Social capital at work: psychometric analysis of a short scale in Spanish among Mexican health workers

Capital social en el trabajo: Análisis psicométrico de una escala breve en español entre trabajadores de la salud mexicanos

Abstract

Most studies on social capital and health are carried out with large home-based surveys, neglecting that many interactions among individuals occur in the workplace. The objective of this study was to explore the psychometric properties of a scale in Spanish used to measure social capital at work. The scale designed by Kouvonen et al was translated into Spanish and tested under classical test theory, item response theory, and confirmatory factorial analysis; 152 public health workers from different socio-cultural contexts participated in the survey. Internal consistency was high (Chronbach's alpha = 0.88). Social capital at work correlated properly with two Job Content Questionnaire dimensions. A ceiling effect was detected and item difficulty was quantified. The confirmatory factor analysis showed the expected theoretical components of social capital: bonding, bridging and trust. The scale has acceptable psychometric properties, thus it can be used in future studies.

Keywords: Social capital. Occupational health. Psychometrics. Social epidemiology.

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Resumen

La mayoría de estudios sobre capital social y salud se realizan con grandes encuestas en hogares, olvidando que muchas interacciones entre los individuos ocurren en el ambiente laboral. Este estudio tuvo como objetivo evaluar las propiedades psicométricas de una escala en español para la medición del capital social en el trabajo. La escala de Kouvonen y colaboradores fue traducida al español y evaluada mediante la teoría clásica de las pruebas, la teoría de respuesta a los ítems y análisis factorial confirmatorio. Participaron 152 trabajadores de la salud mexicanos de diferentes contextos socioculturales. La consistencia interna fue alta (alfa de Cronbach= 0.88). El capital social en el trabajo se correlacionó adecuadamente con dos dimensiones del Cuestionario de Contenido del Trabajo. Se detectó un efecto techo y se cuantificó la dificultad de los ítems. El análisis factorial confirmatorio mostró los componentes teóricamente esperados de vinculación, puente y confianza del capital social en el trabajo. La escala tuvo un aceptable comportamiento psicométrico, por lo que podrá ser utilizada en futuros estudios.

Palabras clave: Capital social. Salud ocupacional. Psicometría. Epidemiología social.

Introduction

Social capital is considered an important determinant of individual and population health[1]. Although there are several definitions of social capital, the most commonly used in public health is Robert Putnam's one. He uses the concept to refer to features of social organization which promote or improve the acquisition of skills, agreements, trust and networks that facilitate social functioning to achieve common goals[2]. This definition has allowed quantitative approximations given that it can be related to indicators such as the level of trust, perceived reciprocity and the density of membership to civic associations[3]. Other definitions such as James Coleman and Pierre Bourdieu´s tend not to be used in epidemiology since their approaches are more extensive and difficult empirical operationalization. The first defines social capital in terms of its role in the facilitation of individual or group action, while the latter emphasizes the fungible nature of social capital within the political economy[4].

Evidence from political sciences indicates that communities with greater cohesion, by having greater participation by civil society, tend to be more efficient in its operation, creative in political initiatives, more successful in the implementation of policies, and less corrupt[2]. The same review by Kawachi & Berkman also reports observations from criminology that support this type of evidence, by stating that societies with higher levels of organization tend to have less crime and fewer suicides. Other studies have shown fewer behavioral problems among minors and better economic and labor development in societies with greater social capital[2].

The vast majority of studies conducted in developed countries suggest that social capital is part of the causal mechanism whereby acts the income inequality on health ("income inequality hypothesis")[5]; however, there is evidence that this does not occur in other countries with lower level of economic development[6,7]. In Latin

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America and the Caribbean, studies on the subject are still scarce and tend to repeat the same findings observed in other developed countries[8]. Perhaps the most relevant exception are the contrary effects described in the studies where it seems to have a "perverse" connotation[9-11]; in other words, with harmful effects on health.

Most epidemiological studies on social capital have been carried out with general population using large-scale surveys[1,8]. This has disregarded that much of the interactions of individuals occur in working environments, which is why it is highly relevant to assess social capital at work; in these contexts, important interactions take place between peers and between leaders and subordinates, which may reflect the general organization of society as a whole[12]. In addition, the notion of social capital, recently has received greater attention as a possible explanation to the disparities in health and its social gradient[13].

A breakthrough in this topic was the development in Finland of a short scale to measure social capital at work[14]. This scale has the prospect of an inequality perspective of the efficacy of social capital; with only eight items (table 1), it seeks to explore whether people feel respected, valued and treated with equality at work. Theoretically, the scale incorporates cognitive (items 3, 5 and 8) and structural components of social capital (items 1, 2, 4, 6 and 7), it also incorporates the linking social capital (items 3, 4 and 5), the bridging or relational social capital (items 6 and 7) and the bonding social capital (items 1, 2 and 8)[14]. The cognitive component makes reference to perceptions of support, reciprocity, exchange and confidence, while the structural refers to the extent and intensity of the links. Another classification identifies union social capital in relations among individuals of the same social group, while it includes the bridging social capital to refer to connections between people from different social groups[14].

These dimensions represent the core axes of social capital in the labor context, and therefore the most representative indicators for its assessment, regardless of other cultural, occupational or geographical aspects[14]. It is important to note that the measurement of social capital in epidemiological studies tends to be one-dimensional and based on relationships of trust and respect[15,16], so this proposal incorporates the key elements for an adequate measurement of social capital.

An initial assessment of the scale, based on the classical test theory, was performed with the answers given by Finnish workers in the public sector. The evaluation included validation of appearance by an expert; internal consistency analysis; correlations between items and the total score; convergence validity with procedural justice (Moorman's scale)[17], effort-reward imbalance (Siegrist's *Effort-Reward Imbalance scale*)[18], and Job control (Karasek's *Job Content Questionnaire*)[19], and divergence validity with anxiety traits (*Trait Anxiety Inventory*)[20], and the magnitude of changes at work (single question with values of one to seven, interpreted as larger and more significant changes). The psychometric results obtained during this analysis were satisfactory[14].

The few studies on social capital at work and health consistently show a positive effect, although it should be noted that they all have been in countries with significant differences in comparison with Latin America. For example, an ecological study in Russia used the quality of relationships at work as an indicator of social capital. This allowed identifying a relationship between social capital and life expectancy and mortality[21]. Other data of the Saskatchewan working population in Canada show that those who frequently socialized with coworkers tend to have better health, compared with those who do not socialize[22]; something similar was reported by Lindström et al. with Swedish workers. They used participation in trade union meetings or study in labor circles as indicators of social capital[23].

In a multilevel analysis, it could be

shown that Finnish employees working in places with low social capital tend to have more health problems, in contrast with those who work in companies with high social capital[24]. Also in Finland, Liukkonen et al. demonstrated that better self-reported health and less psychological distress occur among workers who have a contract with job security and confidence in the support of co-workers[25]. More recently, Suzuki et al. measured social capital at work, through trust and reciprocity, in 1800 workers in 60 Japanese companies. Then, through a multi-level analysis, they explored the effect of these indicators on the individual and enterprise. It was found that only the level of corporate mistrust is associated with a greater likelihood of individual smoking[26].

All these studies used different ways to measure social capital, which is a common trait in investigations on the subject[27]. However, the need for a uniform vision of the construct and its measurement remains an area of opportunity. One advantage of Kouvonen´s model and scale is the fact that it incorporates the most important dimensions of social capital in only a few items, and that regardless of culture they can be considered universal dimensions, which led to the use of this scale in Latin American populations. In this way, and given the need for standardized ways to measure social capital, the objective of this work was to evaluate the psychometric properties of a brief measurement scale of social capital at work. This seeks to contribute to the achievement of a standard measure that allows future studies to explore on key indicators of the level of social capital present in the workplace.

The psychometric testing of the scale is part of a study on work characteristics of the health services context and its impact on population health. In this context, it is assumed that social capital and organizational characteristics are positively associated with organizational performance, workers' health, and consequently the health of individuals who receive their services[28-30].

Materials and methods

Participants in the study. The study was performed in the municipalities of Guachochi (Chihuahua), Jojutla (Morelos) and Tizimín (Yucatán), all in the Mexican Republic, which were selected to incorporate the inherent variability between the North, Center and South of Mexico. In each of these locations, workers in the state health services or the Institute of social security and social services for workers of the state were invited to participate. To collect the data, managers were first contacted to explain the study in detail. Meetings were then held with workers with the same objective, emphasizing that their participation would be voluntary, anonymous, and without labor implications for those who decide to answer the questionnaire or not. Informed consent with signature from each participant was obtained. This study was approved by the Ethics Committee of the National Institute of Public Health in Mexico.

Construction of the scale in Spanish. Based on the original scale, an initial translation into Spanish was done, and then back-translated into English to verify that the content of the original scale was maintained[31]. Pilot tests were conducted with 22 health professionals. This allowed modifying sentences to make them understandable for individuals from the three participating regions. The original and final items in English and Spanish, respectively, are found in table 1.

Assessment psychometric. Guidelines of the classical theory of test, confirmatory factor analysis and item response theory were followed in order to elucidate the psychometric properties of the scale. Classical theory considers that the scores obtained by individuals have a component that reflects the magnitude of the construct measured and an error component. Additionally, it assumes that the true score corresponds to the mathematical expectation of the empirical score, that the value of the real score of an individual is independent of the score error,

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and that the errors of measurement in a test are independent of errors in other tests[32].

Firstly, an exploratory factor analysis with the eight items was conducted, seeking to identify the latent variables not observed and the structure foundation of the construct[33]; in order to do this, an *a-priori* criterion was established to consider that a factor was relevant if it presented a proportional contribution exceeding 5%. Then Cronbach's internal consistency was assessed. We explored the concurrent validity through Spearman correlations among the scores obtained in the scale and the dimensions of supervisor/boss social support and co-workers social support from the job content questionnaire (JCQ)[29], in its version validated for Mexico[34,35]. This is one of the few validated scales in Mexico related to the construct at issue. Analyses were done with the statistical program Stata 11 (Stata Corporation, College Station, Texas).

Given that the classical theory does not allow the comparison of a same construct scores obtained with different instruments,

and the inability to identify differences in the difficulty of items and the skill of those who respond, among other limitations, we carried out a follow-up assessment with some elements of the item response theory. With this analysis, the difficulty of each item in relation to the ability of people can evaluated. This facilitates the obtaining of total scores and incorporating these features on a linear scale[36]. Moreover, among other advantages, it can express parameters of items and people in the same units, which allows to identify the items that an individual can resolve with greater or lesser difficulty; it facilitates proper assessment even when there is missing data, estimates the accuracy of measurement, and detects data that do not conform to the model and outliers. From this approach, an efficient item must follow a logistic curve in a manner that should only be properly answered by individuals who possess the skills required by the cognitive demands intended to be measured[36].

Since on a Likert scale, as the one evaluated here, a total score of the construct is

Table 1 – Items of the original social capital scale in English and the assessed version in Spanish.
Tabla 1 – Ítems de la escala de capital social en el trabajo original, en inglés, y de la versión evaluada en español.

Item	Original version*	Versión en español
c1	Our supervisor treats us with kindness and consideration	Nuestro jefe nos trata con amabilidad y consideración
c2	Our supervisor shows concern for our rights as an employee	Nuestro jefe se preocupa por nuestros derechos como empleados
c3	We have a 'we are together' attitude.	Los que trabajamos aquí tenemos una actitud de "trabajar siempre en equipo"
c4	People keep each other informed about work-related issues in the work unit	La gente que trabaja aquí mantiene informados a los demás de los temas relacionados con el trabajo
c5	People feel understood and accepted by each other	La gente que trabaja aquí siente que es entendida y aceptada por los demás
c6	Do members of the work unit build on each other's ideas in order to achieve the best possible outcome?	¿La gente que trabaja aquí usa las ideas de los demás para lograr el mejor resultado posible?
c7	We can trust our supervisor	Podemos confiar en nuestro jefe
c8	People in the work unit cooperate in order to help develop and apply new ideas	La gente que trabaja aquí coopera con el fin de ayudar a desarrollar y aplicar nuevas ideas

* Tomado de Kouvonen *et al,* 2006[12]. Los primeros siete ítems están construidos como escala Likert donde 1 = desacuerdo total (*fully disagree*), indicando bajo nivel de capital social, y 5 = completo acuerdo (*fully agree*); indicando alto nivel de capital social. El último ítem tuvo como opciones de respuesta 1= muy poco (*very little*) y 5 = mucho (*very much*), teniendo la misma interpretación de los anteriores.
*From Kouvonen et al, 2006[12]. The first seven items are on a Likert scale in which 1 = fully disagree, indicating low level of social capital, and 5 = fully agree, indicating high level of social capital. The response set for the last item was 1 = very little and 5 =very much, with the same interpretation above.

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obtained by the sum of the scores obtained in each item, an initial exploration was carried out with data from all workers using the Partial Credit Model[37]. Under this model, the distances between the categories within the items are not assumed as uniform. Data adjustment with the model was then estimated with statistics of internal and external adjustment of workers and items, thus identifying outliers that did not conform to the model. The quality of the instrument was determined with criteria suggested by Fisher[38]. Curve characteristics of each of the items were estimated. This allows looking at the relationship between the candidates' level of skills and the probability of correct answer to each item. All these analyses were undertaken with Winsteps ®[39].

Lastly, taking into consideration the information obtained in the previous analyses and conceptual foundations of Kouvonen et al.'s scale, confirmatory factorial analyses were done. This technique has shown its value to validate new questionnaires and adaptations of questionnaires developed in other languages or implemented in populations with different cultures[40]. The first model was made for the single factor model (model 1) according to what was obtained in the exploratory analysis; model 2 explored two factors (structural and cognitive components of social capital) following the theoretical concepts referred by Kouvonen et al[14]. Finally, a three factor model was assessed (linking, bridging and bonding components of social capital). Schumacker & Lomax and Hair et al.'s indexes and recommended values were used for the evaluation of adjustment[41,42]. These analyses were done with use of the AMOS 4.01 program[43].

Results

Information was obtained from 152 health workers, most of them were women (62.8%), with ages between 16 and 60 years (median = 34). The main activities of the participants were nursing (38.16%), administrative (28.95%) and medicine (15.79%). Scores according to their occupation can be seen in Figure 1, where the similarity of scores is noticeable, however, with a tendency to be higher among doctors. During factor analysis it was noted that a single factor, with *eigenvalue* of 3.94, explained 94.13% of the variance. After a *varimax* rotation, it was observed that factor loading greater than 0.65 were those for items c3, c4, c5 and c7. After calculating the Kaiser-Meyer-Olkin measures of sampling adequacy, values exceeding 0.80 were obtained for each item and in overall, except for item c2 (0.78), which can be considered as "appropriate"[44]. A Cronbach's alpha of 0.88 showed that all items have the same direction and a high internal consistency.

Table 2 shows Spearman correlations with their respective 95% confidence intervals between scores on the scale and dimensions of the JCQ. Social capital at work positively correlated with the two dimensions of the JCQ that evaluate the level of support provided by the boss (*rho* 0.66, p <0.01) and co-workers (*rho* 0.54, p <0.01). The other dimensions showed several positive correlations, as expected theoretically, but not with the same magnitude. These findings suggest that there is a single construct that can be called social capital at work, with an acceptable concurrent validity.

Item difficulty was quantified by means of logit, obtained by multiplying the response odds ratios to each item of the natural log. Thus it was observed that the easiest item was c1 (- 0.51); followed in increasing order by items c2 (- 0.32), c8 (- 0.11), c4 (- 0.02), c7 (0.11), c3 (0.19), c5 (0.28), and c6 (0.37). This is summarized in table 3. In the Wright map, it was evident that workers have a much greater dispersion in skill to respond, in comparison with the items (figure not shown). The three easiest items were those part of the trust relationships component. In the same table, it can be seen that the internal (infit) and external (outfit) adjustment statistics show values between 0.8 and 1.3, which is evidence of an appropriate adjustment.

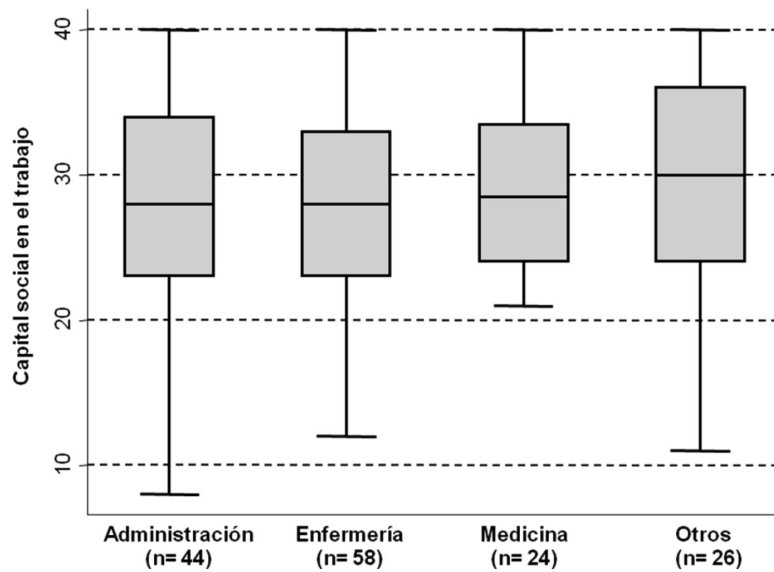Finally, table 4 shows the adjustment indexes for the one-, two- and three-factor

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Figure 1 – Levels of social capital observed in the different participating occupational groups of the study.

Figura 1 – Niveles de capital social observados en los diferentes grupos ocupacionales participantes en el estudio.

models, using confirmatory factor analysis. The indexes were satisfactory in the three-factor model (Figure 2), except for the evaluation using the x^2 test, which could have been due to sample size[45].

Discussion

This study presents the results of several psychometric analyses on the Spanish version of Kouvonen et al.'s social capital

Table 2 – Spearman coorelations and 95% confidence intervals between social capital at work scale and the social support dimensions (supervisor and coworkers) of the Job Content Questionnaire (JCQ).

Tabla 2 – Correlaciones de Spearman e intervalos de confianza de 95% entre la escala de capital social en el trabajo y las dimensiones de apoyo social del jefe y apoyo social de los compañeros del Cuestionario de Contenido del Trabajo (JCQ).

	Social capital at work	Questionnaire content of work (JCQ)					
		1	2	3	4	5	6
1. Supervisor social support	0.66 (0.56 – 0.74)	1					
2 Co-worker social support	0.54 (0.39 – 0.63)	0.37 (0.17 – 0.47)	1				
3 Skill discretion	0.25 (0.11 – 0.41)	0.32 (0.18 – 0.47)	0.16 (-0.01 – 0.31)	1			
4. Decision-making authority	0.38 (0.20 – 0.49)	0.36 (0.23 – 0.51)	0.26 (0.07 – 0.38)	0.53 (0.39 – 0.63)	1		
5. Psychological demands	-0.08 (-0.21 – 0.12)	-0.16 (-0.30 – 0.02)	-0.07 (-0.22 – 0.10)	-0.07 (-0.22 – 0.11)	-0.13 (-0.29 – 0.03)	1	
6. Job control	0.38 (0.21 – 0.50)	0.39 (0.24 – 0.52)	0.25 (0.06 – 0.37)	0.78 (0.70 – 0.83)	0.93 (0.91 – 0.95)	-0.11 (-0.27 – 0.06)	1

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at work scale. The findings showed a good performance of the scale in terms of classical theory. While globally acceptable performance was observed from the item response theory, it also allowed identifying some weaknesses in the scale. A ceiling-effect was evident in 8.55% of the participants, which exceeds the expected (a maximum of 5% to be "acceptable")[38], and this thus suggests the need to have items that explore higher levels of social capital at work and/or that workers responses were biased.

A differential in the difficulty of items was also established, those related to trust (c1 and c2) being the easiest. While possible complementary items should seek the incorporation of cognitive, structural, linking, bridging and bonding, it is suggested that these latter ones are prioritized in terms of the construction of items of greater difficulty. This should be explored in greater depth as most of the epidemiological studies on social capital use measures based on this type of indicators. If this is repeated in other types of populations, it may be that the attempts to measure social capital have only partially explored its effects. Model 3 shows the presence of dimensions of linking, bridging and bonding of social capital with use of confirmatory factor analysis.

Some methodological issues must be considered to adequately interpret the validity of the results. The sample size can be considered small, however, this turns out to be sufficient for the Rasch analysis, where it is well known that even in samples with less than 150 individuals have more than 99% probability that the estimated value of the difficulty of the item is not further than ± 1 logit of its stable value[46-49]; something similar happens in the case of factor analysis, where good estimates can be obtained when high commonalities are present[50], as seen in this study. In the case of confirmatory factor analysis, it is important to remember that only the Tucker-Lewis index is independent of sample size[51], and good a index was obtained in this analysis. While acknowledging that a larger sample would have allowed a more detailed assessment, all the findings suggest that the sample size was sufficient to have a global scale psychometric assessment.

The results of this study support the conclusion that we can rely on a short Spanish scale which includes the components of linking, bridging and bonding, with acceptable psychometric properties to measure social capital at work in contexts where expected levels are not too high, or

Table 3 – Distribution of answers obtained for each ítem, factorial loads and indicators of adjustment of the social capital at work scale to the Rasch model (n = 152).
Tabla 3 – Distribución de las respuestas obtenidas para cada uno de los ítems, cargas factoriales e indicadores de ajuste al modelo Rasch de la escala de capital social en el trabajo (n = 152).

Item	Answers (%)					Factor loading	Measure (logit)	Infit (MNSQ)	Outfit (MNSQ)
	1	2	3	4	5				
c1	6	6	22	17	49	0.28	-0.56	0.89	0.86
c2	7	10	21	18	43	0.21	-0.34	1.03	1.25
c3	11	13	34	14	29	0.65	0.17	1.10	1.13
c4	4	11	41	22	21	0.68	0	1.06	1.07
c5	9	7	38	26	20	0.69	0.30	0.84	0.85
c6	11	9	41	18	22	0.53	0.40	1.22	1.21
c7	7	12	38	17	26	0.68	0.14	0.93	0.91
c8	9	3	30	22	35	0.34	-0.11	0.85	0.77

Table 4 – Comparison of fit indexes in the different models assessed by confirmatory factor analysis.

Tabla 4 – *Cuadro comparativo de índices de ajuste en los diferentes modelos evaluados mediante análisis factorial confirmatorio.*

Indices	Model 1 (single factor)	Model 2 (two factors)	Model 3 (three factors)
Valu p, x^2	0.000	Not estimable	0.030
GFI	0.788	0.789	0.959
AGFI	0.618	0.600	0.908
NFI	0.780	0.788	0.953
RFI	0.692	0.687	0.923
IFI	0.806	0.812	0.980
TLI	0.724	0.719	0.966
CFI	0.803	0.809	0.979
RMSEA	0.198	0.201	0.070

* GFI: *Goodness of Fit Index* (índice de bondad de ajuste); AGFI: *Adjusted Goodness of Fit Index* (índice de bondad de ajuste ajustado); NFI: *Normed Fit Index* (índice de ajuste normado); RFI: *Relative Fit Index* (índice de ajuste relativo); IFI: *Incremental Fit Index* (índice de ajuste incremental); TLI: *Tucker-Lewis Index* (índice de Tucker-Lewis); CFI: *Comparative Fit Index* (índice de ajuste comparado); RMSEA: *Root-Mean-Square Error of Approximation* (índice de error de aproximación cuadrático medio).
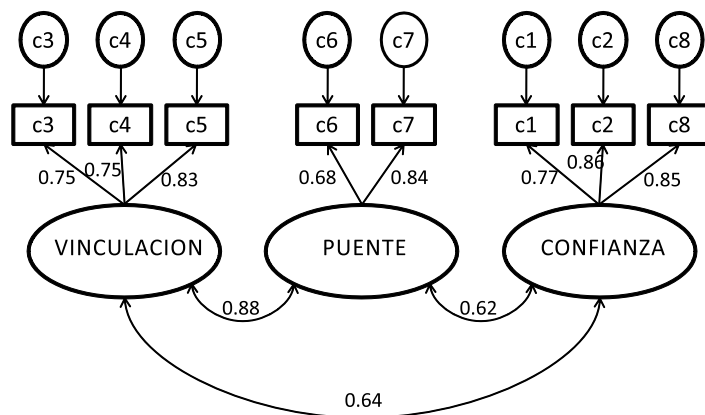

Figure 2 – Confirmatory factor analysis with three components of social capital at work.
Figura 2 – *Análisis factorial confirmatorio con tres componentes del capital social en el trabajo.*

when aggregate indicators of a group are intended, for example through medians, means or standard deviations. For social epidemiology, organizational psychology, and occupational health, it is an important step to have an efficient and consistent measurement method based solidly on the theory. This was evaluated using elements of classical theory, confirmatory factor analysis and Rasch method. The cross-cultural adaptation of this scale integrated elements of three complementary approaches that allow greater validity of the results of the analysis of the differential functioning of items[40].

In conclusion, this scale may be used in future studies with similar populations to the ones studied here taking into account the aforementioned constraints. Experience in this study allows us to point out that when

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there is a need to use an already-built-scale in a different population or population, it is insufficient to rely on classical test theory. It is advisable, and of low cost and simplicity, to make a more detailed explorations of the psychometric properties by incorporating elements of other psychometric approaches. The incorporation of the Rasch model and confirmatory factor analysis for the psychometric assessment of complex constructs in public health should become a regular practice, which will result in improving the validity of its findings. Having a scale to measure social capital at work, with acceptable psychometric results, will allow research in Spanish-speaking countries on the subject to have greater validity of its findings.

Acknowledgements

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