesia Trisakti University Tarumanagara University

Organizing Committee

Dr. M. Sobron Yamin Lubis Priyendiswara A.B., M.Com Dr. Harto Tanujaya Regina Suryadjaja, M.T. Mekarsari, M.Sc. Dewi Linggasari, M.T.

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	Road Wiannenance Flojeci Dewa Ketut Sudarsana Harnen Sulistio Achmad Wieaksono Ludi Diakfar				
	Dewa Ketai Sauai sana, Harnen Sausno, Achinaa Wicaksono, Laaji Djakjar				



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	15.30-17.30	1	CE-07, CE-09, CE-11, CE-14, CE-18, CE-21
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Parallel Session Schedule

Sincerely yours, Dr. Sobron Yamin Lubis

Chairman of the Organizing Committee

ANALYSIS OF EFFECT OF BODY MASS INDEX (BMI) AND SURFACE AREA OF THE HEEL ON FEMALE PROSPECTIVE EMPLOYEE DURING WALKING

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Abstract

Good appearance is needed to give a good impression. The professionalism of company sometimes is measured subjectively by the appearance of employee. Female employee wears a shoe with heel to give more confidence on her appearance. It is not easy for female prospective employee to walk with that kind of shoe. Generally they are first graduate and occasionally wearing a shoe with heel in their activity. The purpose of research is to find an ideal shoe for female prospective employee. Black box method is used in this research. Four models of shoe are wornalternatelyby 2 groups of BMI(16.0-18.5, 18.6-21.0). The effects aredelta heart pulse (kdj) and travel time (wt), 72 objects are measured during walking. The result is tested by3 ways ANOVA andthe effect is discussed.T test is used to find the ideal shoe.

Keywords: Female Shoe, Walking, Physiology, Ergonomic

INTRODUCTION

Generally university student choose a casual shoe or sport shoeduring activities in campus. Occasionally they are wearing a formal shoe for attending seminar or doing a presentation. In transition from student to be professional employee, male student do not have any problem with the formalshoe, but female student have to be wonted wearing a heel shoe for supporting their appearance.

The moving activities of female employeein the office will be done in 3 ways, there are a walkingstraight, upstairs, and downstairs^[1]. The ideal heel height is 2cm^[1]. The purpose of this research is to find an ideal shoe for female prospective employee. The ideal shoe considers a shoe model and heel surface area instead of random model^[1]. First model,foot is covered by shoe and2nd model, under ankle and heel is open can be tighten by belt.Two kinds of heel surface area are 1.8 cm² and 7.5 cm², and the available sizes are37 and 38 (European size) can be selected by student. Table 1.1 shows the combinations of model, heel area, and heel height.In this research body height is considered instead of body weight only^[1] then body mass index (BMI) is used.

Model	Heel Area (cm ²)	Heel height (cm)	Code
1	1.8	2	1.1
	7.5	2	1.3
2	1.8	2	2.1
	7.5	2	2.3

Table 1 Shoe model, heel area, and heel height

MATERIALS AND METHOD

Seventy two students at semester 7 of 8 are measured. They are divided by 2 groups of body mass index (BMI), first group at range 16.0 - 18.5 (under weight, IOTF, WHO 2000) and second group at range 18.6 - 21.0 (normal, IOTF, WHO

2000). The measurement is done when they are doing the activities, bare foot and wearing 4 models of shoe respectively. Walking straight would be walking 30 m straight. Upstairs and downstairs would be walking up and down 2 floors (21 steps each floor), with 17 cm step height and 29 cm step depth. Scenarios of measurement can be seen at figure 1 and figure 2.



Figure 1 Walking straight scenario



Figure 2 Upstairs - downstairs scenario

The heart pulse during activities is obtained by measuring pulse before and after activity. Wrist pulse meter is used to get the data. The travel time in second (wt) is measured by using stopwatch. The normality is done for both data by using Goodness of fit test with 95% confidence and 5% accuracy. Delta heart pulse (kdj) is obtained by subtract working pulse and rest pulse. Kdj describes the increasing of heart pulse after doing an activity, figure 3 shows that condition.



Figure 3 Heart pulse pattern

The effect of BMI, shoe model, and heel area on wt and kdj will be tested by using 3-way ANOVA for 3 activities. The test is done by using SPSS ver.11.5 statistic software. The result will be discussed and the ideal model is obtained by using T-test.

RESULTS AND DISCUSSION

Three-way ANOVA test has been done, the result can be seen on table 2. Dependent will give an influence on independent when the significant value ≤ 0.05 .

	Dependent						
Independent	Wt (significant)			Kdj (significant)			
	Straight	Upstairs	Downstairs	Straight	Upstairs	Downstairs	
BMI	0.706	0.000	0.155	0.655	0.260	0.000	
Shoe model	0.000	0.000	0.000	0.000	0.135	0.017	
Heel area	0.000	0.000	0.000	0.000	0.515	0.133	

Table 2 ANOVA result

Almost travel time on 3 activities influenced by shoe model and heel area, except going upstairs, BMI also gave an influence on the travel time. Figure 3 shows the variation of travel time. Generally the highest travel time (slow) was achieved by shoe model 1 with 1.8cm heel area (code 1.1). The lowest travel time (fast) was achieved by shoe model 2 with 7.5cm heel area (code 2.2).

Delta heart pulse was not influenced by BMI, shoe model, and heel area on walking upstairs. Kdj when walking straight 30m was influenced by shoe model and heel area. BMI and shoe model influenced Kdj on walking downstairs. Figure 3 shows the variations of delta heart pulse. As same as travel time, the highest delta heart pulse was achieved by shoe model 1 with 1.8cm heel area (code 1.1), and the lowest was achieved by shoe model 2 with 7.5cm heel area (code 2.2).

Going upstairs gave a different pattern, there were affected by BMI in the travel time and no effect on delta heart pulse. It may caused by force against gravity.



Figure 3 Diagram average of Wt and Kdj

T –test was used to find an ideal formal shoe for prospective female employee. In this case shoe model with its attributes compared each others to find the short travel time and low delta heart pulse, starting from shoe code 1.1. The result of T-test can be seen on table 3 and table 4. The short travel time and low delta heart pulse was achieved by shoe model 2 with 7.5cm heel area (code 2.2). This shoe has a belt then it can be adjusted by the user to get a comfort condition. Seven point five centimeter on heel area makes a wide pedestal instead of 1.8cm heel area. That model makes user can stabilize a body balance when walking.

Travel time (Wt)								
Codo vorsus	BMI 16.0 - 18.5		Fliminated	BMI 18.6 - 21.0		Fliminatod		
Code versus	$t\alpha =$	t =	Emmateu	$t\alpha =$	t =	Eliminated		
1.1 vs 1.2	-2.92	20.01	1.1		45.61	1.1		
1.1 vs 2.1		8.56	1.1		4.08	1.1		
1.1 vs 2.2		16.89	1.1	2.02	14.20	1.1		
1.2 vs 2.1		-0.67	2.1	-2.92	-0.66	2.1		
1.2 vs 2.2		4.50	1.2		5.32	1.2		
2.1 vs 2.2		9.53	2.1		4.70	2.1		

Table 3 T-test result for travel time (Wt)

	Table + 1-test result for delta heart pulse (Kuj)							
	Delta heart pulse (Kdj)							
Cadavana	Codo vorsus	BMI 16.0 - 18.5		Fliminated	BMI 18.6 - 21.0		Fliminatad	
	Coue versus	$t\alpha =$	t =	Eliminated	$t\alpha =$	t =	Emmated	
	1.1 vs 1.2	-2.92	2.14	1.1		2.60	1.1	
	1.1 vs 2.1		4.78	1.1		3.58	1.1	
	1.1 vs 2.2		5.95	1.1	2.02	5.36	1.1	
	1.2 vs 2.1		0.48	1.2	-2.92	9.09	1.2	
	1.2 vs 2.2		1.99	1.2		3.82	1.2	
	2.1 vs 2.2		2.60	2.1		2.01	2.1	

Table 4 T-test result for delta heart pulse (Kdj)

CONCLUSIONS

The analysis of effect of BMI, shoe model, and heel area influenced travel time and delta heart pulse has been done. The result shows that shoe model and heel area make user walk slower than bare foot, figure 4 shows that condition. BMI affects users when they were going upstairs, force of gravity makes travel time slower.

Delta heart pulse did not affected by BMI, shoe model and heel area when user were going upstairs. Figure 5 shows Kdj on going upstairs is very close for every shoe code.On this case all independent factor was increasing the heart pulse, it is because of force against gravity that make body consume more energy to do that activity.



Figure 4 Travel time



Figure 5 Delta heart pulse

The ideal shoe for prospective female employee has been discussed. It found shoe with belt for adjusting laxity is more comfortable in walking instead of a closed shoe. The 7.5cm surface area of heel is giving footstool for body balance instead of 1.8cm surface area of heel.A questioner about user feels about the shoe they have worn gave the same result as the experiment result. Table 5 shows most users selected shoe code 2.2. That shoe was giving a balance (45) and comfort (42).

Table 5 Questioner result								
Shoe		Balance		Comfort				
code	1	2	3	1	2	3		
1.1	53	14	5	38	24	10		
1.2	3	24	45	4	29	39		
2.1	24	36	12	10	38	24		
2.2	0	28	45	1	29	42		
1 = Not go	bod	2 = Enou	ıgh	3= Good				

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