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The effects of job characteristics and working conditions on job performance

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Abstract

In performance evaluation literature, although the combination of some variables such as age, gender, experience, observation time, and interpersonal affect has been widely considered in determining employee performance, no investigation has indicated the influence of workplace conditions on job performance. This study reports the effects of job characteristics (physical efforts and job grade), and working conditions (environmental conditions and hazards) in addition to experience and education level on task performance and contextual performance. A total of 154 employees in 18 teams at a medium-sized metal company participated in this study. Seven criteria for task performance and 16 for contextual performance were used for measuring employee performance. The results showed that there were substantial relationships between employee performance both job grade and environmental conditions. Poor workplace conditions (physical efforts, environmental conditions, and hazards) result in decreasing employee performance consisted of following organization rules, quality, cooperating with coworkers to solve task problems, concentrating the tasks, creativity, and absenteeism.

Relevance to industry

Unpleasant working conditions in workshops have different effects on each of the job performance indicators. This study highlighted that training program designed to enhance job performance of the employees working under poor workplace conditions should focus on organizational rules in terms of occupational health and safety.

Keywords: Task performance; Contextual performance; Experience; Education level; Job grade; Working conditions; Environmental conditions; Hazards

1. Introduction

Perhaps, the most important dependent variable in industrial and organizational psychology is job performance. For all of the main applications of this branch of psychology, such as employee training and job redesigning, the focus is almost always on improving job performance (Borman, 2004). Borman and Motowidlo (1993) identified two broad classes of employee behavior: task performance and contextual performance. Both types of behavior are presumed to contribute to organizational effectiveness, but in different ways (Kiker and Motowidlo, 1999). Task performance involves patterns of behaviors that are directly involved in producing goods or service or activities that provide indirect support for the organization's core technical processes. Such criteria including quantity, and quality of output were widely used task performance criteria to measure employee job performance in the ergonomic studies. Contextual performance is defined as individual efforts that are not directly related to their main task function but are important because they shape the organizational, social, and psychological context that serves as the critical catalyst for task activities and processes (Werner, 2000). When employees help others complete a task, cooperative with their supervisors, or suggest ways to improve organizational processes, they are engaging in contextual performance (Van Scotter et al., 2000). As interest grows in the type of helpful, cooperative, and innovative job performance behavior, it becomes more

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important to understand its influence on organizational and individual outcomes.

In performance evaluation literature, many systematic studies have been devoted to the potential effects of some variables such as age, gender (Lee and Alvares, 1977), experience (Schmidt et al., 1986), observation time (Moser et al., 1999), interpersonal affect (Antonioni and Park, 2001), rating format (Yun et al., 2005), workplace deviant behaviors (Dunlop and Lee, 2004), and organizational politics (Witt et al., 2002; Miron et al., 2004) on job performance. The major result from these studies was that job experience and education level had direct or indirect effects on job performance. Several authors (e.g., Schmidt et al., 1986; Moser et al., 1999; Posthuma, 2000) have reported a mean correlation of 0.09–0.18 between experience and job performance. Schmidt et al. (1986) concluded that job experience leads to the acquisition of skills, techniques, method, psychomotor habits, etc., that directly produce improvements in performance capabilities. In Borman, Motowidlo and their colleagues' studies (e.g., Borman et al., 1995; Borman and Motowidlo, 1993; Motowidlo et al., 1997; Motowidlo and Van Scotter, 1994; Van Scotter and Motowidlo, 1996), experience was significantly correlated with task performance ($r = 0.30$–0.40) and contextual performance ($r \sim 0.15$). In contrast, Ferris et al.'s (2001) findings, $r = 0.02$ for task performance and $r = 0.23$–0.25 for contextual performance, did not support the expected result. These variations indicate that the relative importance of experience may depend on complexity of job family. It may be that, for jobs of greater complexity, an increase in job experience results in higher job knowledge and task performance. The opposite may be true for jobs of lower complexity.

There is a substantial body of research from both sociology and economics that has revealed the relationship between education, productivity, job satisfaction, and salary (e.g., Groeneveld and Hartog, 2004; Voon and Miller, 2005). Education level required for a job in the workforce is a persistent problem in all industrialized countries. It is expected that the higher the level of education the more productive the employee, wherever he or she is employed. Posthuma's (2000) finding, that education level is positively associated with supervisor evaluations of job performance ($r = 0.24$), supported this hypothesis. A major effect of education is that overall productivity falls short. Education does not guarantee increased productivity. Indeed, it seems likely that overeducated employees would be more prone to morale problem, not to be rewarded with higher salary. Higher dissatisfaction generates lower work effort, which reduces employee productivity. Several authors such as Ferris et al. (2001) have found a negative correlation for task performance (e.g., $r = -0.04$) and overall performance (e.g., $r = -0.13$). Despite the paucity of research literature, personnel psychologists appear to have been aware that education could impact job performance. From this expectation, employers tend to hire overeducated employees.

One of the major concerns of manufacturing companies has focused on improving worker productivity, which is one of the job performance measures. Some of the common features of these companies are heavy loadings, adverse environment, poor human–machine system design, unpleasant working conditions, etc. Heavy loadings, workplace conditions such as inclement weather, extreme heat/cold, chemical smell, noise, poor lighting, vibration, and dust have direct or indirect effects on employee job performance. These conditions decrease employee concentration towards tasks which lead to low employee performance such as low productivity, poor quality, physical and emotional stress, which cause high cost. Effective applications of ergonomics in working conditions enhance employee job performance, provide worker safety, physical well-being, and job satisfaction. Many studies in ergonomic area (e.g., Das and Shikdar, 1999; Resnik and Zanotti, 1997; Shikdar and Sawaqed, 2003; Yeow and Sen, 2006) have focused on the positive effects on quality, productivity, hazards, occupational health, and their cost effectiveness of ergonomic improvements in a workstation or workshop at a manufacturing company. There has been a lack of systematic empirical research designed to investigate the relationship between job performance, or several aspects of job performance and working conditions. To our knowledge, as one of the studies on this topic, Shikdar and Sawaqed (2003) investigated ergonomic factors which lead to low worker productivity in six different industries by applying questionnaires to 50 production managers. In this study, measures related to performance were productivity, quality, and absenteeism, and environmental factors including heat, humidity, noise, light, dust, and pollution. From the statistical analysis, they concluded that there was a significant correlation ($r = 0.234$) between performance indicators and environmental factors. It indicates that companies with higher environmental problems had more performance related problems such as low productivity, high absenteeism. In the ergonomic literature, no research has examined the relationship between job characteristics, working conditions and employee job performance. The current research is the first attempt to shed some lights on the issue of which job characteristics (job grade and physical effort) and working conditions (environmental conditions and hazards) play a more important role in influencing any job performance measure.

2. Relationship between job characteristics, working conditions and job performance

In job performance literature, although age, gender, experience, observation time, and interpersonal affect have been considered in many studies, no research has been devoted to the potential effects of job characteristics and working conditions on task and contextual performance.

Some jobs in the workshops of mechanical processing, machining, and maintenance are high level jobs of complexity. Job type, job level, and job context create different influences on job performance. Some jobs are required high level skill and responsibility to perform tasks successfully. It is plausible that those employees who carry out these jobs should undertake higher level of job performance to fulfill the job responsibilities satisfactorily.

Blue-collar employees working in manufacturing companies exert different levels, frequencies, and durations of the physical effort during performing the tasks of their jobs. They use strength of kneeling, crouching/crawling, walking, standing, balancing, lifting, and pulling/pushing objects. The physical effort requirement for a job changes from a combination of sitting, standing, and working with little requirement to an intense requirement for lifting objects weighing over 30 Kg with no mechanical aid. An increase in the level of physical effort was accompanied by an increase in energy expenditure. The majority of the energy consumption generally is converted to the waste activities such as static effort (e.g., lifting, pulling/pushing objects), to other awkward postures, or to inefficient equipment or method. These waste activities cause decreasing productivity.

Some jobs in the workshops such as mechanical processing, painting, maintenance are performed in unpleasant working conditions. In job evaluation literature, working conditions imply two dimensions: environmental conditions and hazards. Environmental conditions range from ordinary to extreme conditions in terms of the factors such as heat, humidity, noise, smell, light, and dust. Unpleasant environmental conditions have both direct and indirect effects on employee job performance. The concentration to tasks of an employee who exposes to these impacts decreases, which leads to low employee performance including productivity, quality, emotional stress, and in turn this causes high cost. Hazards are unavoidable direct or indirect exposure to light wound/scald, flammable danger, electrical hazards, occupational disease, and mortal hazards. It is believed that ergonomic deficiencies are the root causes of workplace health hazards, low level of safety (Shikdar and Sawaqed, 2003). The application of the relevant human factor principles can reduce the likelihood of accidents and injuries. These impacts reduce worker productivity, and cause high absenteeism.

3. Method

3.1. Subjects

Our research was conducted in a medium-sized manufacturing company, which produces various types of tractor cabin. The company was founded approximately 10 years ago, and has grown to its current size of over 200 employees for all the jobs. This is an important context for examining that not enough research in field settings has focused on blue-collar workers.

Fourteen immediate supervisors participated in this study as raters; each was a first-line manager of one or two work teams. The number of workers in a team is ranging from 4 to 29, with an average of 10.21 workers per team. All supervisors participated in several one-day workplace training courses. These courses covered principles of assessment such as reliability, fairness, halo errors in ratings, definitions of the items used to measure employee performance, and the assessment procedure.

A total of 154 blue-collar employees working in the departments including stock control (one team, four workers), mechanical processing (7 teams, 98 workers), assembly (4 teams, 23 workers), maintenance (3 teams, 9 workers), R&D (one team, 7 workers), and quality (2 teams, 13 workers) participated in this study as part of a larger HRM project. Several authors (e.g., Rothstein, 1990) have argued that new employees should be evaluated only after a certain time has passed because supervisors need adequate opportunities to observe subordinates' behaviors. In this study, the employees were those who are working in the company much longer than four months so that they can be assessed fairly by their own supervisors. Job experience (number of years that employee is working in the company) and education level of each ratee were obtained from the company's archival sources. The average length was 8.61 (s.d. = 5.52) years for experience. Among them, the majority (91) had graduated from high schools or below. Education level was a grouped measure that was coded from 1 (high school or below) to 4 (junior college—two years university).

3.2. Job analyses

A job analysis questionnaire was designed to obtain current job information under 14 job evaluation factors adopted from Metal Industry Job Grading System (MIJGS) (1996) for the purpose of determining job characteristics and working conditions. Forty-nine blue-collar jobs whose base duties, responsibilities, skills, personal attributes necessary for successful execution, and working conditions were different from each other, were analyzed in 18 teams. The questionnaires were distributed to less than five employees for each identified job. Employees were asked to fill them out by checking an appropriate alternative or answering the questions as far as possible, seeking assistance from their supervisors. A total of 129 questionnaires were returned, with a response rate of 83.77%.

Job grade: The questionnaires for each job were evaluated to score, and the results were checked with the same or similar jobs in MIJGS (Metal Industry Job Grading System) (1996) for consistency. It was found that job scores varied from 204.50 to 645.50 points. Job score was graded as 1 for 250 points and below, 2 for 251–300 points, …, 9 for 601 points and above. Greater job score and grade reflects higher level of complexity in terms of job knowledge, responsibility, ability, and effort requirements.

Physical effort: Eight factors were identified for physical effort. Two (lifting and pulling/pushing) had strength levels ranging from (1) 5 Kg and below to (5) 30 Kg and above. The others were frequencies of kneeling, crouching/crawling, walking, standing, sitting, balancing items ranging from (1) never to (5) continuous. Physical effort was grouped into five levels; each level consisted of a combination of these factors. Levels ranged from 1 = "A combination of sitting (low), standing and walking with an ongoing requirement for physical effort. There may be a requirement to exert light physical effort (lifting, pushing, pulling objects below 5 Kg) for short periods." to 5 = "There is an occasional requirement to exert intense physical effort (lifting, pushing, pulling objects weighing over 30 Kg with no mechanical aids) for long periods during a shift."

Environmental conditions: Seven factors were identified for environmental conditions. Five were conditions including fumes/bad odors, dust, illumination, dirt, and humidity scored from (1) never to (5) continuous. Noise consisted of three levels: (1) low, (2) 75 dBA and below, (3) higher than 75 dBA. Temperature had three levels: (1) about 20 °C, (2) 22–30 °C (or cold), (3) 30 °C and above. In job evaluation, environmental conditions are sub-divided into levels ranging from 5 to 6. In this study, they were grouped from 1 = "Exposure to environmental conditions is rare." to 5 = "Continuous exposure to highly unpleasant environmental conditions", where each level consisted of a combination of these factors.

Hazards: Twelve factors such as light wound/scald, flammable danger, electrical hazards, occupational disease, and mortal hazards were identified for hazards consisted of four levels ranging from (1) sometimes to (4) continuous. Hazards were grouped into five levels ranging from 1 = "Exposure to hazards is rare" to 5 = "Exposure to mortal hazards".

3.3. Job performance measures

Task performance: Task performance was measured using seven criteria. Criterion development was based on the empirical work of Motowidlo and Van Scotter (1994) and the results of our job analysis applied for identifying important tasks and behaviors. In a meeting, the evaluation committee consisted of department directors reviewed the criteria for appropriateness and then came to an agreement for seven criteria (see Table 3). The last four criteria in the table came from Motowidlo and Van Scotter's (1994) empirical work, and the others—job knowledge (measure of the knowledge required to get the job done), problem solving, and concentrating to duties—were the results of the job analysis. Each employee was rated by his supervisor on a five-point Likert scale ranging from (1) inadequate to (5) excellent.

Contextual performance: Twenty-five contextual performance criteria were generated from previous studies reporting contextual performance criteria (e.g., Motowidlo and Van Scotter, 1994; Goodman and Svyantek, 1999; Coleman and Borman, 2000) and tools implemented by several companies in the city. The appropriateness of each criterion was discussed in a meeting. The evaluation committee accepted 16 criteria which were important for the company's vision and values. As a result, the criteria were adopted from Coleman and Borman (2000) (six items), Motowidlo and Van Scotter (1994) (three items), and the tools in use (seven items). Coleman and Borman's (2000) categorization provided a useful model (a three group model) for classifying the criteria. Supervisors used a five-point scale ranging from 1 = "fails to meet expectations" to 5 = "clearly and consistently exceeds expectations" to rate their employees' performance.

A performance evaluation questionnaire consisting of the criteria to assess employee performance, employee name, and job information (job identification, job grade, team, and department) was designed for each of two separate tools. Ratings were made at the end of a six-month period of observation. One questionnaire per employee was distributed to the supervisors at work. They were asked to fill out the questionnaires and give them back to HRM department in a week. It was guaranteed that their responses would remain completely confidential. All of the supervisors completed the performance rating questionnaires for all their employees.

4. Results

4.1. Correlations among the variables

Table 1 reveals descriptive statistics (means and standard deviations) and Pearson correlation coefficients of the variables. There are several interesting findings that should be noted. Job grade was strongly correlated with task performance ($r = 0.456$, $p < 0.01$) and contextual performance ($r = 0.411$, $p < 0.01$). It is worthwhile that one of the most positive correlations among the variables was obtained with job grade, which exposes the contribution of this study. Supervisors indicated that employees who work at the qualified jobs had higher performance than the others. There were significant but small positive correlations (not high enough to indicate empirical redundancy) between job grade and the other study predictors ($r = 0.191$, 0.203, and 0.237). Second, environmental conditions were significantly correlated with task performance ($r = 0.332$, $p < 0.01$), not related to contextual performance ($r = 0.058$). In other words, unpleasant environmental conditions cause decreasing the task performance scores of the workers. Surprisingly, it was found that there was a second significant (negative) interaction between environmental conditions and employee's education level ($r = -0.461$, $p < 0.01$). In general, those employees who were less educated perform the jobs in poor working conditions.

Thirdly, there was the highest correlation coefficient ($r = 0.622$, $p < 0.001$) between environmental conditions

Table 1
Descriptive statistics and Pearson correlation coefficients

	Mean	Std. dev.	1	2	3	4	5	6	7
1. Task performance	3.20	0.36	–						
2. Contextual performance	3.08	0.46	0.535***	–					
3. Experience	8.61	5.52	0.166*	0.057	–				
4. Education level	1.53	0.78	−0.254**	0.063	−0.428**	–			
5. Job grade	5.08	1.81	0.456**	0.411**	0.038	0.073	–		
6. Physical effort	2.95	0.98	0.043	−0.160*	0.175*	−0.369**	0.191*	–	
7. Environmental conditions	2.51	1.31	0.332**	0.058	0.139	−0.461**	0.203*	0.622**	–
8. Hazards	2.53	0.83	−0.119	−0.029	−0.036	0.205*	0.237**	0.324**	−0.072

Notes: *$p<0.05$ (2-tailed), **$p<0.01$ (2-tailed).

Table 2
Hierarchical multiple regression analyses

Independent variables	Step 1	Step 2	Step 3	Step 4	Step 5
(a) *Task performance*					
Experience	0.070	0.030	0.030	0.062	0.063
Education	−0.224**	−0.276***	−0.349***	−0.236**	−0.222**
Job grade	–	0.475***	0.517***	0.470***	0.480***
Physical effort	–	–	−0.189**	−0.357***	−0.321***
Environmental conditions	–	–	–	0.341***	0.320***
Hazards	–	–	–	–	−0.058
R^2 (adjusted)	0.06	0.28	0.30	0.36	0.36
ΔR^2		+0.22	+0.02	+0.06	+0.00
(b) *Contextual performance*					
Experience	0.102	0.068	0.069	0.088	0.088
Education	0.107	0.063	−0.043	0.024	0.023
Job grade	–	0.404***	0.465***	0.437***	0.436***
Physical effort	–	–	−0.277***	−0.376***	−0.378***
Environmental conditions	–	–	–	0.203*	0.204*
Hazards	–	–	–	–	0.003
R^2 (adjusted)	0.00	0.16	0.22	0.23	0.26
ΔR^2		+0.16	+0.04	+0.01	+0.03

Notes: Beta values for the models. *$p<0.05$, **$p<0.01$, ***$p<0.001$.

and physical effort. The general conclusion from this result is that the worse the working conditions, the higher the physical effort. Employees who expose to highly unpleasant environmental conditions also perform their jobs with intense requirement for physical effort.

4.2. Multiple regression analyses

Multiple regression analyses were conducted to reveal the relative contribution of each variable to the prediction of job performance. To control the incremental effects of the proposed variables (job grade, physical effort, working conditions, and hazards) in the regression analysis, five hierarchical regression models were established. In the base model (Step 1), job (task or contextual) performance was dependent variable, and two variables (experience year and education level) were a fixed block as independent variables. For the next models, each variable was extended to the previous model; job grade in Step 2, physical effort in Step 3, environmental conditions in Step 4, and hazards in Step 5. Such an approach shows the effect of the extended variable on job performance. Table 2 reports the standardized coefficient (β), the amount of variation in the dependent (predicted) variable by the model (R^2), and the change in R^2 (ΔR^2) for task performance (Table 2a), and contextual performance (Table 2b).

The first column in Table 2a (Step 1) shows that only education level ($\beta = -0.24$, $p<0.01$), significantly but negatively, explained the variation in the ratings of task performance. As some authors have depicted, increase in the education level results in lower score in task performance. Experience was not a significant predictor. Nevertheless, all the variables accounted for 6% of the total variation of ratings ($R^2 = 0.06$) which is quite small. In all the analyses (Steps 1–5), the variables had a similar pattern. When job grade was entered into regression equation (Step 2), the change in R^2 was 22%. As predicted, job grade accounted for a significant incremental portion of R^2 in predicting task performance after controlling the effects of the variables in the base model. In support of our

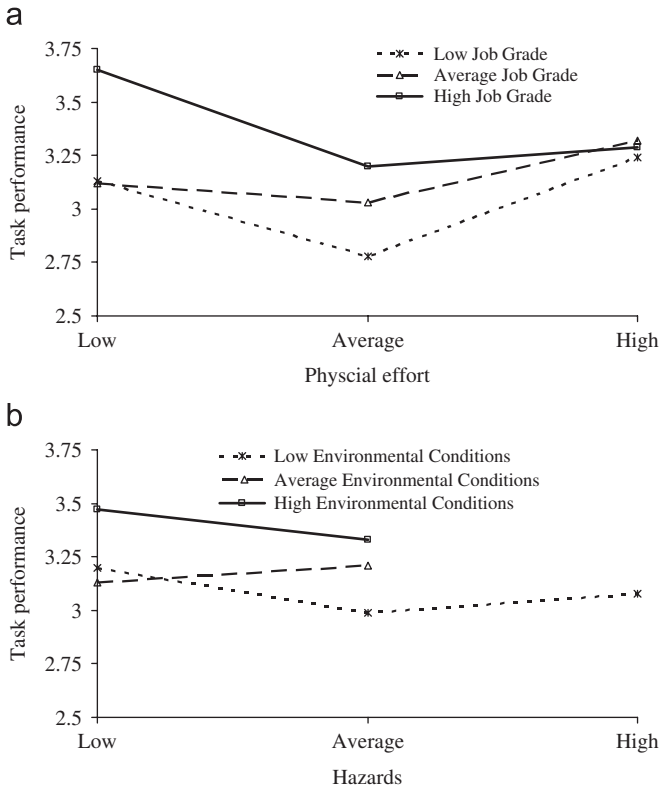

Fig. 1. Interactions between the study variables. (a) Physical effort and job grade. *Note*: The levels for job grade imply that low: 1–3 grades; average; 4–6 grades; high: 7–9 grades. The levels for physical effort imply that low: levels 1 and 2; average: level 3; high: level 4. (b). Hazards and environmental conditions. *Note*: The levels for environmental conditions and hazards imply that low: levels 1 and 2; average: level 3; high: levels 4 and 5. High hazards levels were found for both average and high environmental conditions.

predictions, job grade was a statistically significant predictor of task performance ($\beta = 0.475$, $p < 0.001$). In Model 3 (including physical effort), ΔR^2 was 2%. Neither physical effort nor hazards had an important effect on task performance. The results of the Model 5 indicate that the most significant predictors were job grade ($\beta = 0.480$, $p < 0.001$) and environmental conditions ($\beta = 0.320$, $p < 0.001$). The results in Table 2b show that the variables except for job grade had no significant effects on contextual performance. According to Model 2, the amount of the variation explained by job grade was quite important ($\Delta R^2 = 0.16$). As a result, job grade and environmental conditions (less) were better predictors on task and contextual performance ratings.

To identify the form of the interactions between job performance and the study variables, we plotted the prediction of job performance scores at the means as well as at high and low levels of the variables. As shown in Fig. 1, which illustrates the interaction on task performance, we found that there were significant but small interaction effects of physical effort and hazards on task performance. Those employees who perform qualified jobs under light physical conditions reached to higher level task performance than the others. This implies that physical conditions have a substantial effect on qualified jobs; getting the worst physical effort produces a larger decrease in task performance. In a poor physical effort, employees with any level of job grade reached to the same level of task performance (see Fig. 1a). We also considered the interaction from the standpoint of the relationship between task performance and both environmental conditions and hazards. Hazards demonstrated at least a low decreasing effect on task performance among workers under high and low environmental conditions

4.3. The effects of variables on job performance criteria

An additional correlation analysis was performed to reveal the contribution of each variable to various measures of job performance. The results of this analysis (Table 3) provided a general support that each variable had a different contribution to each performance measure. Surprisingly, it was found that the variables had significantly greater effects on contextual performance criteria. The substantial performance criteria were "Engaging in self-development to improve own effectiveness", and "Creativity to solve a work problem" for job grade, "Quality", and "Cooperating with others to solve problems" for physical effort, "Following organization rules and proper procedures", and "Cooperating with others to solve problems" for environmental conditions, and "Following organization rules and proper procedures", and "Concentrating to the duties" for hazards.

5. Discussion

In performance evaluation literature, although many systematic studies have been devoted to the potential effects of some variables such as age, gender, experience, observation time, interpersonal affect, rating format, workplace deviant behaviors, and organizational politics, to our knowledge, this is the first investigation to indicate the influence of job characteristics and workplace conditions on job performance. Some jobs in the manufacturing and maintenance departments differ from the traditional jobs. They are performed under the working conditions ranging from rarely to extremely unpleasant in terms of heat, cold, smells, noise, humidity, etc. These conditions influence employee to demonstrate low level job performance than the others who work under better conditions. In this study, we intended to explain the effects of job characteristics and working conditions on task and contextual performance.

The argument for distinguishing between task and contextual performance gains force if they are correlated with different demographic characteristics. Borman and Motowidlo (1993) suggested that the major source of variation in task performance is the proficiency with which a person can carry out task activities. This means that individual differences in knowledge, skills, and abilities

Table 3
Pearson correlation coefficients between the variables and criteria

Dimension	Criteria	Physical effort	Environmental conditions	Hazards
Task performance	Job knowledge	0.088	0.299	−0.129
	Overcoming obstacles to complete a task	−0.003	0.256	−0.113
	Problem solving (ability to solve problem quickly and correctly)	−0.072	0.182	−0.072
	Operating equipment, using tools, or both	0.115	0.123	0.034
	Working safely	0.066	0.168	0.084
	Concentrating to the duties	0.052	**0.303**	**−0.154**
	Protecting the resources	−0.089	0.052	−0.098
Interpersonal Citizenship	Assisting co-workers with personal matters	−0.176	−0.152	0.092
	Cooperating with others to solve problems	**−0.358**	**−0.360**	0.057
	Engaging responsibly in meetings and group activities	−0.202	−0.052	0.073
Organizational Citizenship	Treatment the supervisor with respect	−0.171	0.063	−0.002
	Absenteeism	0.090	0.258	**−0.153**
	Working systematically	0.104	0.105	0.113
	Following organization rules and proper procedures	0.141	**0.463**	**−0.205**
	Participating responsibility in the organization	−0.089	0.084	−0.049
	Completing a task on time	−0.087	0.078	−0.086
Job dedication	Attention to important details	−0.164	0.032	−0.008
	Quality	**−0.363**	−0.166	−0.082
	Productivity	−0.007	0.141	−0.044
	Creativity to solve a work problem	**−0.277**	−0.184	0.126
	Engaging in self-development to improve own effectiveness	−0.095	−0.054	−0.007
	Generating new ideas to make things (tasks) better (innovation)	−0.202	0.098	−0.035
	Planning and organizing work	−0.070	−0.067	0.039

should covary more with task performance than with contextual performance. Experience may have a direct or indirect impact on job performance. Increase in experience may produce increase in job knowledge, which leads to improved job performance. In Van Scotter and colleagues' studies, experience has significantly correlated with task performance ($r = 0.30$–0.40) and contextual performance ($r \sim 0.15$). In contrast, Ferris et al.'s (2001) findings, $r = 0.02$ for task performance and $r = 0.23$–0.25 for contextual performance, did not support the expected result. Our results ($r = 0.17$ for task performance, $r = 0.06$ for contextual performance) differed from their findings; they did not support the above sight but overlapped too much with Moser et al.'s (1999) results. However, experienced employees may, generally, get difficulty in adjusting to social or new situations or engaging in self-development to improve own performance and also do not assist and cooperative with others. The correlation between job performance and education level did not yield the predicted pattern of result. Education was negatively correlated with task performance ($r = -0.25$, $p < 0.01$), but positively and weakly correlated with contextual performance ($r = 0.06$); thus, task performance may diminish somewhat with increasing education level, which has been concluded by some authors as well. Higher education level may not guarantee higher job performance.

The finding showed that job grade was strongly correlated with task and contextual performance. As expected, job grade was more strongly associated with task performance ($r = 0.456$) than with contextual performance (0.411). Job grade accounted for a significant incremental portion of the variation in predicting task performance ($\Delta R^2 = 0.22$) and contextual performance ($\Delta R^2 = 0.16$). It indicates that, generally, those employees who perform the qualified jobs had higher levels of job performance. It is a foresight that while employees who had higher performance work at high graded jobs, the others in the same team perform low graded jobs. For example, although the employees carrying out the "Heavy welding" scored as 524 points (grade 7) were rated as 3.57, the others working at the "Light welding" job scored as 458 points (grade 6) were rated as 3.14. When job gets difficult, employees who are perceived as being good at task performance will also achieve the highest rating on contextual performance. This pattern shows that job performance differs depending on job difficulty level.

As shown in Fig. 1a, employees who perform high graded jobs under a requirement to exert light physical effort reached to higher level task performance than the others; physical conditions had a substantial effect on qualified jobs. Getting the worst physical effort produced a larger decrease (from 3.65 to 3.29 of 5.00) in task performance. This implies that ergonomic improvements focused on physical effort will contribute to task performance, when they are conducted on the jobs with high level grade. In an intense physical effort, employees with any level of job grade reached to the same level of task performance. In a word, physical effort contributes less to

task performance while a job has a low or average level grade.

One of the major contributions of the present study is to report the effect of working conditions on job performance. Some jobs in the workshops such as welding and painting are performed in such environmental conditions as extreme cold or heat, excessive noise (above 90 dBA), chemical smell. It is expected that these environmental conditions can show a negative effect on job performance. The findings showed that environmental conditions had a second important effect on job performance. It accounted for approximately 6% of the total variation.

The results of this research have practical implications on employees and organizations. It may be one of the first empirical studies in the related literature to investigate the point effects of workplace conditions on job performance measures. An implication for ergonomic practice may be to implement workplace improvements designed to enhance employee job performance on areas where a factor is poor. The correlation coefficients provided a general support that each variables had a different contribution on each job performance indicator as depicted in Table 3. For three relevant variables, the most important job performance criteria will be discussed below.

Physical effort: Blue-collar employees working in workshops exert different levels, frequencies, and durations of the physical effort while performing the tasks of their jobs. The requirement for physical effort of a job changes from a combination of sitting, standing, and working with little requirement to an intense requirement for lifting objects weighing over 30 kg with no mechanical aid. In a general sense, it is expected that intense physical effort leads to decreasing productivity of an employee while performing the job. Although physical conditions impress a variety of performance criteria, our results showed that physical conditions had a greater effect on "quality", "cooperating", and "creativity", respectively. Emphasis on the quality of products and services has increased with the establishment of the ISO 9000 quality standard. The major requirements of ISO 9000 are that organizations develop and implement a set of routines and procedures for product design, manufacturing, delivery, service, and support. Standardization assures that all customers get the same product and service as promised. Reliable and standardized production with minimal variation can be achieved only when employees confirm and adhere to existing rules. Nevertheless, our results indicated that ergonomic improvements based on physical effort will contribute employee to reach to high quality.

Environmental conditions: There were significant relationships between environmental conditions and many task and contextual performance criteria. Surprisingly, environmental conditions were strongly correlated with "following organizational rules" ($r = 0.463$), "cooperating", ($r = -0.360$) and "concentrating" ($r = 0.303$) criteria, respectively. The first and third results highlight that those employees who work under unpleasant conditions obey the organizational rules and also concentrate the tasks much more than the others. However, environmental conditions decrease cooperation among co-workers to solve task problems.

Hazards: These findings are evidence that, according to our results, as predicted, employees demonstrate a high level of absenteeism and concentration, whereas the likelihood of accidents and injuries increases.

The current study has several limitations that need to be considered when interpreting the results, and that should be addressed in future research. The major limitation of this study is the generalizability to other task environments. These findings were obtained from a medium-sized metal manufacturing company where some jobs are at intermediate levels of complexity. It may be that, for jobs of greater complexity and/or greater autonomy and discretion, improvements in the conditions that reduce or enhance the impact on task performance and contextual performance across a range of different occupations do continue to contribute to job performance. The opposite may be true for jobs of lower complexity. Different findings could reflect real differences in the way that workplace conditions affect task performance and contextual performance in these jobs. Future research, to be conducted in more than one organization, would strengthen the generalization of the present findings. Another limitation is the source of the ratings. The validity of supervisors' ratings as performance indicators has been widely criticized. As Podsakoff et al. (1997) suggested, subjective job performance ratings are less reliable because they are affected by rater's instinct factors (e.g., personality, cognitive errors). If alternative objective indicators for some performance measures such as productivity ratio, percentage of products that was rejected (quality), and the number of suggestions acquired from company record are used for assessments, much reliable results can be produced.

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