

Shortening the Work Preference Inventory for Use with Physician Scientists: WPI-10

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Abstract

The Work Preference Inventory (WPI) is a four-factor, 30-item measure that assesses work motivation. Used to help individuals choose appropriate career paths, its length contributes to response burden, especially when combined with other measures. We aimed to develop a shortened, valid, and reliable version of the WPI. Trainees at the University of Pittsburgh's Institute for Clinical Research Education completed the 30-item WPI between 2007 and 2012. We conducted exploratory and confirmatory factor analyses to reduce the number of items. Of the 402 eligible trainees, 371 (92%) provided data for the exploratory factor analysis (EFA), and 134 of the eligible 144 trainees (93%) provided data for the confirmatory factor analysis (CFA). EFA revealed four factors that were roughly equivalent to those of the original. CFA used the three items with the highest loadings on each factor, with two items removed due to low loadings and R-squareds, resulting in a 10-item scale. Cronbach's alpha for each of the four factors ranged from 0.68 to 0.76. Factors in the WPI-10 were strongly and significantly associated with factors in the original WPI, indicating strong validity of the shortened measure. The WPI-10 shows evidence for similar validity and reliability to the original instrument while reducing respondent burden. *Clin Trans Sci* 2014; Volume #: 1–5

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Introduction

In today's translational and clinical research environment, when funding levels at NIH are low,¹ the regulatory burden is high,² and faculty face increasing demands competing for their scarce time,³ strong motivation is key for career success as a physician-scientist. Intrinsic and extrinsic motivation build researchers' resilience to overcome challenges in the course of their work.

The Research on Careers committee at the University of Pittsburgh's Institute for Clinical Research Education (ICRE) developed a conceptual model that places motivation among six other personality traits that contribute to the career success of physician-scientists.⁴ An individual's motivation is defined as "intrinsic" when he or she finds satisfaction or meaning in performing a task and enjoys the work.⁵ Motivation can be defined as "extrinsic" when ultimate goals, such as promotion and financial rewards, are central. The conceptual model is intended to help identify the factors that promote success. This knowledge will allow academic medical centers to offer interventions that help physician scientists develop a successful career, in combination with institutional and career factors that promote career success.⁶

A commonly used measure of work motivation is the Work Preference Inventory (WPI).^{7,8} The WPI's authors demonstrated that WPI subscales are associated with personality, academic performance, and creativity. It has therefore been used in a variety of academic and professional settings. In academia, it has been employed to help undergraduates determine appropriate career paths^{9,10} and to predict factors that contribute to higher academic achievement.^{11,12} In the workplace, it has contributed to a clearer understanding of the factors that promote commitment to one's work and career satisfaction.^{13,14}

The WPI consists of 30 items in two domains—intrinsic and extrinsic motivation. Each domain represents two subfactors: intrinsic motivation is composed of challenge (5 items) and enjoyment (10 items); extrinsic motivation is composed of compensation (5 items) and outward orientation (10 items).^{7,8}

The original instrument had reasonable internal consistency among working adults and undergraduates, in both two- and four-factor models (for adults, the alphas ranged from 0.62 to 0.75; for undergraduates the alphas ranged from 0.71 to 0.79). In both populations, there was higher internal consistency in the two-factor model than the four-factor. The instrument proved temporally reliable, with test–retest reliability of 0.84–0.94 for undergraduates, and 0.73–0.89 for working adults, over 6 months.

In academic and corporate settings, it is common for students and workers to be required to complete multiple surveys and scales as they are advised for career direction or considered for management positions. At 30 items, the WPI by itself is not overly onerous for respondents. However, when combined with several other measures, the response burden may deter students or employees from giving each question due consideration or completing all the questions.¹⁵

The substantial time pressures faced by faculty members in academic medicine demand a brief measure to assess motivation so that we can intervene on junior investigators' career paths if needed. Thus, we aimed to develop a shortened, valid, and reliable version of the WPI.

Methods

The study sample consisted of trainees across the entire career pipeline in clinical research, from medical school students to faculty members, who were enrolled between 2007 and 2012 in 12 degree or career development programs at the ICRE at the University of Pittsburgh. Trainees in all ICRE programs complete a series of instruments covering a variety of topics, including sociodemographic characteristics, career goals, mentoring, networking, resources, burnout, clinical research self-efficacy, and important life events. The ICRE survey administration was approved under expedited review by the University of Pittsburgh Institutional Review Board, IRB0608202. While it is

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	Training data Mean (SD), n (%)	Testing data Mean (SD), n (%)	p-value
Age	32.3 (6.78)	31.8 (5.95)	0.403
Sex			0.03
Female	190 (51%)	54 (40%)	
Male	181 (49%)	80 (60%)	
Race			0.194
White	260 (70%)	89 (66%)	
African American	87 (24%)	29 (22%)	
Asian	21 (5.7%)	14 (10%)	
Other	2 (0.54%)	2 (1.5%)	
Degree type			0.058
MD/PhD	6 (1.6%)	4 (3%)	
PhD	31 (8.4%)	15 (11%)	
MD	203 (55%)	70 (52%)	
Other doctorate	14 (3.8%)	8 (6%)	
MS	15 (4%)	12 (9%)	
BS/BA	94 (25%)	25 (19%)	
No undergraduate degree	8 (2.2%)	0 (0%)	
Position			<0.001
Fellow/postdoctoral scholar	100 (29%)	60 (45%)	
Faculty	99 (28%)	18 (13%)	
Medical student	53 (15%)	18 (13%)	
Resident	36 (10%)	17 (13%)	
Clinical doctoral student (other than medical student)	34 (9.7%)	4 (3%)	
PhD student	22 (6.3%)	11 (8.2%)	
MD/PhD Student	5 (1.4%)	1 (0.75%)	
Master's student	1 (0.29%)	4 (3%)	
Other	0 (0%)	1 (0.75%)	

Table 1. Demographic characteristics of the 505 study participants.

not mandatory for trainees to provide informed consent, the ICRE requires trainees to complete the survey, including the WPI, annually for programmatic purposes.

For this study, we used only the baseline data of trainees who provided informed consent. We used data from the full length (30 item) WPI, collected in 2007–2010, to calibrate our model and data from 2011–2012 to test it. Respondents used a 4-point scale (0 = *never or almost never true of me*, 3 = *always or almost always true of me*) to rate the degree to which each item described them.

We first attempted to confirm the underlying structure of the original 30-item measure (2 factors and 4 subfactors) using confirmatory factor analysis (CFA) with Mplus version 6.11 (Muthén & Muthén, Los Angeles, CA, USA). If this underlying structure was confirmed, we planned to retain that structure and reduce the number of items for each subfactor; if not, we planned to explore alternative models of the underlying structure using exploratory factor analysis (EFA). We followed the framework for factor analysis as presented by Nunnally and Bernstein,¹⁶ where exploratory analysis is defined in mathematical terms as trying to obtain the best fit by explaining most of the variance.

With confirmatory analysis, factors are hypothesized to be measured by specific items.

Taking the latter course, we conducted a two-factor EFA with Stata version 12 (Stata Corporation, College Station, TX, USA), to represent the intrinsic and extrinsic factors. We examined the pattern of item loadings and eliminated items that either did not load (≥ 0.30)¹⁷ onto their intended factor or had substantial cross-loadings. We then restricted the two separate EFAs to two factors for both the extrinsic and intrinsic items to represent the subscales that measure the extrinsic and intrinsic factors and selected the three highest items for each of the four subscales. We then confirmed the model that emerged from the EFA analysis with CFA in Mplus and made subsequent revisions to improve the model fit based on item-loadings, *p*-values, and R^2 . Ideally, we wanted three items for each subscale to prevent model identification problems for our CFA.¹⁸ All EFAs used Spearman correlations while CFAs used Pearson correlations. We examined the reliability of the resulting factors using Cronbach's alpha.

Results

Participants

Of the 402 trainees who enrolled in clinical research degree and training programs 2007–2010, 382 consented to participate. We used listwise deletion and only the respondents who answered all 30 items are included in the EFA ($N = 332$; 87%). We tested to see if any demographic differences existed between those with some missing data and the full sample and found no

significant differences. Of the 144 trainees in the testing dataset, 139 consented and 134 (96% of eligible trainees) of those responded to at least one item in the WPI.

The average age of respondents was 32 years. Approximately half of the respondents were female, and the majority were white and had doctoral degrees. Almost one-quarter (23%) of respondents were faculty members, 83% of whom were assistant professors (Table 1).

Factor analyses

We first conducted CFA with all 30 items to attempt to confirm the previously specified factor structure. The higher order factor analysis (2 factors and 4 subfactors) did not converge so we fit a four-factor model allowing for correlations among all four factors. This model also failed to fit the data adequately ($\chi^2 = 1352$; $p < 0.001$; CFI = 0.65; TLI = 0.62; RMSEA = 0.08). In addition, five of the 30-item loadings were less than 0.30.

The failure of the original factor model, or any of the alternative CFA models that we examined, to fit the data adequately led us to pursue the factor structure from an exploratory perspective. We

Factor	Item	Outward factor	Compensation factor	Question
Extrinsic—outward	Recognition	0.66	0.09	I am strongly motivated by the recognition I can earn from other people.
Extrinsic—outward	Other people	0.63	0.07	I want other people to find out how good I really can be at my work.
Extrinsic—outward	Better	0.58	0.03	To me, success means doing better than other people.
Extrinsic—compensation	Promotion	-0.0003	0.52	I am keenly aware of the promotion goals I have for myself.
Extrinsic—compensation	Income	-0.03	0.61	I am keenly aware of the income goals I have for myself.
Factor	Item	Challenge factor	Enjoy factor	Question
Intrinsic—challenge	Tackling	0.74	-0.07	I enjoy tackling problems that are completely new to me.
Intrinsic—challenge	Solve	0.76	-0.02	I enjoy trying to solve complex problems.
Intrinsic—challenge	Difficult	0.72	-0.17	The more difficult the problem, the more I enjoy trying to solve it.
Intrinsic—enjoy	Matter	-0.14	0.78	What matters most to me is enjoying what I do.
Intrinsic—enjoy	Important	-0.13	0.75	It is important for me to be able to do what I most enjoy.

(R) Reverse-coded.

Table 2. Factors, loadings, and questions of WPI-10.

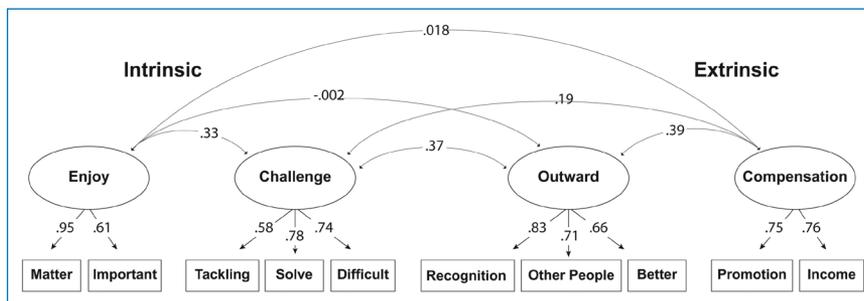


Figure 1. Model of WPI-10.

conducted a factor analysis restricted to two factors with all 30 items, using principal components analysis with an orthogonal (varimax) rotation. This was intended to explore the potential of extrinsic and intrinsic factors as well as determine the items with low loadings on their theorized factors and substantial cross-loadings between the two factors. The loading pattern was consistent with the theorized factor structure and allowed us to identify one factor as extrinsic and the other as intrinsic. We removed three items that did not load on their theorized factor (<0.30), and none due to cross-loading. Because we theorized independence between extrinsic and intrinsic domains, we conducted two separate EFAs with the remaining 27 items, one with the intrinsic items and one with the extrinsic items. We restricted each EFA to two factors to reflect the original subfactor structure. All four factors were roughly equivalent to the four factors from the original 30-item WPI (enjoy, challenge, outward, compensation). We identified the three items with the highest factor loadings on each factor, with factor loadings ranging from 0.52 to 0.78 (Table 2).

We confirmed this model on the testing dataset with CFA using a four-factor, 12-item structure, allowing for correlations between each pair of factors. We removed an additional two items due to low loadings and low R-squareds. The final 10-item model produced an excellent model fit ($\chi^2 = 28; p = 0.579; CFI = 1.0; TLI = 1.01; RMSEA < 0.001$) and is shown in Figure 1.

Internal reliability

Internal consistency of the four subscales (enjoy, challenge, outward, compensation) and the higher order scales (intrinsic and

extrinsic) was assessed with Cronbach’s alpha. Alphas for the WPI-10 were very similar to those of the 30-item WPI, as were the scale means and standard deviations (Table 3). For the four subsfactors, the alphas for the 10-item version ranged from 0.68 to 0.76, which is similar to those of the original measure’s range of 0.63–0.76.

Representativeness

To assess validity of the new 10-item WPI, we evaluated the association of the WPI-10 with the original WPI and its subscales. The two overall factors and four subscales of the original and modified WPI were significantly correlated (range = 0.63–0.88), indicating a high degree of convergence and minimal loss of information with the modified scale (Table 3).

Discussion

The purpose of this study was to develop a shorter version of the WPI with minimal loss of reliability or validity. The resulting 10-item measure is just over one-third the length of the original,

Original subscale (# items)	Alpha	Mean (SD)	Modified subscale (# items)	Alpha	Mean (SD)	Pearson correlation*
Intrinsic (15)	0.81	2.1 (0.38)	Intrinsic (5)	0.71	2.2 (0.46)	0.88
Enjoy (10)	0.76	2.1 (0.41)	Enjoy (2)	0.75	2.6 (0.51)	0.63
Challenge (5)	0.63	1.9 (0.47)	Challenge (3)	0.76	2.0 (0.58)	0.87
Extrinsic (15)	0.75	1.4 (0.40)	Extrinsic (5)	0.69	1.5 (0.58)	0.85
Outward (10)	0.72	1.4 (0.47)	Outward (3)	0.75	1.3 (0.70)	0.86
Compensation (5)	0.66	1.4 (0.55)	Compensation (2)	0.68	1.6 (0.78)	0.80

*Correlation between modified subscale and original subscale.

Table 3. Convergent and discriminant validity—correlations.

which reduces respondent burden. This makes it easier to complete, and therefore perhaps more likely to be used in academic and professional settings.

This study was conducted with data provided by physician scientists at various stages of their training, from medical students to early-career faculty. The choice of profession of our study population had already been determined, meaning that the results of the WPI would not contribute to career choice. However, even in this group, it is important for individuals to understand how they are motivated. Given the range of activities on which faculty may focus their time (e.g., clinical work, research, teaching, community service, institutional service, administration), routine administration of the WPI-10 may help faculty leaders encourage junior faculty to focus their efforts in areas that they will find most rewarding. This may not guarantee success, but the business literature links intrinsic motivation to enhanced job satisfaction and improved performance.⁵ It is also plausible that individuals who are highly intrinsically motivated are less likely to experience burnout because they are excited and energized about their work. Those who do burn out, even if intrinsically motivated originally, are unlikely to remain so with regard to their work.

We were surprised that the original CFA did not fit our data. However, this may be a result of our specific population. Amabile and colleagues^{7,8} obtained data from two main groups: undergraduates and adults working in a variety of professional positions. Our sample consisted solely of graduate or medical students and early-career physician scientists. Given the homogeneity of career goals among our sample, it is understandable that they may have different motivations than the broader sample in the original research. Future research could usefully look at the sensitivity of the measure to demonstrate whether motivations, as measured by the WPI-10, change demonstrably for physician-scientists at different career stages.

Such homogeneity contributes to a notable limitation of this study: it was conducted at a single institution with participants who were fairly homogenous in race/ethnicity, degree levels, and career goals. This may limit the generalizability of the findings to other populations. Another limitation is that we conducted only a single study, which limits our ability to determine reliability and validity. Although we are satisfied that the WPI-10 has strong evidence for validity and reliability, based on the tests we performed, future studies may benefit from including additional types of reliability and validity tests. It should also be noted that, while correlations with the original WPI were high, we base our claim of strong evidence validity with this dataset on the validity of the original instrument.

Conclusion

The WPI-10 provides academic and corporate organizations with a shorter measure to assess work motivation. The reduced response-burden is likely to be appreciated by respondents and contribute to a wider use of the measure in career development and support.

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Ethical Approval

The University of Pittsburgh institutional review boards reviewed and approved the use of annual trainee data for research purposes.

Other Disclosures

None.

Disclaimer

The ideas expressed in this paper are solely the views of the authors and do not necessarily represent the official views of the National Institutes of Health.

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