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Validity and reliability of the job content questionnaire in formal and informal jobs in Brazil

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Objectives This study evaluated the job content questionnaire (JCQ) in measuring work psychology aspects with respect to formal and informal jobs in Brazilian occupational groups.

Methods A cross-sectional study was carried out in a random sample of 1311 ≥15-year-old residents in the urban area of the city of Feira de Santana, Bahia, Brazil. The Portuguese JCQ version included the recommended 49-item of the original version. The JCQ performance evaluation included descriptive analysis, discriminant analysis, internal consistency, and construct validity.

Results Averages of the JCQ scales were similar for the formal and informal workers, except for decision authority (formal job: χ=31.9; informal jobs: χ=34.5). The averages of the Portuguese JCQ scales did not differ substantially from those obtained in other European, North American, and Japanese studies, albeit they were slightly lower in the Brazilian case. In general, Cronbach's alpha coefficients revealed performance similar to other large-sample studies, showing acceptable internal consistency. The coefficients were relatively similar for formal and informal jobs. Factor analysis revealed high consistency with the theoretical model.

Conclusions This is the first study to evaluate JCQ performance comparing formal and informal jobs in a developing country. The job content questionnaire presented a good global performance, and it did not differ substantially from those observed in other studies. These findings suggest that the job content questionnaire can be used in studies carried out in developing countries and in situations in which informal jobs are common.

Key terms decision latitude; demand–control model; occupational stress; psychological demand; psychological distress.

There is a significant amount of scientific literature on the psychosocial aspects of work in developed countries. However, research addressing the measurement of these aspects in developing countries is recent and scarce. In developing countries, work organization aspects are usually considered to be a less relevant problem than other crucial problems, such as unemployment, accidents, and other occupational hazards that threaten life and put worker's physical health at risk. Moreover, there is an assumption that instruments used to measure psychosocial aspects in developed countries are not applicable in developing countries because of different cultural contexts.

However, these arguments have been criticized because of, at least, the following three factors: (i) the globalization process—many multinational companies have been operating in developing countries under job standards and technologies that are similar to those used in developed countries (1), (ii) social and economic structural heterogeneity in developing societies—which include, in the same region, areas with a high level of development (industrialized areas) and very poor areas, and (iii) the increasing rates of occupational diseases and disabilities related to work organization conditions shown by some developing countries. These three processes, acting together, reveal that psychosocial aspects at work are a relevant problem in different social and economic contexts. The impacts on mental and physical health are already visible in developing contexts (2, 3), and they indicate the importance of investigating work psychology aspects in both developed and developing countries.

Some models have aimed at evaluating psychosocial characteristics at work and their effects on worker health. The demand–control model has worldwide use and is a strong influence on this research field (4, 5). It focuses on two crucial work dimensions, decision latitude and psychological demands. Decision latitude

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refers to the ability to make decisions about one's work and the possibility of being creative and using or developing new skills. It includes two dimensions, skill discretion (opportunity to use skills) and decision authority (opportunity to make decisions). Psychological demand refers to workload, mental requirements, organizational constraints put on the worker, and conflicting demands. The job content questionnaire (JCQ) is a standardized instrument proposed to measure the dimensions of the demand–control model (6).

In the last two decades, the job content questionnaire has been intensively used in developed countries, and its performance has been tested in populations from these countries (7–15). However, performance on the job content questionnaire in developing countries remains a less studied issue. In our literature review we identified only three studies conducted in "developing" countries to evaluate performance on the job content questionnaire, carried out in Mexico (16), Taiwan (17) and China (18). Specific occupational groups were studied: in Taiwan, workers from four companies, including men and women; in Mexico only women from two maquiladora microelectronic plants; in China, male and female health care workers. In Brazil, the Swedish version of the job content questionnaire (17 questions) was tested in a sample of the technical and administrative staff of a Brazilian university. The global performance of the scales for decision latitude, psychological demand, and social support was good (3).

The main objective of this study was to assess the validity and reliability of the job content questionnaire in measuring work psychosocial characteristics for workers in formal and informal jobs in Brazil.

Study population and methods

Study design

A cross-sectional study was carried out in a random sample of workers 15 years or older from the city of Feira de Santana in 2002. It is the second largest city in the State of Bahia, in the northeast region of Brazil, with around half a million inhabitants.

Definition of formal and informal jobs

In Brazil, the Labor Ministry has adopted an instrument to define formal and informal jobs: the Job Card ("Carteira de Trabalho"). This card establishes the job contract between employees and employers. It is regulated by national laws and provides all kinds of benefits, including placing the worker in a social security system. The job card establishes a formal job for the worker. Informal jobs are not regulated by law; there is no social security system, nor any other kind of social or economic rights.

Among different kinds of informal jobs, selling products in the street is the most common type. Another type that has increased, as a result of the unemployment situation, is the family store (stores that are constructed in the living room of a person's own home).

Study population

The study areas were selected using random procedures, based on population data from the national census. The sampling procedures were conducted using the following steps: (i) selection of the sectors within each subdistrict, by a random procedure, (ii) random selection of streets within each selected sector, (iii) visitation of all houses on the selected streets, and (iv) interview of all people 15 years or older by well-trained interviewers using standard procedures. The use of a field manual helped to standardize procedures in the interview and avoid biases in the data collection. Up to three visits were made to a person's residence, in an effort to perform an interview.

We visited 1479 residences and interviewed 3190 people. To evaluate JCQ performance, we analyzed information only from people who were working at the time of the interview. Altogether 1311 workers were included in this study.

Sixty-six percent of the target population worked in an informal job. The percentage of formal and informal jobs was similar according to gender (49.1% for the women and 50.4% for the men). No relevant differences were found across the age groups in the informal jobs. However, in the formal jobs, the proportion of workers increased from the beginning of worklife to the middle of it, but it decreased sharply after 40 years of age (from 46.7% among the workers 26–34 years of age to 25.5% among the workers ≥41 years of age). The workers in formal jobs had a higher education than those in informal jobs. Workers at the graduate level were 3.1 times more likely to be in formal jobs than in informal jobs.

Commercial activity (retail sales) employed the highest number of workers (38.8%), followed by services in general (27.8%), private household services (11.2%), education (6.9%), manufacturing (6.6%), transportation (4.3%), and construction (4.1%).

The composition according to formal and informal jobs showed clear job insecurity in some specific sectors. Among the workers employed in the construction sector, 87.0% had an informal job; for private household services the proportion was 86.5%; and it was 70% for commercial activity, 64.2% for transportation workers, and 62% for the workers in general services. On the other hand, 67.9% of the people working in education and 57.1% of those in manufacturing had formal jobs.

Considering the place where people worked, we observed more variety for informal jobs. The highest proportion of informal workers was found for working on the street (23.6%), followed by company (22.8%), another person's home (20.8%), and in their own house (18.3%). Among the formal workers, 66.8% worked in companies (private enterprise), and 21.9% were employed in public buildings.

Portuguese translation process for the job content questionnaire

The translation process took into account aspects like conceptual equivalence, item equivalence, semantic equivalence, operational equivalence, measurement equivalence, and functional equivalence (19) .

The recommended procedures to build a cross-cultural translation of the job content questionnaire were followed. First, the questionnaire was translated independently into Portuguese by two Brazilian translators. Specific instructions were clarified to guide the translation process. According to these instructions, the emphasis in the translation was given to the meaning of the terms rather than to literal translation, reinforcing the item meaning in the Brazilian occupational context. The translation, produced in this first step, was discussed in meetings with the research team and translators until a consensual version was drawn up. This consensual Portuguese version was translated back into English (back translation) by two other translators, who were native English speakers and also fluent in Portuguese. The Portuguese version of the job content questionnaire and the back translation were sent to the JCQ Center to be evaluated by the Center researchers. After this evaluation, some modifications were suggested for the first translation, and they were promptly accounted for.

A pretest was conducted to test the clarity of question formulation, problems found in answering specific questions, and conceptual equivalence between both languages (English and Portuguese). Based on the pretest results, a new version was clarified (including a new back translation). The JCQ Center approved the final version in December 2001.

Scales and subscales of the job content questionnaire

The Portuguese version of the job content questionnaire included the following recommended format (6): 49 questions (scales of decision latitude—skill discretion and decision authority, psychological demand, physical demand, social support—supervisor and coworker support, and job insecurity). In order to build indicators, for each scale of the questionnaire, a sum of the weighted item score was calculated according to the user's guide of the job content questionnaire (6).

Statistical analysis

All of the analyses were conducted separately for the formal and informal workers. Mean values and standard deviations were calculated for each scale and subscale. The performance analysis included a discriminant analysis, internal consistency (reliability indicators), and construct validity (factor analysis).

Discriminant analysis. This study included workers from different job sectors. Discriminant validity was analyzed by comparing the means of the scales and subscales of the job content questionnaires gathered from workers in each sector. An analysis of variance (ANOVA) was performed to compare the observed differences.

Internal consistency. Cronbach's alpha coefficient was calculated to assess the internal consistency or homogeneity of the questions aimed at measuring the same construct. Alpha values above 0.65 were considered acceptable (12, 14).

Construct validity (factor analysis). The analysis was developed in three steps. First, an exploratory analysis using a correlation matrix for all of the variables was computed. In the second step, a principal component method was used to extract the factors (eigenvalues ≥1 criterion). A rotation varimax (orthogonal) was conducted to make the factors more interpretable (20). Factors loading values of >40 were considered indicators of significant factorial contribution (10).

Measurement of mental health outcome. To evaluate performance on the job content questionnaire in identifying work conditions involving a risk to mental health, we evaluated the prevalence of psychological distress according to the demand–control model. The self-reporting questionnaire (SRQ-20), a structured instrument designed by the World Health Organization to measure psychological distress in developing countries, was used.

The scales for decision latitude and psychological demand were dichotomized. The mean values were used to dichotomize both scales. Based on the combination between the levels of demand and control, four categories were established for the demand–control model. A multiple logistic regression was performed to adjust for potential confounders.

Results

The means and standard deviations of the scales of the job content questionnaire were similar for the formal and

informal jobs (table 1). The most important difference was observed for "decision authority" in that there was a higher mean for informal jobs (34.46) than for formal jobs (31.99).

The Cronbach's alpha coefficients were relatively similar for the formal and informal jobs, even though the coefficients were higher for the formal jobs—the coefficients ranged from 0.65 to 0.79. The internal consistency for psychological demand was low for the informal jobs (0.55). The subscale "conflicting demands" presented poor consistency with the other subscales; its correlation coefficient was lower than 0.10. For skill discretion, the internal consistency was also relatively low for informal jobs (0.6029). The subscale "variety" showed low consistency with the other subscales, the correlation coefficient with the other items being 0.19. For the job insecurity scale, the performance was poor for both types of jobs (but better for informal jobs).

The analysis of the means of the scales of the job content questionnaire according to sector of activity showed some significant differences. Table 2 shows the subscale means of the questionnaire according to sectors. The mean for skill discretion was lower for private household services (formal jobs: χ=29.18; informal jobs: χ=32.12) than for education (formal jobs: χ=35.33; informal jobs: χ=34.08). Similar differences were observed for decision authority (note the high means for education for both formal and informal jobs). Psychological demand revealed a similar pattern across all of the sectors. The means for physical demand were higher for construction (formal jobs: χ=12.50; informal jobs: χ=14.30) and manufacturing (formal jobs: χ=13.45; informal jobs: χ=12.66) and lower for education (formal jobs: χ=11.84; informal jobs: χ=11.71), as expected. The highest job insecurity means were observed for the construction sector (formal jobs: χ=7.00; informal jobs: χ=9.78).

Correlation coefficient by sector

No correlation was found between decision latitude and psychological demand (formal workers: 0.057; informal workers: 0.010). This finding supports the hypothesis of relative independence between these two factors, as theoretically postulated.

For almost all of the scales of the job content questionnaire, the correlation coefficients showed a similar pattern for the sectors. The pattern was similar by sector with respect to the formal and informal jobs, following the predicted direction, as proposed by Karasek's demand–control model. Some small differences were observed in the coefficient magnitude, but not in the direction of the coefficients. However, a substantial difference was observed between the two dimensions of decision latitude. In the sectors of education, manufacturing, private household services, construction, and general services, a positive correlation between skill discretion (SD) and decision authority (DA) was observed—as expected. For the sectors of commercial activity and transportation, we observed no correlation between skill discretion and decision authority, 0.068 and 0.077, respectively.

Construct validity

The factor analysis loaded eight factors for formal and informal jobs (tables 3 and 4). Similar patterns were observed for both types of jobs. There was high

Table 1. Means, standard deviations (SD), and Cronbach's alpha reliability coefficients for the scales and subscales of the job content questionnaire according to formal and informal jobs.

Scales	Range	Formal jobs			Informal jobs		
		Mean	SD	α	Mean	SD	α
Decision latitude	24–96	64.76	8.44	0.6576	65.91	7.84	0.6211
Skill discretion	12–48	32.76	4.25	0.6500	31.39	4.06	0.6029
Decision authority	12–48	31.99	6.20	0.6869	34.46	6.01	0.7194
Psychological demand	12–48	30.07	3.63	0.6627	29.89	3.29	0.5588
Social support	8–32	23.07	2.09	0.7103	23.20	2.01	0.6588
Coworker support	4–16	11.75	1.16	0.6901	11.97	1.25	0.7009
Supervisory support	4–16	11.28	1.47	0.7900	11.38	1.30	0.6515
Physical demand	5–20	12.30	2.14	0.7584	12.53	2.25	0.7615
Job insecurity [a]	3–12	5.25	1.15	0.3613	5.90	1.83	0.5540
Age	15–82	33.93	11.59	–	34.94	13.93	–

[a] Means for job insecurity (4 items): formal jobs: 6.47 (SD 1.44); informal jobs: 7.44 (SD 2.47).

Table 2. Means of the subscales of the job content questionnaire according to sector of activity for the formal and informal jobs. (SD = skill discretion, DA = decision authority, DL = decision latitude, PD = psychological demand, PhyD = physical demand, JI = job insecurity)

Sector	SD	DA	DL	PD	PhyD	JI
Formal jobs						
Construction	31.67	33.84	65.71	28.67	12.50	7.00
Manufacturing	33.09	31.91	65.07	31.45	13.45	6.32
Commerce (retail activity)	32.80	31.54	64.28	30.47	12.45	6.23
Transportation	31.78	29.68	61.33	29.28	12.74	6.20
Education	35.06	35.33	70.56	30.02	11.84	4.87
General services	32.13	32.44	64.79	30.11	12.29	5.44
Private household services	30.47	29.18	59.65	29.50	12.13	5.50
Informal jobs						
Construction	31.40	32.41	63.95	30.78	14.30	9.78
Manufacturing	33.10	33.25	66.26	31.03	12.66	7.61
Commerce (retail activity)	31.40	35.66	67.13	30.01	12.36	7.00
Transportation	30.94	36.25	67.25	31.03	13.35	6.38
Education	35.28	34.08	69.36	29.44	11.71	6.30
General Services	31.94	34.60	66.64	29.66	12.50	7.07
Private household services	29.12	32.12	61.34	28.98	12.07	6.58

Table 3. Factor (F) analysis using the principal component extraction method and varimax rotation with the formal jobs.

Scale	Formal job (N=403)							
	F1	F2	F3	F4	F5	F6	F7	F8
Skill discretion								
Learn new things	·	·	0.639	·	·	·	·	·
Repetitive work [a]	·	·	[b]					–0.481
Requires creativity	·	·	0.687	·	·	·	·	·
High skill level	·	·	0.650	·	·	·	·	·
Variety	·	0.577	[b]	·	·	·	·	·
Develop own abilities			0.653	·	·	·	·	·
Decision authority								
Allows own decisions	·	·	·	·	·	·	0.780	
Little decision freedom [a]	·	·	·	·	·	·	0.674	
Opinions influential	·	·	·	·	·	·	0.737	
Psychological demand								
Work fast	·	0.477	·	·	·	·	·	·
Work hard	·	0.687	·	·	·	·	·	·
Excessive work [a]	·	0.614	·	·	·	·	·	·
Insufficient time [a]	·	0.673	·	·	·	·	·	·
Conflicting demands [a]	·	·	·	·	·	·	·	0.802
Social support								
Supervisor is concerned	0.716	·	·	·	·	·	·	·
Supervisor pays attention	0.674	·	·	·	·	·	·	·
Helpful supervisor	0.744	·	·	·	·	·	·	·
Supervisor good organizer	0.717	·	·	·	·	·	·	·
Coworker support								
Coworkers competent	·	·	·	·	0.432	·	·	·
Coworker interest in me	·	·	·	·	0.757	·	·	·
Friendly coworkers	·	·	·	·	0.746	·	·	·
Coworkers helpful	·	·	·	·	0.730	·	·	·
Physical demand								
Much physical effort	·	·	·	0.747	·	·	·	·
Lift heavy loads	·	·	·	0.482	·	·	·	·
Rapid physical activity	·	·	·	0.837	·	·	·	·
Awkward body position	·	·	·	[b]	·	0.891	·	·
Awkward arm–head position	·	·	·	[b]	·	0.881	·	·
Variance explained (after rotation)(%)	8.43	8.19	7.81	7.79	7.54	6.96	6.37	4.48
Total variance explained (%)	62.4	·	·	·	·	·	·	·

[a] Item formulated in a negative direction; the score was reversed before the factor analysis.
[b] Item loaded on a different factor.

Table 4. Factor (F) analysis using the principal component extraction method and varimax rotation with the informal jobs.

Scale	Informal job (N=780)							
	F1	F2	F3	F4	F5	F6	F7	F8
Skill discretion								
Learn new things	·	·	·	0.661	·	·	·	·
Repetitive work [a]	·	·	·	0.480	·	·	·	·
Requires creativity	·	·	·	0.587	·	·	·	·
High skill level	·	·	·	0.644	·	·	·	·
Variety	·	·	·	[b]		0.502		
Develop own abilities				0.724	·	·	·	·
Decision authority								
Allows own decisions	·	·	0.809	·	·	·	·	·
Little decision freedom [a]	·	·	0.822	·	·	·	·	·
Opinions influential	·	·	0.690	·	·	·	·	·
Psychological demand								
Work fast	·	·	·	·	·	0.430	·	·
Work hard	·	·	·	·	·	0.479	·	·
Excessive work [a]	·	·	·	·	·	0.686	·	·
Insufficient time [a]	·	·	·	·	·	0.599	·	·
Conflicting demands [a]	·	·	·	·	·	·	·	0.774
Social support								
Supervisor is concerned	·	·	·	·	0.760	·	·	·
Supervisor pays attention	·	·	·	·	0.718	·	·	·
Helpful supervisor	·	·	·	·	0.417	·	·	·
Supervisor good organizer	·	·	·	·	0.774	·	·	·
Coworker support								
Coworkers competent	0.722	·	·	·	·	·	·	·
Coworker interest in me	0.710	·	·	·	·	·	·	·
Friendly coworkers	0.652	·	·	·	·	·	·	·
Coworkers helpful	0.714	·	·	·	·	·	·	·
Physical demand								
Much physical effort	·	0.706	·	·	·	·	·	·
Lift heavy loads	·	0.659	·	·	·	·	·	·
Rapid physical activity	·	0.756	·	·	·	·	·	·
Awkward body position	·	[b]	·	·	·	·	0.874	·
Awkward arm–head position	·	[b]	·	·	·	·	0.855	·
Variance explained (after rotation) (%)	12.3	10.3	7.39	7.06	6.17	4.90	4.23	3.89
Total variance explained (%)	56.3	·	·	·	·	·	·	·

[a] Item formulated in a negative direction; the score was reversed before the factor analysis.
[b] Item loaded on a different factor.

consistency with the theoretical model for the scales for supervisory support, coworker support, skill discretion, decision authority, and physical demand.

The subscales related to psychological demand loaded on different factors. The subscale "conflicting demands" did not load on the psychological demand scale, as expected. For both the formal and informal jobs, it loaded on one separate factor (factor 8).

For the skill discretion scale, the subscale "variety" loaded on the factor related to the psychological demand

scale, and it was not related to the scale for skill discretion, as expected.

Physical demand loaded on two different factors, revealing two different types of physical workloads, type 1 including "much physical effort", "lift heavy loads", and "rapid physical activity" and type 2 including "awkward body position" and "awkward arm and head positions".

Capability of the job content questionnaire to identify different work situations as risks to mental health

Relevant differences in the prevalence of psychological distress were observed according to the job strain quadrants. The high-strain quadrant had the highest psychological distress prevalence (table 5). Similar results were found for the formal and informal jobs. The low-strain situation had the lowest psychological distress prevalence. A difference was found in the quadrants of diagonal B (passive and active). In formal jobs, the prevalence of psychological distress was higher for the active job quadrant. For the informal jobs, the prevalence of psychological distress was higher in the passive job quadrant (1.4 higher than in the low-strain situation).

Discussion

This is the first study to evaluate performance of the job content questionnaire by comparing formal and informal jobs in a developing country. Performance of the questionnaire was tested in a poor region of northeast Brazil, where general living conditions are precarious and the educational level is low; the worker's qualification levels were, in general, very low. Despite the cultural and economic differences from developed country contexts, the job content questionnaire has good global performance.

Our means and standard deviations were similar to results from the job stress absenteeism and coronary heart disease European cooperative study (the JACE study) (9), including eight samples from five European countries. Some differences occurred as expected, such as higher means for physical demand and job insecurity in our study (formal and informal jobs) and higher decision latitude for the JACE study. It is notable that, for decision authority, the means for the informal jobs and the JACE study were similar. This similarity indicates a significant freedom for the workers to decide how to do their own work in informal jobs but also pointed out that, among these workers, the possibility to make decisions was not combined with the use or development of skills. For example, in the sectors of commercial activity and transportation, the workers seemed to be free to decide how to do their work, but the same did not apply to the development of new skills and abilities. The means for decision authority were higher than the means for skill discretion in these sectors. Within these sectors, the proportion of people working on the streets was high, a fact that could partially explain this result

In general, the Cronbach's alpha coefficients revealed a performance similar to that found with other large-sample studies, conducted in developed countries, even though they were slightly lower in our study. The estimated coefficients indicated acceptable levels of internal consistency for almost all of the scales of the job content questionnaire. The psychological demand scale, with five questions, showed poor internal consistency. The reliability was acceptable for the formal jobs but low for the informal jobs. This finding has been observed also in other studies. For example, in the JACE study, the Cronbach's alpha coefficient was relatively low for the men (Netherlands 0.57, Canada–Quebec 0.59, Japan 0.61) and for the women (Netherlands 0.51 and US–QES 0.62). These results revealed a general imprecision of the job content questionnaire in measuring psychological demand. Karasek et al (9) have argued that different meanings of psychological demand by population groups could explain part of these results. These differences in meaning are related to the actual stage of area development. Until now, there has been no agreement about the exact meaning of psychological

Table 5. Prevalence rates for psychological distress—the prevalence ratio (PR) and the respective confidence intervals (95% CI) according to the job strain model for formal and informal jobs adjusted for age, educational level, gender, social support, time in this position (results from the multiple logistic regression analysis).

Job strain model [a]	Prevalence (%)	PR [b]	95% CI
Formal jobs			
Low strain (↑ decision latitude ↓ psychological demand)	11.5	–	–
Passive job (↓ decision latitude ↓ psychological demand)	15.5	1.35	0.64–2.84
Active job (↑ decision latitude ↑ psychological demand)	23.8	2.07	1.05–4.08
High strain (↑ decision latitude ↑ psychological demand)	26.7	2.32	1.18–4.56
Informal jobs			
Low strain (↑ decision latitude ↓ psychological demand)	20.0	–	
Passive job (↓ decision latitude ↓ psychological demand)	24.5	1.23	0.91–1.66
Active job (↑ decision latitude ↑ psychological demand)	24.1	1.20	0.90–1.61
High strain (↓ decision latitude ↑ psychological demand)	33.1	1.65	1.26–2.18

[a] Reference group: decision latitude and psychological demand.
[b] The delta method was used to convert odds ratios to prevalence ratios.

demand in our social and cultural contexts. It remains an important question for future studies.

In addition, to make this concept and correspondent scale more reliable, a clear distinction between "qualitative" and "quantitative" psychological demands has been proposed. Suggestions to include emotional demand as a job dimension has also been noted in the literature (21).

High internal consistency was observed for decision authority among the formal and informal workers. The items used to evaluate the measure of worker opportunity to make decisions in both highly structured and unstructured settings performed well, as indicated by Cronbach's alpha. It is important to note that, when these two job-control subscales are taken as a single scale—decision latitude—the reliability is acceptable for both formal and informal jobs.

The subscales for coworker support and supervisory support showed the highest consistency with the demand–control model theory. The high consistency of these scales had been observed earlier in other studies of the validity and reliability of the job content questionnaire (14, 17) .

The physical demand scale also showed good reliability for groups in formal and informal jobs. This scale has also been observed to perform well in other studies (9, 12).

The factor analysis showed a structure that is consistent with the theoretical presumptions of the job strain model. Our study produced eight factors, almost all of them in an expected way. The scales for decision authority, supervisory support, coworker support, physical demand, and skill discretion were consistent with the proposed scales of the job content questionnaire, as observed in other studies (22).

However, some findings of our study need to be more carefully analyzed. For example, aspects related to the physical demand scale loaded on two types of factors, showing that the job content questionnaire measured two different physical workloads. Although the questionnaire establishes only a scale for physical demand, Karasek & Theorell (23) assumed that two specific types of physical demand were involved in job tasks (physical exertion and physical isometric load). In fact, it is acceptable that the questionnaire includes at least two different kinds of physical demands, as observed in our study. Indeed, this result reinforces the ability of the questionnaire to measure and identify specific characteristics of the work environment. With this perspective, future improvements in the questionnaire should consider the evaluation of these two dimensions separately, instead of only one, as currently suggested.

One item of the skill discretion scale was also critical. The subscale "variety" ("I get to do a variety of different things in my job"), in both the formal and informal groups, was more related to psychological demand aspects than to the skill discretion scale, as expected. The data suggested that doing different things was not related to job enrichment in the studied population in Brazil. In fact, it represents an increase in workload. Moreover, translation difficulties could be considered a potential explanation for these specific results (cultural differences).

One item related to psychological demand, "conflicting demands", loaded on a separate factor for both the formal and informal jobs. It revealed a low correlation of this subscale with other subscales related to psychological demand, which duplicated rather precisely a problem found in studies in other countries (8, 9, 12) for this question. Our results also showed relevant problems with this subscale, reinforcing the hypothesis that changes in this item structure are needed to improve the performance of the psychological demand measurement. For the formal jobs, the item "repetitive work" did not load on the skill discretion factor, as expected. Similar results were found in studies in other countries (7, 12, 24, 25). The low consistency of this item with the skill discretion subscale could be related to a nonnormal distribution of this aspect. Usually, repetitive work is much more frequent for the lowest skill (9) .

The Portuguese version of the job content questionnaire showed a high capability to identify risk to mental health. As predicted by the control–demand model, work with high strain consistently has the highest negative effect on mental health for both formal and informal jobs, albeit more strongly for formal jobs. It supports an association between psychological distress and job strain, as pointed out in other studies on mental health (25).

In conclusion, the validity and reliability of the Portuguese version of the job content questionnaire is good, and it is performed similarly among workers with formal or informal jobs in Brazil.

Future research should address a detailed evaluation of the decision-latitude dimensions in informal jobs, especially in relation to skill discretion, which performed regularly among informal workers and in new investigations of psychological demand indicators and their performance. Gender differences form another important aspect to be explored in future studies.

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