makalah ISID 2018

Submission date: 08-May-2024 09:18AM (UTC+0700)
Submission ID: 2264076847
File name: makalah_ISID_2018.pdf (1.1M)
Word count: 2872
Character count: 15069

ISSN 1755-1307

IOP Conference Series
Earth and Environmental Science

1st Workshop on Metrology for Agriculture and Forestry (METROAGRIFOR)

275

VOLUME 275 – 2019

1–2 October 2018
Ancona, Italy

EDITOR
Enrico Primo Tomasini

The open access journal for conference proceedings

iopscience.org/jpcs

IOP Publishing

IOP Conference Series: Earth and Environmental Science

Table of contents

Volume 419
2020

‹ Previous issue Next issue ›

The 3rd International Conference on Civil and Environmental Engineering (ICCEE 2019) 29–30 August 2019, Bali, Indonesia

Published online: 08 February 2020

IOP Conference Series: Earth and Environmental Science

COUNTRY	SUBJECT AREA AND CATEGORY	PUBLISHER	H-INDEX
United Kingdom Universities and research institutions in United Kingdom Media Ranking in United Kingdom	Earth and Planetary Sciences Earth and Planetary Sciences (miscellaneous) Environmental Science Environmental Science (miscellaneous) Physics and Astronomy Physics and Astronomy (miscellaneous)	IOP Publishing Ltd.	41

PUBLICATION TYPE	ISSN	COVERAGE	INFORMATION
Conferences and Proceedings	17551315, 17551307	2010-2022	Homepage How to publish in this journal ees@ioppublishing.org

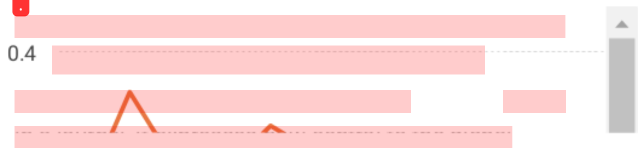
SCOPE

The open access IOP Conference Series: Earth and Environmental Science (EES) provides a fast, versatile and cost-effective proceedings publication service.

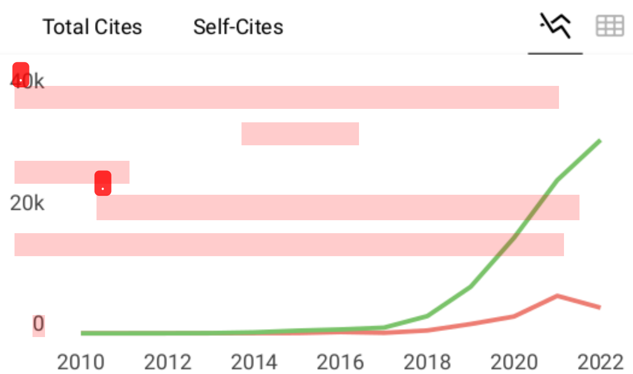
Join the conversation about this journal

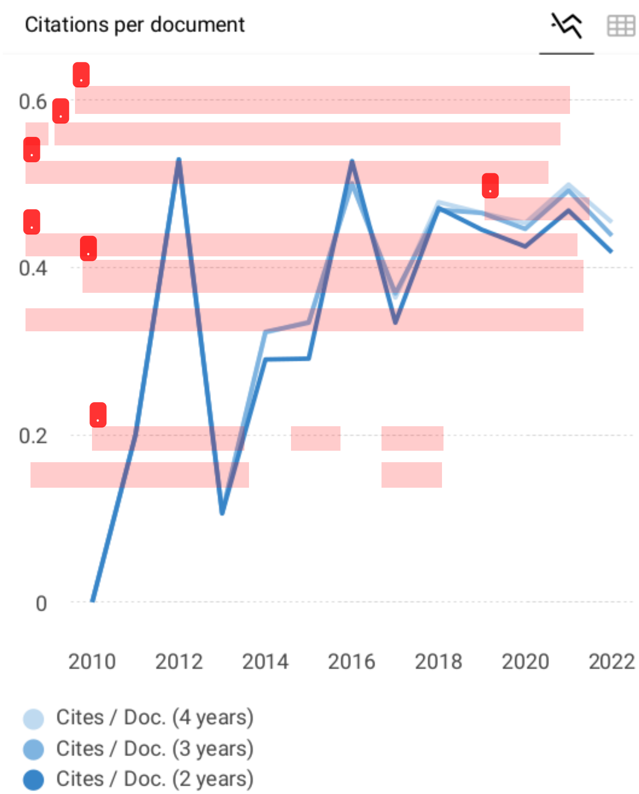
SJR

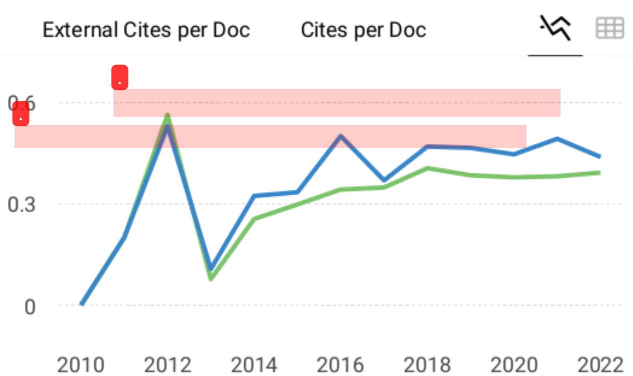
Total Documents

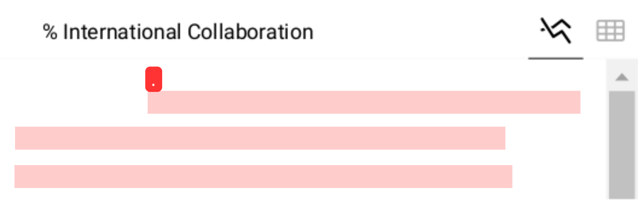

0.4

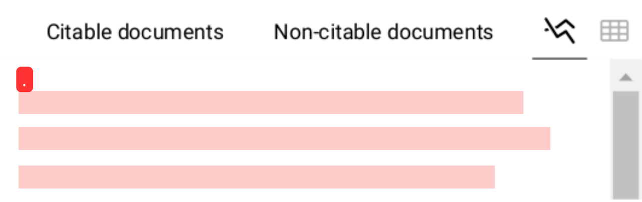

40k

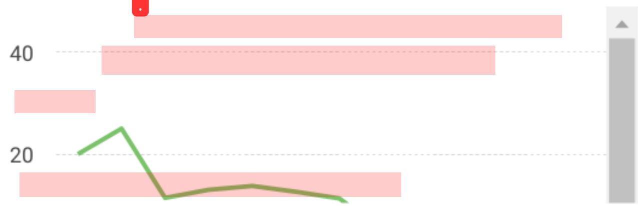

Total Cites
Self-Cites
40k
20k
0
2010
2012
2014
2016
2018
2020
2022

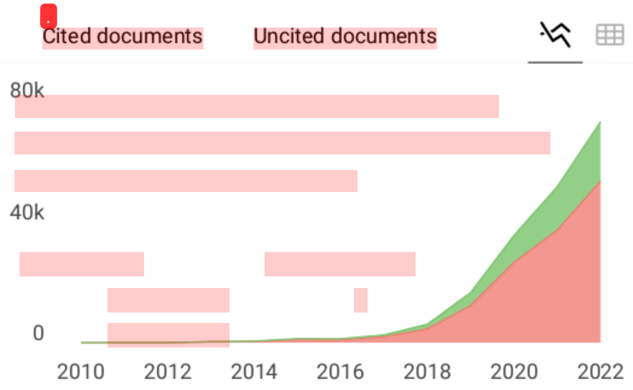

Citations per document
0.6
0.4
0.2
0
2010
2012
2014
2016
2018
2020
2022
Cites / Doc. (4 years)
Cites / Doc. (3 years)
Cites / Doc. (2 years)


External Cites per Doc
Cites per Doc
0.6
0.3
0
2010
2012
2014
2016
2018
2020
2022


% International Collaboration


Citable documents
Non-citable documents





← Show this widget in your own website

Just copy the code below and paste within your html code:

```
<a href="https://www.scimag
```

Explore, visually communicate and make sense of data with our **new data visualization tool**.

Construction labor's physiological workload based on labor's perspective

Construction labor's physiological workload based on labor's perspective

B Anondho[1] and M Y Suparman[2]

[1] Civil Engineering Department, Universitas Tarumanagara, Jakarta, 11450 Indonesia
[2] Psychology Department, Universitas Tarumanagara, Jakarta, 11450 Indonesia

E-mail: basukia@ft.untar.ac.id

Abstract. Construction craftwork is a physically strenuous and demanding occupation. Physically demanding work leads to physical fatigue which is associated with decreased productivity. This paper investigates the feasibility of measuring in situ physical demands based on a labor perspective. In that case, physiological measures of energy expenditure data were collected from 110 construction workers performing typical construction work, in this case, is an ironworker. The measurement of energy expenditure during physical work activities is considered a measure of the physiological workload experienced by construction workers. The measured data were evaluated against published guidelines for acceptable levels of physical performance. The result shows that the working load of ironworkers in Jakarta is very heavy on 3.0925 Kcal/minute energy expenditure by labor perspective. This paper developed for further applied research regarding the physical demands of construction work.

1. Introduction

Construction craftwork is a physically demanding occupation that leads to physical fatigue which is associated with productivity decrease. This condition gives influence on time management as one important variable in construction management. The nature of the construction services industry has evolved where contractors rely on labor [1]. The more time the workers do their jobs, it decreases the ability to convert chemical energy into mechanics [2]. In general, physical fatigue leads to productivity and motivation decreased, disorganization, poor judgment, poor quality of work, job dissatisfaction, accidents, and injuries [3-4].

Basically, productivity is influenced by 3 factors namely workload, work capacity and an additional burden due to the work environment. Labor productivity is a fundamental part of the information for estimating and scheduling construction projects [5]. The workload itself is related to the physical, mental and social burdens that affect the workforce. Several previous studies have suggested that workers who feel fatigued have difficulty with their physical and/ or cognitive functions [6]. Labor has a very important role in improving construction performance [7-8].

Further studies of the physical demands of labor had been conducted since the 1950s and 1960s up to now. Abdelhamid and Everett conducted research based on occupational physiology, energy expenditure, oxygen consumption, and pulse rate. Understanding the physical needs of construction work is essential to protecting safety and health while increasing labor productivity [9].

Based on the previous research above, this paper was describing preliminary research conducted in Jakarta to identify the workload of construction workers from labors perspective with the ironworkers as specific labor classification.

IOP Conf. Series: Earth and Environmental Science **419** (2020) 012014 doi:10.1088/1755-1315/419/1/012014

2. Methodology

2.1 Data gathering
This preliminary research used the questionnaire as a research instrument for gathering data. The questionnaire consists of 4 main variables which are: Level of ability, working expense, working weight, and level of fatigue tiredness. These 4 variables are measured by several physiological indicators each of which are obtained from the literature of previous research. The questionnaire addressed to the ironworkers at a construction project as object goals in this research. Likert scale is used to measure perceptions, attitudes or opinions of a person about an event or a social phenomenon, based on the operational definition set by the researcher. In this research, the Likert scale with the value of 1 (one) is the minimum value (not agree) up to the value of 5 (five) the maximum value (strongly agree).

2.2 Data processing
The process of data analysis is done by calculating the value of the RII (Relative Importance Index) method of each indicator on the questionnaire, which is based on workload, ability, fatigue level, and psychological influence. The value of RII calculated by the formula:

$$\mathrm{RII_i} = \frac{\sum_{l=1}^{Q} l\, \mathrm{n}_\ell}{Q \sum \mathrm{n}_\ell} \tag{1}$$

i = Question/ statement item
n_ℓ = Number of the respondent with l score answer
l = Number of Likert scale
Q = Likert range

Each question RII value will be ranked from the largest RII value to the smallest. The workload of each worker determined based on table physiological demands by construction trade (Abdelhamid, 2002) with the value of energy expenditure. Workload conversion is done by multiplying the value of RII from each item of the question with the value of energy expenditure as in the following equation:

$$WL_n = P_n \text{ x } EE_n \tag{2}$$

WL_n = Workload indicator n
P_n = RII value of indicator n
EE_n = Energy expenditure indicator n as table physiological demands

Then the next step is to calculate the value of the workload of ironworkers by sum up the value of the first rank of workload for each independent variable which is the workload, ability, fatigue level, and psychological influence.

$$\text{WL Ironworker Total} = \frac{\text{WLvar1+WLvar2+WLvar3+WLvar4}}{4} \tag{3}$$

Energy expenditure calculation was done also with the same thing method, where each variable was determine based on the top ranking of sub-variable, then the sum of it divided by 4 type variables.

3. Result and discussion

3.1 Result
The questionnaire consists of 4 variables and 21 indicators where variable workload had 4 indicators which are respondents' opinions about their workload. The variable ability had 6 indicators consist of how the ironworker doing their job. Variable fatigue consists of 8 indicators of working conditions

that influence their physiological performance and variable psychology had 3 indicators of emotion and environment influence. The research started by distributes the questionnaire to 60 ironworker respondents where 51 gave back the responses.

RII analysis tabulated as seen on table 1 for ironworker perspective about working load they have to bear, table 2 for their ability or competence, table 3 shows the level of fatigue on their perspective and table 4 describes environment influence on their performance. This tabulation is the result of the analysis.

Table 1. Working load for an ironworker.

Question number (Q)	RII (P)	Ranking	Energy expenditure (EE) (Kcal/min)	Working load value Wl
3	0.82	1	5.65	**4.63**
4	0.75	2	5.6	4.22
1	0.70	3	3.53	2.48
2	0.67	4	2.61	1.74

Table 2. Working load for ironworker competencies.

Question number (Q)	RII (P)	Ranking	Energy expenditure (EE) (Kcal/min)	Working load value Wl
1	0.82	1	5.65	**4.61**
2	0.80	2	5.6	4.50
5	0.76	3	5.31	4.06
4	0.72	4	3.53	2.53
3	0.69	5	3.53	2.45
6	0.66	6	2.61	1.73

Table 3. Fatigue level of an ironworker.

Question number (Q)	RII (P)	Ranking	Energy expenditure (EE) (Kcal/min)	Working load value Wl
2	0.94	1	5.65	**5.32**
4	0.84	2	5.60	4.72
1	0.78	3	5.31	4.16
3	0.74	4	5.31	3.96
5	0.67	5	3.86	2.60
6	0.67	6	3.53	2.38
7	0.66	7	3.53	2.34
8	0.62	8	2.61	1.62

Table 4. Psychology impact.

Question number (Q)	RII (P)	Ranking	Energy expenditure (EE) (Kcal/min)	Working load value Wl
1	0.79	1	3.53	**2.78**
2	0.75	2	3.53	2.63
3	0.69	3	2.61	1.79

The RII analysis gave 4 sub-variables which are: continuously works for physically load variable, type of tools for competencies, the power requirement for fatigue and rest time for psychology impact, as top-ranking answered by the ironworkers.

The total amount of ironworker working load by summing the amount of each variable divided by 4 to get average, gives 4.31 Kcal/minute based on the ironworker perspective. The above results are based on energy expenditure relative to the perspective of the construction workforce (ironworker).

3.2 Discussion

Ironworkers have a workload based on energy expenditure of 4.31 Kcal/min Energy expenditure values obtained from the physiological demands by construction trade table. This result classified ironworker jobs at a very heavy level. This is a suitable result with some previous research which states that the work of the smith or ironworker classified as heavy work [10].

It is clear that ironworkers work beyond the generally accepted reasonable threshold for energy expenditure. Not surprisingly the workers were exhausted at the end of their working day. If the worker cannot get around or find alternative work, then the worker can face the dilemma of continuing his work caused by fatigue.

4. Conclusions

This paper reports the physiological workload from the perspective of its specific workers. The workload of ironworkers is 4.31 Kcal/min. The findings of this research reveal that based on the energy expenditure; the ironworker workload is classified as level very heavy work [11]. This may cause experience physical fatigue, leading to a decrease in productivity and motivation, lack of attention and decision making, poor quality of work, accidents, and work-related injuries.

The main purpose of this study is to address the need to change the policy philosophy of safety in the field of construction. This can be done by applying physiological work to the workplace. This study is only limited to the calculation of the workload of construction workers from the perspective of the workers itself and it is associated with the value of energy expenditure. Further research should investigate not only the value of energy expenditure but also other factors that can show more accurate results.

Additional research is also needed for other types of workers and shows how the workload will affect the changes in the workforce. This will assist workers and managers in identifying opportunities to reduce workload or work fatigue and introduce work procedures that accommodate the capabilities of all workers while increasing productivity.

References

[1] Abdelhamid T S and Everett J G 2002 Physical demands during construction work *J. Constr. Eng. Manage.* **128**(5) 427-437

[2] Singleton W T, Fox J G and Whitfield D 1971 *Measurement of Man at Work, and Appraisal of Psychological and Psychological Criteria in Man-Machine System* (London: Taylor and Francis)

[3] Brouha L 1967 *Physiology in Industry* (New York: Pergamon Press)

[4] Janaro R E 1982 *Diss. The Development and Implementation of Optimal Multi-Rest Break Scheduling Model* (Florida: Florida State University)

[5] Song J, Haas C T and Caldas C H 2008 Tracking the location of materials on construction job sites *J. Constr. Eng. Manage* **132**(9) 911–918

[6] Zhang M, Murphy L A, Fang D and Caban-Martinez A J 2015 Influence of fatigue on construction workers' physical and cognitive function *The Society of Occup. Med.* **65** 245-250

[7] Jergeas G 2010 *Proc. Cons. Research Project 2010: Innovation for Reshaping Construction Practice (Banff)* (USA: ASCE) 1030-1038

[8] Castaneda J A, Tucker R L and Haas C T 2005 Worker's skill and receptiveness to operate under the tier II strategy management strategy *J. Constr. Eng. Manage* **131(7)** 709-807

[9] Abdelhamid T S and Everett J G 1999 Physiological demands of concrete slab placing and finishing work *J. Constr. Eng. Manage.* **125**(1) 47-52

[10] Abdelhamid T S and Everett J. G. 2000 *Proc. Constr. Congress VI: Building Together for a Better Tomorrow in an Increasingly Complex World (Orlando)* (USA: ASCE) 631-639

[11] Abdelhamid T S 1999 *Diss Measuring and Evaluating Physiological Demands of Construction Work* (Michigan: University of Michigan)

makalah ISID 2018

ORIGINALITY REPORT

26%	%	%	26%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

MATCH ALL SOURCES (ONLY SELECTED SOURCE PRINTED)

17%

★ Submitted to urjc

Student Paper

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		