Relationship of Job Competency, Personality Types, and Mental Workload with Work Incident in Welder Fitters Occupational

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\textbf{Abstract}
Background: Occupational accidents are often found in the shipping industry, that involves welding and cutting workers. The risk of accidents that is quite large creates a feeling of pressure in facing their work. The purpose of this study was to determine the relationship between competence, personality type, and mental workload on incidents of welding and cutting officers at the Maintenance and Repair Division of a shipyard company in Surabaya.

Aims: The study aimed to discover the relationship of competency, personality type, and mental workload to working accidents in the PT. PAL (Persero).

Settings and Design: This research was analytic with a cross-sectional approach

Methods and Material: Research variables in this study included workers' competencies, personality types, mental workload, and work incidents. The selection of respondents was taken based on the simple method random sampling of 44 respondents.

Statistical analysis used: The data obtained were collected from questionnaires, interviews, measurements, and observations. Data analysis used the Chi-square test with a significant level of confidence \(z=0.05\).

Results: The results showed that there was a relationship between welders' competencies \((p=0.039)\), personality types \((p=0.00)\) and mental workload \((p=0.047)\) with incidents. The most significant factor associated with welder and fitter work incidents was a personality type.

Conclusion: The conclusion in this study is that there is a significant relationship between competence, personality type, and mental workload with incidents at welding and cutting officers in the HARKAN division.

\textbf{Keywords:} Work Incident, Job Competency, Personality Types, Mental Workload, Welding Fitter

\textbf{Key Massages:}
Providing information regarding factors affecting working accidents and prevention efforts to minimize working accident risks.

**How to cite this article:** Laksana DP, Ardyanto Wahyidiono YD, Arini SY (2021): Relationship of job competency, personality types, and mental workload with work incident in welder fitters occupational, Ann Trop Med & Public Health; 22(S01): SP24149. DOI: [http://doi.org/10.36295/ASRO.2021.24149](http://doi.org/10.36295/ASRO.2021.24149)

**Introduction**

The rapidly growing industrialization process in Indonesia drives industrial actors to compete in generating excellent products to be utilized by customers. It slowly accompanies the emergence of hazard risks in each working stage. An excellent product needs supporting equipment such as machines to produce the desired product. For instance, a welding work needs to cut two metal pieces and melt them with or without pressures using heat energy as the melter of materials to be welded [1]. During the welding process, several hazards regarding health and safety are present [2].

PT. PAL Indonesia (Persero), as a strategic industry producing the primary tool of Indonesia's defense system, especially for the marine matra, has a vital and strategic role in supporting national maritime industry development [3]. Shipbuilding and repair need heavy equipment and pose labors to continuously in contact with heat and materials such as steel and iron. Crucial working roles during the process is welding and cutting. Such risky jobs have to be carried out by competent people to minimize the accident risk.

The working accident data from 2005-2006 showed working accidents caused by gram flakes on faces and hands to be the leading cause of several divisions in PT. PAL Indonesia. Indirectly, it illustrates that the risk of PT. PAL's labors is increasing, given 25 cases of working accidents from 2012 to 2013 [3]. An initial preliminary study stated several major divisions were involved in new ship assembly and old ships repair. One of which is the Maintenance and Repair Division (HARKAN) that engages in the repairing field from the hull plate replacement to machinery.

All these activities are related to old plate replacement. It means that the repair risk aspect has a higher hazard risk than the new plate (new ship assembly). It follows Basuki and Chairunnisak’s (2012) study that sought risks and risk levels on new buildings, especially buildings related to the small-scale dockyard field [4]. Fundamentally, working accidents are caused by two categories. The first category is the mechanic and environment factor (unsafe condition), while the second category is the human factor (unsafe action) [5].

One of the human factors affecting working accidents is the personality type. Carl Gustav Jung in Suryabrata (2007) argued that introverts tend to be close, hard to get along with, and distant from others. The argument was supported by Hans J. Eysenck in Suryabrata (2007), stating that introvert people tend to show fear and depression symptoms [6].

Stress may provoke various harmful effects of decreased health and illness [5]. According to Moekijat (2006), the workload analysis provided information regarding labor requirements in a qualitative setting and types of positions and employees needed to finish assignments. The mental workload analysis uses subjective measurements of the Duty-Free Index and National Aeronautics & Space Administration – NASA (NASA Task Load Index – TLX). [7]

The study aimed to discover the relationship of competency, personality type, and mental workload to working accidents in the PT. PAL (Persero).
The study benefit is as a reference in providing information regarding factors affecting working accidents and prevention efforts to minimize working accident risks.

**Subjects and Methods**

This study was analytic with a quantitative approach and a cross-sectional design. Respondents in the study were welders/fitters working in PT. PAL (Indonesia) Persero. The population consisted of welders/fitters of PT. PAL INDONESIA (Persero) Surabaya and the HARKAN division for 44 respondents comprised permanent and contract employees.

The data collection was conducted by distributing questionnaires to 44 respondents selected to be study samples. Independent variables consisted of welder and fitter competencies, personality types, and mental workloads. Meanwhile, the dependent variable was data of incidents. The data were then processed using a data processing program, i.e., SPSS, using Fisher’s exact test to examine the relationship between independent and dependent variables.

**Results**

1. **Incidents on Welders and Fitters**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>39</td>
<td>88.6</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>11.4</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100</td>
</tr>
</tbody>
</table>

Based on data in Table 1, it is discovered that most welders and fitters in this division had experienced incidents during their working period for 88.6%.

Generally, the direct cause of an incident is unsafe acts and unsafe conditions [8]. The most occurring incident was electrocuted. Heinrich (1980) argued that an accident is a causal process sequence, not based merely on a single incident. Fatal accidents emerged from several related causing factors [9]. An example in the workplace is water splattered on the deck floor after raining, which is not cleaned or has an improper cleaning process. Such a condition may result in a life-threatening or life-handicapped accident. For instance, someone slips and falls down by hitting their heads. If the causing factor is eliminated, it will prevent incidents on welders or fitters. One preventive action is wearing proper safety shoes to minimize the slipping risk because of rubber-based shoes.
2. Competencies of Welders and Fitters

Table 2. Competencies of Welders and Fitters to Incidents

<table>
<thead>
<tr>
<th>Competency of Welders and Fitters</th>
<th>Incident</th>
<th>Association Coeff.</th>
<th>p-value</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tidak</td>
<td>Ya</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does not have certificates</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>26.7</td>
<td>11</td>
<td>73.3</td>
</tr>
<tr>
<td>Has certificates</td>
<td>1</td>
<td>3.4</td>
<td>28</td>
<td>96.6</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>11.4</td>
<td>39</td>
<td>88.6</td>
</tr>
</tbody>
</table>

Table 2 shows the relationship between respondents’ certificate ownership with incidents in welders and fitters. Descriptive analysis with cross-tabulation mentions that between certificate ownership of welders and fitters and working accidents, welders and fitters experiencing incidents mostly did not have welding or cutting certificates.

This study follows the OHSAS 18001 precondition that, in an organization, individuals engaged in K3 impacted works have competencies in running their jobs [10]. Particularly, welders who their daily jobs are ‘hot works.’ A competency is obtained through education, training, and experience in conducting an activity, especially in welding and cutting. In the welding field, a welder should possess national- and international-standard certificates. Competency is a vital requirement to ensure that the job is well-executed according to the precondition. In conducting a job, it should follow the working standard.

3. Personality Type

Table 3. Personality Type and Incidents

<table>
<thead>
<tr>
<th>Personality</th>
<th>Incident</th>
<th>Association Coeff.</th>
<th>p-value</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tidak</td>
<td>Ya</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrovert</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>45.5</td>
<td>6</td>
<td>54.5</td>
</tr>
<tr>
<td>Introvert</td>
<td>0</td>
<td>0</td>
<td>33</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>11.4</td>
<td>39</td>
<td>88.6</td>
</tr>
</tbody>
</table>

Based on Table 3, statistical analysis results suggested a significant relationship between respondents’ personality type and working accidents. Descriptive analysis with cross-tabulation shows that respondents experiencing incidents were mostly introverts.

It follows the study of Faris, 2015, stating that introverts experienced high work stress compared to extrovert respondents, and statistics showed that personality affected stress emergence in respondents [11].

If personality type is connected to heavy workloads, it is strongly believed that individuals with introvert personalities tend to keep their problems away from their surrounding people when experiencing heavy workloads. Therefore, they do not share their loads, tend to be close and keep their problems.
Munandar, 2001, argued that introverts tend to suffer from more immense tensions than extroverts [12]. In contrast, an extrovert individual tends to be more open and communicating their problems to the workshop head, supervisor, or manager.

### 4. Mental Workload

Table 4. Mental Workload with Incidents

<table>
<thead>
<tr>
<th>Mental Workload</th>
<th>Incident</th>
<th>Association Coeff.</th>
<th>p-value</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No N %</td>
<td>Yes N %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>0 0</td>
<td>2 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>5 25</td>
<td>15 75</td>
<td>0.392</td>
<td>0.047</td>
</tr>
<tr>
<td>Heavy</td>
<td>0 0</td>
<td>22 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5 11.4</td>
<td>39 88.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 shows the relationship between the respondents’ mental workload and working accidents. Descriptive analysis with cross-tabulation mentions that respondents experiencing incidents were mostly respondents in heavy and moderate mental workloads.

According to Moekijat (2006), workload analysis provided information regarding labor requirements in a qualitative setting and types of positions and employees required to finish assignments [13]. Mental workload has a relationship with work accidents. Welding and cutting works posed workers not being in a spacious and ergonomic area when working, but in a limited space instead.

Suma’mur, 2009, argued that workload determined how long a person can work according to their working capacities [14]. Someone who works with a heavy workload that does not balance their working capacities will result in fatigue. The energy required is more when muscles are contracting against the load. The recovery energy in relaxation is not comparable and hence, generating fatigue.

Mental workload evaluation is perceived as necessary in a study to discover the comfort, labors’ satisfaction, and safety levels in the working place, as a milestone of ergonomic implementation.

### Discussion

This study concludes that workers’ characteristics consisted of welders’ competencies, personality types, and mental workload is related to incidents. It is suggested to conduct material refreshment regarding welding and its hazards. Besides, a proactive approach to workers who tend to be close as a person is necessary, especially concerning incidents in the working place.

### Acknowledgement

We would like to express our gratitude to all of the study participants and data collectors for their dedication during data collection. And last I would like to thank the Health Faculty Dian Nuswantoro Semarang.

### References