Developing a psychometric instrument to measure physical education teachers' job demands and resources

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Abstract:

Based on the job demands–resources model, the study developed and validated an instrument that measures physical education teachers' job demands–resources perception. Expert review established content validity with the average item rating of 3.6/5.0. Construct validity and reliability were determined with a teacher sample (n = 397). Exploratory factor analysis established a five-dimension construct structure matching the theoretical construct deliberated in the literature. The composite reliability scores for the five dimensions range from .68 to .83. Validity coefficients (intraclass correlational coefficients) are .69 for job resources items and .82 for job demands items. Inter-scale correlational coefficients range from –.32 to .47. Confirmatory factor analysis confirmed the construct validity with high dimensional factor loadings (ranging from .47 to .84 for job resources scale and from .50 to .85 for job demands scale) and adequate model fit indexes (root mean square error of approximation = .06). The instrument provides a tool to measure physical education teachers' perception of their working environment.

Keywords: confirmatory factor analysis | exploratory factor analysis | instrument development and validation | job demands–resources model | working environment perception

Article:

Introduction

A motivated teaching force of physical education is critical for students to gain sound knowledge and skills to adopt a physically active lifestyle. Previous research has documented that physical education teachers' working environmental factors influence teacher motivation (see Blankenship & Coleman, 2009; Patton & Griffin, 2008; Rainer, Cropley, Jarvis, & Griffiths, 2012). Thus, it is imperative to develop a tool to systematically assess physical education teachers' perception of working environment for the purpose of building conceptual

connection between teachers' working environment and workplace motivation. Based on the job demands–resources model, the purpose of this study was to develop and validate an instrument that measures physical education teachers' job demands–resources perception.

Job demands–resources model

Job demands and resources embedded in the working environment determine workers' perceptions of the working environment (Zapf, Dormann, & Frese, 1996) and influence workers' motivation (Schaufeli, Bakker, & Van Rhenen, 2009). In order to systematically evaluate physical education teachers' working environment in relation to their motivation, the job demands–resources model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Schaufeli et al., 2009) was employed to investigate teachers' working environment. The job demands–resources model is a heuristic model that accommodates various environmental factors that can potentially inform our understandings of workplace perception. In this model, job demands refer to those physical, emotional, cognitive, and organizational aspects of the job that require sustained effort, and are, therefore, associated with certain physiological and/or psychological costs (Bakker, Demerouti, & Schaufeli, 2003; Bakker, Demerouti, & Verbeke, 2004). Across various professions, examples of job demands include high work pressure, time pressure, unfavorable work schedule, unfavorable physical environment, and emotionally demanding interactions with clients (Bakker & Demerouti, 2007). These factors could eventually lead to low motivation, workers' burnout, and/or deteriorated health.

Job resources refer to the physical, organizational, and social aspects of the job that are "functional in achieving work goals; reduce job demands and the associated physiological and psychological costs; stimulate personal growth, learning, and development" to promote greater productivity (Bakker & Demerouti, 2007, p. 312). Similar to job demands, job resources are multi-level in nature, as it can be organizational (e.g., salary, career opportunities), interpersonal (support from administrator and co-workers), relevant to nature of work (role clarity, communication within the organization, and role in the decision-making process), and task supports (skill training, performance feedback; Bakker, Hakanen, Demerouti, & Xanthopoulou, 2007).

Research indicates that job demands as the aspects of the job that require sustained effort or skills are associated with costs (Bakker & Demerouti, 2007). On the other hand, job resources are not only necessary to deal with job demands, but they also the means to high motivation, work engagement, and achievement (Bakker & Demerouti, 2007). In other words, job resources reduce the negative influences generated by job demands, and maximize motivational potential for individuals with high job demands (Hobfoll, 2002).

Job resources and demands for physical education teachers

Physical education carries the potential of promoting healthy and active lifestyles to students (McKenzie & Lounsbery, 2009); however, research has reported that current physical education programs in public schools often fail to achieve this objective (Chen, Zhu, Kim, Welk, & Lanningham-Foster, 2016; Rainer et al., 2012; Sun, Chen, & Zhu, 2012). Research also indicates factors including low social status (Hardman & Marshall, 2000; Macdonald, 1995; McKenzie &

Lounsbery, 2009), limited instruction time (Locke, 1992; McKenzie & Lounsbery, 2009), limited decision making (Macdonald, 1995), lack of financial support (Hardman & Marshall, 2000; McKenzie & Lounsbery, 2009), lack of equipment and facilities (Fejgin, Ephraty, & Ben-Sira, 1995), lack of meaningful professional development (Armour & Yelling, 2004), challenging teacher socialization process (Templin & Richards, 2014), role limitation (Fejgin et al., 1995), students' disruptive behaviors (Fejgin et al., 1995), and non-teaching related duties (Richards, Templin, Levesque-Bristol, & Blankenship, 2014) contribute to low quality physical education, as well as teachers' low motivation and even teacher burnout. Meanwhile, in the past decade, higher expectations for physical education teachers have been established through standards and policies. For instance, professional organizations, such as SHAPE America (2014)—Society of Health and Physical Educators (SHAPE)—and many states' Department of Public Education published standards and grade-level outcomes for K–12 physical education. These standards not only provide teachers reference and guidance for teaching practices, but also drastically increase the scope and depth of the pedagogical content for this subject.

The working environment is considered one of the determinants for worker motivation along with behavioral and cognitive factors (Bandura, 1986). From teacher motivation perspective, the influence generated by job demands and resources in the working environment on teachers needs to be studied and understood. Thus, it is critical to comprehensively evaluate physical education teachers' perception of job resources and demands embedded in their working environment.

Measurement of job demands and resources

Researchers mainly operationalized job demands and resources using two approaches. The first approach is to operationalize them according to the specific aspects of jobs in a working environment. Scholars have using this approach operationalize and measure job demands–resources on very specific, tangible terms, such as job control and autonomy (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009), coworker, organization support, social climate, access to information within organization (Bakker & Demerouti, 2007), opportunities to learn and access to performance feedback (Schaufeli et al., 2009), supervisor's leadership, job variety and workplace events (Crawford, LePine, & Rich, 2010), and opportunities for further development (Bakker & Bal, 2010). Measures of specific job demands include the level of attention required by the job, pressure to complete tasks, time urgency, organizational politics (Crawford et al., 2010), role ambiguity and role conflict (Fernet, Guay, Senecal, & Austin, 2012), requirement on the level of attention and precision, and emotional situations in the job (Tims, Bakker, & Derks, 2013).

The second is to operationalize job demands and resources in terms of the impact of overall working environment on workers. Researchers use this approach to operationalize and measure job demands and resources at the conceptual level as worker perceptions of the overall working environment. For instance, de Jong and Dormann (2003) developed the Demand-Induced Strain Compensation (DISC) Questionnaire to measures both job demands and resources as multi-dimensional conceptual construct that comprises cognitive, emotional, and/or physical dimensions. It has been validated and applied in different working environments, such as hospitals (van den Tooren & De Jong, 2008), schools (Näring, Vlerick, & van de Ven, 2012), hi-tech companies (van de Ven & Vlerick, 2013), and fire department (Huynh, Xanthopoulou, &

Winefield, 2013). Although the DISC Questionnaire has been widely applied on different occupations in various working environments, the dimensions it specifies cannot accommodate the uniqueness of physical education teaching. As a result, we used it as a reference for developing an occupation-specific instrument to evaluate physical education teachers' working environment.

The DISC Questionnaire includes three dimensions for job resources and demands: cognitive, emotional, and physical. By considering existing literature on physical education teachers' working environment, three dimensions of job resources—physical, organizational, and social—were specified, replacing the emotional and cognitive resources identified by the DISC Questionnaire. Physical job resources refer to monetary and/or material resources that are available and can be used in teaching. Organizational resources refer to the institutionalized supports in schools. Examples are task specificity and variety, action, and decision latitude, possibilities for professional development, communication, and cooperation possibilities (Rimann & Udris, 1997). Social resources refer to available network relationship and social support. (Friborg, Barlaug, Martinussen, Rosenvinge, & Hjemdal, 2005).

In the same vein, job demands were specified in four dimensions—physical, organizational, emotional, and cognitive. Physical job demands refer to the required physical effort. Such a demand exerts pressure on the musculo-skeletal system and is often associated with physical fatigue (Bakker & Demerouti, 2007). Emotional demands refer to the effort needed to maintain professionalism during working (Morris & Feldman, 1996). It is related to teachers' efforts to manage their own emotions and the frequency of interaction that could cause teachers to experience emotional distress. Cognitive demands refer to the requirement of constant brain processing large amount of information with high concentration (Demerouti et al., 2001). Organizational demands refer to the effort needed to overcome organizational barriers to job achievement, such as adversary policies and ineffective procedures, that restrict teachers from effective performance (Resodihardjo, 2009).

Methodology

The section consisted of three phases. In Phase I, the dimensions were specified under the job demands–resources model, and items were generated based on literature on physical education teachers' working environment. In Phase II, the items' content validity was established with expert review of the consistence between the items and corresponding dimensions. In Phase III, the items' construct validity was established by analyzing responses to the items from two independent teacher samples using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

Phase I: Item development

The item development processes involves two writers: one of the writers is an established faculty member in a physical education teacher education program, specializing motivation theories and physical education pedagogy; the other is a doctoral student who share a similar concentration. Both item writers actively engaged in pre-service teacher training and conducting research on physical education teaching. After the items were drafted, we conducted several rounds of in-

depth internal deliberations to revise the items to ensure their consistency with their respective dimensional specifications.

Phase II: Content validation

The goal of the content validation was to determine the degree to which the developed items accurately represented the to-be-assessed theoretical dimensions (Oermann & Gaberson, 2014). We followed the expert judgmental method to evaluate the consistency of each item with its respective dimension (Morrow, Jackson, Disch, & Mood, 2011). The expert panel was selected based on knowledge about the job demands–resources model. Five experts who had published studies on peer-reviewed scholarly journals using the job demands–resources model served on the panel and completed the content validation processes. They were asked to evaluate the consistency between the items and their respective dimension. A detailed instruction was provided to experts on how to evaluate the items.

The developed items were distributed to the expert panel online through Qualtrics, a web-based survey mechanism. The experts were asked to use a 5-point rating scale to evaluate the consistency of the items with their respective dimensions (5 = very consistent, 1 = very inconsistent). In addition, ample space was provided for the experts to comment on the drafted items, revise the items, or write new items to replace those when necessary. It was determined that an item with a mean rating score below 3.0 and/or with substantial revision suggestions should not be accepted. Items with a mean rating score equal or above 3.0 without substantial comments/suggestions for revision were retained. According to the experts' feedback, revisions were made on the items. The revised items were sent back to the experts for additional feedback. After two rounds of review–revision, all experts were satisfied with all items and confirmed with no additional comments and concerns.

Phase III: Construct validation

Construct validity refers to the extent to which the operational measures reflect the theoretical constructs they represent (Calder, Phillips, & Tybout, 1982). The goal of construct validation is to determine the extent to which the item-dimension relationship embedded in the empirical data reflects the theorized relationship in the job demands and recourses model. To test the construct validity, we used a sample of in-service, certified physical education teachers (n = 397) from three states—two Atlantic coastal states and one mid-south state. The three states shared a similar goal for physical education, as it was specified by their state standards—providing students in-class learning experiences to learn knowledge and skills for developing a healthy lifestyle and to receive the benefits of physical activities. There were 244 female teachers (61.5%) and 153 male teachers (38.5%). All teachers were certified in physical education with at least some college education; 197 (49.6%) held a bachelor's degree and 199 (50.1%) held post-graduate degrees. In the sample, 43 teachers (10.8%) had less than 3 years of teaching experiences; 184 teachers (46.4 %) have 4–15 years of experiences, and 170 (42.8%) have more than 15 year of experiences. There were 203 (51.3%) teachers serving elementary schools (grade K–5), 122 (30.7%) teachers were serving middle/junior high schools (grade 6–8); and 72 (18.1%) teachers were serving high schools (grade 9–12).

Data collection

The data was collected through three channels. First, the items were distributed online through Qualtrics. The order of the items was randomized. Once the items were imported to the Qualtrics, a hyper-link was generated. The link was sent to the teachers via e-mails. Before distributing the hyper-link, an approval from university's institutional review board (IRB) was obtained. The IRB granted this study a waiver to collect teachers' consent electronically. The consent form informed the teachers the purposes and the methods of the study, the voluntary nature of their participation, and confidentiality arrangements for their responses. The items were placed in Qualtrics with a forced response function to prevent missing data. Second, the data were collected through traditional paper–pencil survey during a state-level professional conference for physical education teachers. Third, the data were collected after the researcher offered a workshop for local physical education teachers. The researcher explained the goals, the voluntary nature of their participation, the research process and other possible concerns, such as confidentiality and privacy, of the study to the teachers face-to-face. The university approved teacher consent form was attached to the survey as the first page for the teachers to keep as a record.

Data analysis

The preliminary data screening was conducted to ensure data accuracy and integrity. Multivariate normality was evaluated using Mardia's normalized estimate of multivariate kurtosis (Mardia, 1970). Bentler (2005) suggested that Mardia's coefficents larger than 5.00 indicate that data distributions are not normal. The Mardia's coefficients are 2.13 and .46 for job resources items and job demand items, respectively, suggesting a normal multivariate distribution.

The data analysis for the construct validation consisted of two separate and related steps: dimension identification and dimension confirmation. The 397 teachers were randomly divided into two independent subsamples, one for the EFA procedure and the other for or CFA. In the first step, we assessed the convergent and discriminant validity and reliability using EFA (Bagozzi, Tybout, Craig, & Sternthal, 1979), factor correlation analysis (inter-scale correlation), and intra-class reliability. These procedures allowed us to identify the match of underlying item-dimensions relation from the existing data with the theorized relation in the model. For EFA, a principal component analysis with orthogonal rotation (Varimax) was performed to generate dimensions from the teacher responses (Costello & Osborne, 2005). We used the traditional Kaiser-Guttman rule, keeping factors with Eigenvalues greater than 1.0 as the criterion to identify and retain underlying factors (Guttman, 1954; Kaiser, 1960). Items with loading higher than .40 were kept. Parallel analysis (PA) was used to confirm the number of extracted factors suggested by EFA (Ledesma & Valero-Mora, 2007; Tabachnick & Fidell, 2007a).

In the second step, we applied the CFA on the other subsample to assess and verify the factors extracted through EFA. Maximum likelihood estimation was used due to its advantages of allowing a wide range of indexes for model-data fit estimate (Cudeck & O'Dell, 1994). Model fit was evaluated based on various fit indices including χ^2, the comparative fit index (CFI; acceptable > .90, good fit > .95; Bentler, 1990), the root mean square error of approximation

(RMSEA; acceptable < .08, good fit < .05; Browne & Cudeck, 1993), the Akaike's informational criteria (AIC, lower values indicate better fit; Akaike, 1987), the standardized root mean square residual (SRMR; adequate < .08; Hu & Bentler, 1999); the goodness-of-fit statistics (GFI; acceptable > .90; Tabachnick & Fidell, 2007b); and Tucker-Lewis Index (TLI; reasonable > .90; Bentler, 1990).

Results

Phase I: Item development

A total of 25 items were written for job resources and 24 items for job demands. After deliberation, 18 items for job resources and 18 items for job demands were retained. Items that were removed due to weak relevance to physical education teaching and low conceptual inconsistency with the job demands–resources model. Table 1 provides sample items in the Organizational Job Resources and Emotional Demands dimensions. Overall, a total of 49 items were initially generated. And a total of 36 items were retained at the end of the Item Development Phase.

Table 1. Sample items for organizational job demands and emotional job demands (1st draft).

Organizational Resources (OR)
I have access to professional development opportunities (such as workshops and professional conferences) to improve my teaching. I have opportunities to participate in decision making at my school. I have opportunities to receive teaching advice from my colleagues. My achievement in teaching physical education is recognized by my school.
I have clearly defined job responsibilities. School administrators recognize PE's significance.
Emotional Job Demands (ED)
I experience emotional distress resulting from dealing with students' disruptive behaviors. I experience emotional distress resulting from trying to fulfill state/district standards. I experience emotional distress when my school administrators intervene my way of teaching. I experience emotional distress resulting from teaching unmotivated students. I experience emotional distress resulting from teaching students with special needs.

Phase II: Content validation

The two rounds of expert evaluation and revision yielded an average rating for the 36 items of 3.6/5.0. Three items received an average rating below 3.0. Among the three, two were for factual information (budget and numbers of students in a class). Another was under social resources, asking about parents' support to physical education. The expert panel considered it as irrelevant to teaching. The two items to collect factual information were excluded from EFA. The item on parents' support was first included in EFA, but later dropped due to low loading.

Phase III: Construct validation

EFA results

For job resources, EFA yielded three factors: organizational, physical, and social resources. After dropping the cross-loading items, there were only two items on the social resources dimension,

which indicated an unacceptable factor/dimension (Costello & Osborne, 2005). Thus, two factors—organizational and physical resources—were retained. Together, the two factors explained 49.95% of the total variance. The two factors were consistent with the theoretical dimensions upon which items were initially developed. Table 2 reports the relevant information, including Eigenvalues, the percentages of variance explained of the extracted factors, and the loadings of each item under the two factors (dimensions).

Table 2. Extracted dimensions and corresponding items for job resources.

Items	Loadings
Dimension 1: Organizational Resources (Variance explained: 37.35%, Eigenvalues: 4.86)	
V1. School administrators recognize PE's significance	.65
V2. Achievement in teaching PE is recognized by school	.63
V3. PE teachers have clearly defined responsibilities	.68
V4. PE teachers can receive teaching advices from colleagues	.64
V5. PE teachers can participate in decision making at school	.73
V6. PE teachers have access to professional development	.48
Dimension 2: Physical Resources (Variance explained: 12.60%, Eigenvalues: 1.51)	
V1. PE department has sufficient budget	.74
V2. PE teachers have sufficient equipment	.76
V3. PE teachers have facilities to conduct teaching	.70

The EFA on job demand resulted in a five-factor structure. Two factors were eliminated due to insufficient items (two items in each). The final structure retained three factors—cognitive, physical and emotional demands. The three-dimension structure explained 51.72% of the total variance. The results are reported in Table 3.

Table 3. Extracted factors and corresponding items for job demands.

Items	Loadings
Dimension 1: Cognitive Demands (Variance Explained: 30.08%; Eigenvalue: 5.41)	
V1. Feel challenged for planning lessons to reflect standards	.82
V2. Feel challenged for planning lessons to meet students' needs	.83
V3. Feel challenged to teach lesson to facilitate students' adoption of active lifestyle	.82
V4. Feel challenged to provide students immediate feedback	.65
Dimension 3: Physical Demands (Variance Explained: 7.38%; Eigenvalue: 1.41)	
V1. Cope with inadequate class preparation time	.75
V2. Cope with inadequate equipment	.72
V3. Cope with distraction caused by sharing facilities	.64
V4. Cope with interruption caused by non-teaching duties	.60
Dimension 2: Emotional Demands (Variance Explained: 14.26%; Eigenvalue 1.97)	
V1. Distress from teaching unmotivated students	.75
V2. Distress from students' disruptive behaviors	.72

PA results

In addition to the Kaiser-Guttman rule, a PA was adopted to confirm the number of extracted factors to retain based on the results of EFA. PA is a Monte Carlo simulation technique to

determine the number of factors (Ledesma & Valero-Mora, 2007). Specifically, "Eigenvalues are obtained by simulating normal random samples that parallel the observed data (on which EFA was performed) in terms of sample size and number of variables (Ledesma & Valero-Mora, 2007, p. 3). It is recommended to compare the Eigenvalue that corresponds to 95th percentile of the distribution of Eigenvalues derived from the random data with the Eigenvalue obtained from the observed data (Buja & Eyuboglu, 1992; Cota, Longman, Holden, Fekken, & Xinaris, 1993; Glorfeld, 1995). If the Eigenvalue obtained from the observed data is larger than the corresponding 95th percentile random data Eigenvalue, the factor should be retained. Otherwise, the factor should be dropped. In Table 4, the Eigenvalues extracted by the EFA were juxtaposed with a list of 95 percentile Eigenvalues generated from random data (Buja & Eyuboglu, 1992).

Table 4. Eigenvalues comparison (EFA versus parallel analysis).

Factors/Dimensions	Eigenvalues by the EFA	95 Percentile Eigenvalues n = 200 (Buja & Eyuboglu, 1992)
Job Resources		
Factor 1: Organizational Resources	4.86	1.47
Factor 2: Physical Resources	1.38	1.32
Job Demands		
Factor 1: Cognitive Demands	5.41	1.61
Factor 2: Physical Demands	1.97	1.46
Factor 3: Emotional Demands	1.41	1.36

Reliability and validity

As a measure of scale reliability, composite reliability evaluates the internal consistency of a measure (Fornell & Larcker, 1981). Based on the item standardized loadings and error variances, the extracted factors' composite reliability was calculated for job demand and resources. The composite reliability scores are .68 for physical resources, .81 for organizational resources, .83 for cognitive demands, .72 for physical demands, and .72 for emotional demands, suggesting acceptable to good reliability (Fornell & Larcker, 1981). Convergent validity refers to the overlap or similarity of two or more measures' abilities to assess the same construct (Freeman, Felgoise, & Davis, 2008). Intra-class correlation of the items under one construct—indicates that the items are related to the construct they represent. To test convergent validity, intra-class correlational coefficients were calculated for the 9 items that measure job resources and the 12 items that measure job demands. The intra-class correlational coefficients range from .66 and .81 for items under the five constructs, indicating good to excellent convergent validity (Cicchetti, 1994).

Inter-scale correlations, the correlation among the dimensions, were calculated to examine the interrelated nature of the dimensions as delineated in the theory. The correlation co-efficient, which represented the degree to which any two dimensions were related, was calculated within the job resources and demands dimensions separately. The inter-scale correlations ranged from –.34 to .49, which delineated the interrelated nature of the dimensions as expected in the theory. The results suggest that, despite the shared variance is as large as 24.01%, the scales still show

considerable independence in terms of their representations for the respective dimensions. Table 5 reports intra and inter-scale correlation coefficients of the extracted factors.

Table 5. Intraclass correlation and correlations between five job demands–resources scales.

	Intra-class	1	2	3	4
1. Organizational Resources	.78	—			
2. Physical Resources	.66	.49	—		
3. Cognitive Demands	.81	–.24	–.08	—	
4. Physical Demands	.69	–.30	–.34	.38	—
5. Emotional Demands	.72	–.21	–.30	.43	.47

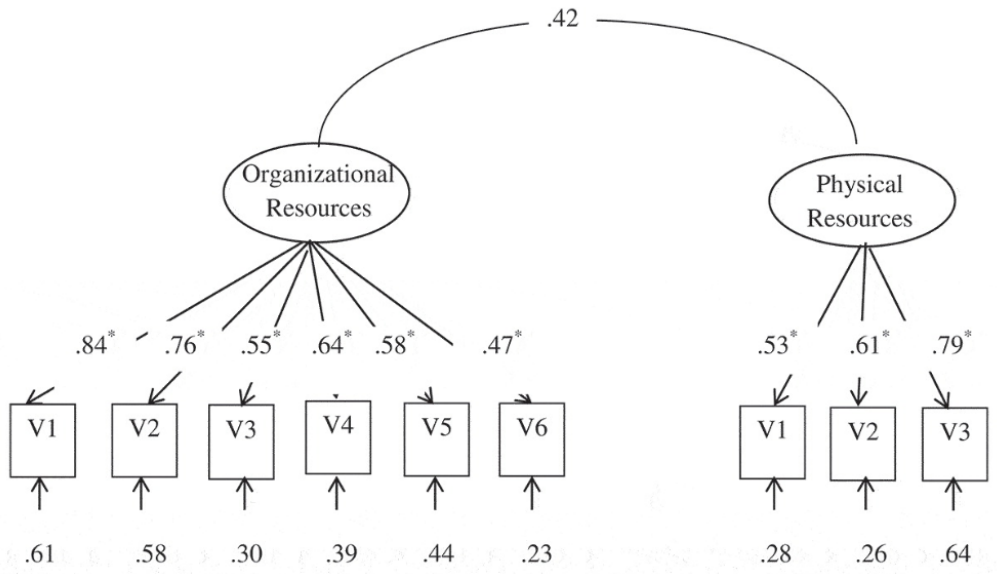

Figure 1. CFA results for job resources.
Note: *$p < .01$, $Z > 1.96$; V1 …Vn are corresponding item for the dimension.

Table 6. Model fit statistics for measurement invariance.

Model	Fit statistics								
	χ^2	*df*	*p*	CFI	AIC	RMSEA	SRMR	GFI	TLI
Job Resources									
CFA	73.98	26	.00	.95	116.98	.06(.05–.08)	.06	.96	.92
Configural Invariance	102.58	52	.00	.93	189.58	.05(.04, .07)	.07	.94	.91
Metric Invariance	116.32	61	.00	.92	212.26	.05(.04, .07)	.08	.94	.91
Job Demands									
CFA	128.20	51	.00	.94	186.21	.06(.05–.08)	.06	.95	.92
Configural Invariance	176.06	102	.00	.93	296.20	.05(.04, .06)	.06	.93	.92
Metric Invariance	191.82	114	.00	.93	257.46	.05(.04, .06)	.07	.92	.93
Job Demands–Resources Model (second-order)									
CFA	408.00	188	.00	.90	518.01	.06(.05–.07)	.06	.91	.89

Note: χ^2 = Chi-square estimate; *df* = degrees of freedom; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation; CFI = comparative fit index; AIC = Akaike's Informational Criteria 90% confidence interval of RMSEA is presented in parenthesis; GFI = goodness-of-fit statistic; and TLI = Tucker–Lewis Index.

Construct and measurement testing

The CFA was conducted to test the tenability of the construct structure revealed in the EFA as well as measurement invariance across the two sub-samples. Figure 1 and Figure 2 present the job resources and job demands dimensional models, respectively. The item loadings ranged from .47 to .84 for the job resources model and from .50 to .85 for the job demands model. Then, a second-order CFA model that includes both job resources and job demands was tested with the entire sample. Figure 3 presents the second-order CFA model. The correlation between job resources and job demands is –.39. The CFA fitting indices are reported in Table 6.

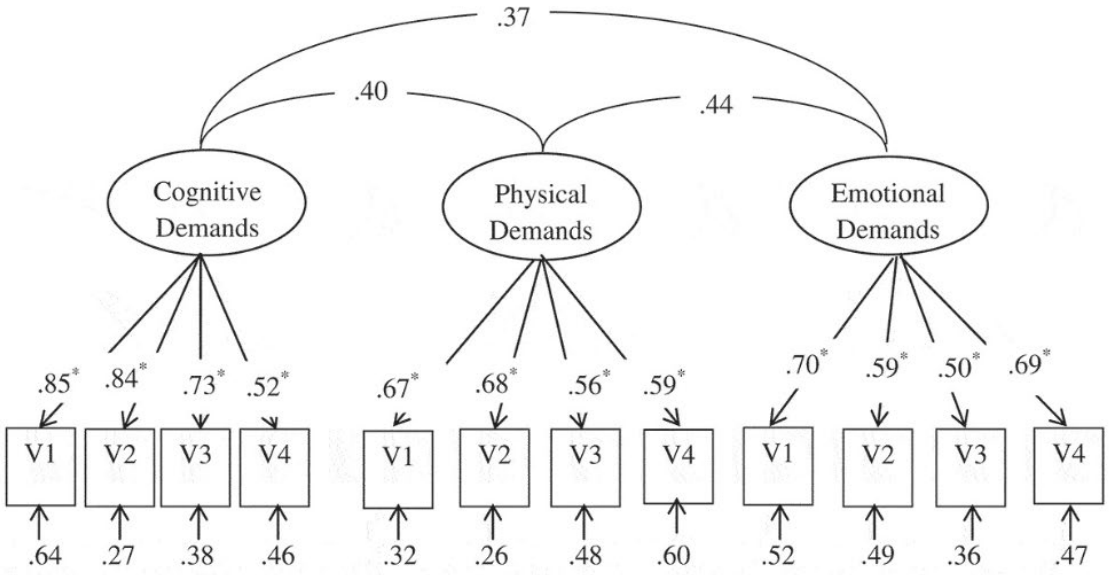

Figure 2. Confirmatory factor analysis results for job demands.
Note: *$p < .01$, $Z > 1.96$; V1 …Vn are corresponding item for the dimension.

We tested both configural invariance and metric invariance for model-data fit (Meredith, 1993). Configural invariance, also called pattern invariance, indicates the extent to which the measurement model with the same structures (sets of items and dimensions) are equivalent across different groups in the sample. A satisfactory configural invariance indicates the theoretical structure can be observed across different groups (i.e., regardless of gender, age, or other factors). Metric invariance, on the other hand, tests whether the same factor loading within dimensions are equivalent across different groups in the sample. A satisfactory metric invariance indicates that respondents in different samples (i.e., regardless of gender, age, etc.) are likely to interpret the items in the same dimensions the same way (Byrne, 1998). Satisfaction in both suggests construct validity of the measurement model.

As recommended, we tested the configural variance first (Dimitrov, 2010). It is because structurally the CFA model to test metric invariance is nested within the model to test configural invariance. Maximum likelihood estimation was used to allow model comparison. Table 6 reports the fitting indices for configural and metric invariance model testing.

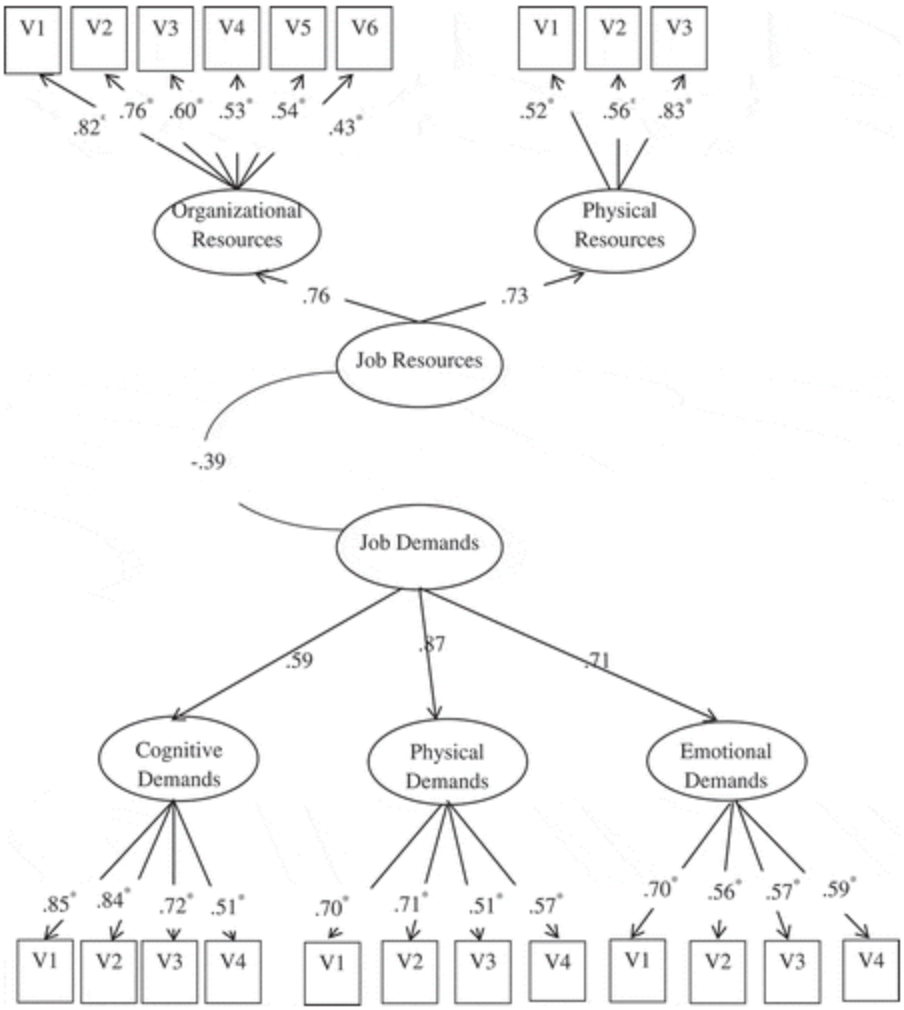

Figure 3. Confirmatory factor analysis results for job demands–resources model.

For job resources, the χ^2 and other fit indices for the configural invariance suggest a good model fit, indicating that the model structure was held well across both subsamples. For the metric invariance, except χ^2, all other fit indices suggest a good model fit, indicating an equivalent reception of all items in the dimensions by all the teachers in both subsamples. For job demands, all model fit indices except χ^2 for metric invariance suggest adequate model fit. Given the over-sensitivity of χ^2 test, it is recommended that χ^2 results not be considered solely; instead, the other indices be used as major model fit indicators. The other indices in Table 6 collectively indicate adequate model fit for both job resources and job demands dimensions.

One index showing support to the observed construct validity is the change in fit index, Chi-square change ($\Delta\chi^2$, also called Delta Chi-square), between the configural and metric invariances. It was calculated to determine if there are differentiations between the two. No differentiation can be considered to be a further evidence of model equivalence across samples. The calculated $\Delta\chi^2$ was insignificant for both job resources ($\Delta\chi^2 = 13.74$, $\Delta df = 9$, $p = .13$) and job demands ($\Delta\chi^2 = 15.76$, $\Delta df = 12$, $p = .20$) dimensions. Another index delta CFI (ΔCFA) was calculated for job resources (ΔCFI = .008) and demands (ΔCFI = .004), both indicating measurement invariance (Cheung & Rensvold, 2000).

Discussion

The purpose of this study was to develop and validate a psychometric instrument based on the job demands–resources model to measure physical education teachers' perception of their working environment. The instrument development and validation went through three sequential phases: (1) item development; (2) testing content validity; and (3) construct validation.

This three-phased procedure resulted in an instrument, *job demands and resources scale for PE teachers*, supported by evidence for the content and construct validity and reliability (measurement invariances). The evidence gives researchers confidence that the job demands and resources scale can provide valid and reliable information for research on a variety topics associated with physical education teaching environment. In addition to the practical value of the scale, the findings of the study also render evidence with theoretical implications. These implications, discussed below, seem to inform us about the characteristics of the environment in which physical education is taught. In short, teachers' perception of job resources and demands in their working environment are multifaceted. And, their perception centers on the resources-demands dilemma/connectivity as the negative relationship between job resources and demands revealed by the result of testing the second-order CFA model.

Multi-dimensional working environment

The multi-dimensional job demands and resources scale allows us to understand physical education teachers' working environment as a whole from the job demands and resources perspective. As widely acknowledged, the marginalized status of physical education often leads to lack of physical job resources, such as funding, equipment and facilities, as reflected and validated in the scale. The lack of these resources presents as a major barrier that prevents them from teaching quality physical education (Young et al., 2007) and might be also a major contributor to the "multi-activity, exposure, or do-nothing physical education" (Ennis, 2011, p. 11). In addition to physical job resources, organizational resources attracts attention from researchers and administrators. Based on the results of this study, physical education teachers identified administrators' recognition of physical education value and physical education teachers' contribution to education, clearly defined responsibilities, constructive feedback to instruction, opportunity to participate in school's decision making, and access to professional development to be important job resources. Literature also suggests that the lack of these organizational resources contributes to the marginalization of physical education, which eventually leads to dysfunctional physical education programs and ineffective teaching (Locke, 1992; Macdonald, 1995; Patton & Griffin, 2008).

As commonly recognized, job demands in working environment generate negative influence on workplace motivation (Bakker & Demerouti, 2007; Demerouti et al., 2001). The results of this study indicate, physical education teachers perceive job demands in three dimensions: physical, emotional, and cognitive. Physical demands include distractions resulted from sharing facilities, lack of preparation time and equipment, and distraction from non-teaching duties. These factors related to standards-required physical education programming which directs teachers to emphasize learning-oriented student achievement. Second, emotional demands seem to become

part of their job in teaching physical education. As Fejgin and colleagues (1995) noted, dealing with disruptive behaviors and disengagement in a relatively open setting requires teachers to invest extra effort to overcome emotional challenges. Additionally, being visible in the gym or on the field, physical education teachers and their behaviors are often subjected to scrutiny from school administrators (Fejgin et al., 1995). All these could result in emotional consequences for the teachers. The findings also indicate that physical education teachers are facing cognitive demands, as national and state standards delineate students' learning and achievement as the foremost priority (Lund & Tannehill, 2015). Physical education teachers need to align their practices with the standards that demand much more cognitively challenging goals than the traditional curriculum characterized by a recreational activity model (Bulger, Housner, & Lee, 2008).

Confirming the distinctive dimensions of job demands and resources allows researchers to use the scale to conduct dimension-specific and holistic evaluation of physical education teachers' working environment. Evaluating teachers' working environment as a holistic entity can provide information to researchers and policy makers about the entire context in which physical education teachers work in. Dimension-specific information, on the other hand, can be used to pinpoint specific areas where interventions may focus on improving the working environment for physical education teachers.

Potential research and limitations

Using the *job demands and resources scale for PE teachers*, researchers can investigate the relationship between physical education teachers' psychological dispositions and teachers' working environment, namely job resources and job demands. Research in this direction carries the potential of contributing to strategic improvement of teachers' working environment. As Demerouti and colleagues (2001) suggested, a balanced approach can be adopted to promote worker motivation through three strategies: Reducing or removing job demands to curb psychological and physiological cost, providing job resources to facilitate work processes, and offering resources to stimulate personal growth, learning, and professional development in relation to workers' aspiration. The development of *job demands and resources scale for PE teachers* enables future research to collect evidences for developing specific strategies that can promote physical education teacher motivation and facilitate quality teaching.

Despite the evidence provided previously, this study has evident limitations. First, the sample used for validation is gender-unbalanced (female 61.5%; male 38.5%). The unbalance exists in sub-samples collected through all three channels. In the future, more responses from male teachers should be collected for validation analysis. In addition, because this instrument is intended for measuring teachers' perception of working environment, it is necessary to continue the validation as their working environment changes in responses to the changes of standards, policies, and accountability systems.

Conclusion

A three-phase instrument development procedure yields the *job demands and resources scale for PE teachers*. The scale consists of 21 items to measure physical education teachers' job demands

and resources perception. The content validity was achieved through expert review panel with the average item rating of 3.6 on a 5-point scale. With a physical education teacher sample (n = 397), the construct validity was achieved through a two-step cross-sectional testing procedure with a split-sample method. First, EFA suggested the five-dimension construct structure—institutional resources, physical resources, cognitive demands, physical demands, and emotional demands. The intraclass correlational coefficients ranged from .75 to .80 and from .80 to .83 for the job resources and job demands dimensions, respectively. Second, CFA reaffirmed the construct structure with high dimensional factor loadings (.47–.85) and model fit indexes (RMSEA .06).

The job demands and resources scale can be used as a tool to investigate the relationship between physical education teachers' working environment and various teacher motivation and performance variables. It also can be used to provide useful information for administrators to assess teachers' working environment in order to design organization-improvement strategies and teacher performance evaluation.

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