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Development and Validation of a Revised Measure of Individual Capacities for Tolerating Information Overload in Occupational Settings

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Abstract

The anthropologist Edward Hall wrote extensively on the concept of polychronicity in which he documented the differences between people and cultures in the extent to which they differentially managed their daily activities in the context of space and time. In the work reported here, we have broadened the definition of the polychronicity concept that we define as the capacity of the individual to tolerate multiple sources of stimuli and information occurring in both time and space without suffering psychological distress or disorientation. In earlier work, summarized in several publications, we have constructed and validated a 25-item measure of individual capacity for tolerating stimulus loads across the following five information processing dimensions namely, information load, interpersonal load, change load, activity structure, and time structure. Several previous studies by our research group have found significant connections to a variety of behavioral criteria, including the capacity for visual and motor multitasking, arousal levels, speed of processing, and cross-cultural differences. In this article, we report on how we have augmented the number of items in each of the five dimensions, performed item analysis, reassessed the internal consistency reliability of the five subscales, and evaluated the validity of the new subscales against several criteria with a contemporary sample of 431 employed adults drawn from each of the Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC) categories of Holland's taxonomy.

Keywords

information processing, vocational interest, Holland's typology

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The anthropologist Hall (1959) wrote extensively on the concept of polychronicity in which he documented the differences between people and cultures in the extent to which they differentially managed their daily activities in the context of space and time. Since Hall's seminal work, he (Hall, 1959, 1966), Sommer (1969), Wohlwill (1970), Mehrabian and Russell (1974), Haase (1986), and others have broadened the definitions and applications of the polychronicity concept that we define here as the capacity of the individual to tolerate multiple sources of stimuli and information occurring in both time and space, without suffering psychological distress or disorientation. In the literature of cognitive psychology, these concepts are closely related to the human factor aspects of information processing (Wickens & Flach, 1988), multitasking (König, Bühner, & Mürling, 2005; Meyer & Kierasm, 1997a, 1997b; Pashler, 1994), and serial and parallel processing (Logan, 2002).

Our first version of the Environmental Preference Inventory (EPI) defined a 25-item measure of individual capacity for tolerating stimulus loads across the following five information processing dimensions namely, information load, interpersonal load, change load, activity structure, and time structure (the subscale definitions with prototypical item content is shown in Table 1). Several published studies by our research group have found significant connections to a variety of behavioral criteria, including the capacity for visual and motor multitasking, arousal levels, speed of processing (Haase, 1986; Haase, Lee, & Banks, 1979; Dumont & Vamos, 1975), cross-cultural differences (Haase et al., 2011), and partial origins in biologically based Pavlovian temperament (Haase et al., 2014). In previous studies (Haase et al., 2014), we have also investigated the factor structure across several samples. Throughout these several studies, it has become increasingly apparent that the 25-item version of these five dimensions possessed less than optimal reliability, although the concurrent and construct validity have been amply demonstrated despite these psychometric deficiencies.

In this article, we reiterate the description of the initial factors of the scales, report on how we augmented the number of items in each of the five dimensions, performed item analysis, reassessed the internal consistency reliability of the five subscales, and evaluated the validity of the new subscales against several relevant criteria with a contemporary sample of 400 employed adults covering Holland's Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC) taxonomy. We investigated the capacity of these revised scales to discriminate between occupational groups (RIASEC categories) and showed that the newly revised scales are significantly related to a nomological network of theoretically predictable measures, including measures of Pavlovian temperament, measures of intrinsic, and extrinsic work motivations in one's chosen occupation as well as occupational longevity, satisfaction, and success. In the following sections, we introduce the constructs of the EPI, review the available past research with the constructs, present the methods we employed to refine the measurement of the five factors of the model, and present the current reliability and validity of the new form of the instrument. In addition, we describe the development, use, and classification adequacy of a 42-item interest inventory that we called the Career Preference Inventory (CPI) whose purpose is to tie together the constructs of the EPI to previously magnitude estimated scale values of the demand characteristics of the same 42 occupation names.

The Five Dimensions of the EPI

The Definitions of the Scales and the Added Items

In this current revision of the items of the EPI, we preserved the original five theoretical constructs that comprise this measure of the self-rated capacity to tolerate stimulus and information overload. The five dimensions of (1) information load, (2) interpersonal load, (3) change load, (4) time structure, and (5) activity structure are summarized in Table 1. The prototypical items in each subscale

Table 1. Definitions, Prototypical Items, and Internal Consistency Scale Reliabilities of the Five Subscales of the EPI.

Factor	Exemplary Items	Definition	# Items/α/*n*
Information Load	"I have no trouble at all carrying on more than one activity at a time" "I have no difficulty in keeping several projects going at the same time"	*High scores*: Reflect the capacity to tolerate, cope with, and process large amounts of information and to resist being overwhelmed by high loads of nonpersonal informational stimuli *Low scores*: Admit to easily being overwhelmed by sheer amounts of information and high demands for information processing	15/.80/405
Interpersonal Load	"Crowds make me uncomfortable" "I dislike large parties"	*High scores*: Endorse the capacity to tolerate high information load conditions that arise largely from the presence of other individuals *Low scores*: Admit to an inability to tolerate high information load conditions that arise from the presence of others	9/.70/405
Change Load	"Things happen so fast nowadays that I can't keep up with everything" "Nowadays there is so much new information thrown at a person that it is impossible to keep up with things"	*High scores*: Define the capacity to tolerate, cope with, and process information that is accelerating and rapidly changing *Low scores*: Admit to a preference for informational environments in which information is relatively stable and changes slowly	7/.74/413
Activity Structure	"I prefer to finish one job before starting another" "The ability to make plans and stick to them is essential"	*High scores*: Define the capacity to tolerate highly *un*structured environments in which activities are subject to few, if any, schedules *Low scores*: Admit to a preference for highly structured and scheduled activities in order to maintain psychological well-being	9/.68/408
Time Structure	"People who cannot stick to a schedule are usually not very effective" "I like to go to bed at the same time every night"	*High scores*: Define the capacity to tolerate highly *un*structured, fluid, and indeterminate time schedules *Low scores*: Admit to a preference for control over highly structured temporal sequences in environments	7/.64/408

Note. EPI = Environmental Preference Inventory.

exemplify the definition of the subscales. Information load from nonpersonal sources, interpersonal sources, and rapidly changing stimuli constitutes the first three factors of information load with individuals ranging from declaration of no difficulty in dealing with challenging information conditions, to individuals who have little self-rated capacity for tolerating rich or densely populated environmental stimulus conditions. The factors of time and activity structure discriminate between individuals who have little problem dealing with highly unstructured environments in terms of time and activity and individuals who report considerable distress in environments where time and activities

are highly unstructured—these individuals tend to prefer environments that are more controlled and structured in terms of time and scheduled activities. The constructs that identify each of these dimensions are focused on an individual's self-assessment. Our ultimate goal for the EPI is to have a mechanism by which the profile of information processing capacities of the individual can be matched to the profiles of the magnitude estimated, information processing, demand characteristics of 42 occupations organized around Holland's RIASEC codes (the 42 occupation names are discussed in a later paragraph describing the CPI). We do not pursue the magnitude estimated profiles further here. They are detailed in Haase, Ferreira, Santos, Aguyao, and Fallon (2008) and Haase et al. (2011).

In so far as lack of reliability may well be a function of too few items per construct, we added items to each of the five subscales. The original EPI consisted of 5 items per scale. We augmented each of the scales and expanded the number of total items from 25 to 47. The items are displayed in Tables 2 and 3 along with the subscales to which each item belongs. While adding items to the scales, we attempted to keep the content as similar as possible in order to preserve the homogeneity of each scale.

The Sample

Most of the previous work with the constructs outlined above has been completed with college students. In the current work, we recruited a sample of Portuguese employed adults deliberately selected to represent the six occupational groupings of Holland's (1997) RIASEC types. We purposefully sampled electricians ($n = 17$), pharmacists ($n = 71$), journalists ($n = 124$), teachers ($n = 112$), real estate agents ($n = 48$), and accountants ($n = 59$). A person was included in the sample whether they had educational background appropriate to the occupation and had been employed in that occupation for at least 1 year prior to their participation in the study. This sample consisted of 431 employed adults who had complete data for the EPI, the CPI, the Pavlovian Temperament Scales, and demographic questions. This group consisted of 46% females of an average age of 36 years (range 19–73), with a work experience that ranged from 1 to 40 years (mean = 11.7 years), and who rated themselves as moderately satisfied (mean = 2.6, range = 1–4) and moderately successful (mean = 3.0, range = 1–4).

Item Analysis and Internal Consistency Reliabilities of the EPI

We computed the correlations between each item and its intended scale as well as the correlations between each item and its opposite scales. An item was retained in the final subscale if it correlated more highly with its own scale than with the other subscales. The number of items, ranging from 14 to 7 per subscale, which met these criteria and were kept for further analysis are listed in Table 4 along with the number of respondents who completed each subscale and the internal consistency reliability estimated by Cronbach's α. The reliabilities of the scales are considerably higher than that had been the case for the former 25-item scale and the most part are respectable ranging from .80 to .64. The internal consistency reliability for the total score was found to be $\alpha = .93$.

The Items and Scoring of the EPI

The 47 items of the EPI are presented in Tables 2 and 3. The information processing dimension to which each item belongs is listed in the left most column of the table. Of the 53 original items, the 47 items listed in Tables 2 and 3 survived the item analysis stage. The response alternatives are Likert-type 5-point scales, with 1 being *Strongly disagree* and 5 being *Strongly agree*. The factor correspondence is noted in the rightmost column of Table 2, along with the items that must be reversed are designated with an "[R]." The syntax of an SPSS scoring program, and instructions for its use,

Table 2. The Environmental Preference Inventory (EPI).

Environmental Preference Inventory		
Directions: You will find below a series of statements that allow you to record your preferences about a wide range of activities. Read each statement and decide whether you Strongly agree (1), Agree (2), are Neutral (3), Disagree (4), or Strongly disagree (5), with each statement. Enter your response by circling the appropriate response to the right of the question. There are no "right" or "wrong" answers to these questions; you need to only record your preferences.		
Item#	Item	Factor [Reverse]
1	I prefer to finish one job before starting another	4
2	If I am going to work effectively, I must have peace and quiet	1
3	While talking with you, some people crowd you so closely you can hardly think	2
4	I enjoy doing things on the spur of the moment	3 [R]
5	It is important for me to have my meals at regular hours	5
6	Having an overfull schedule gets me down	3
7	Organization of time is the key to efficiency	4
8	I can deal only with one person at a time	1
9	My efficiency really drops off if there is a lot going around me	1
10	I am the kind of person who can easily do more than one thing at a time	1 [R]
11	I usually arrange my room or office to provide lots of privacy	1
12	When I do a job, I take one piece at a time	5
13	Some people insist on standing so close to you during a conversation that you can hardly concentrate on what they are saying	2
14	Crowds of people make me nervous	4
15	People who can't stick to a schedule are usually not very effective	2
16	When too much is going on at once I really become disorganized	2
17	I like crowded, noisy places	5 [R]
18	Things usually change too fast for me	1
19	I can't deal effectively with more than one person at a time	2
20	I can't think straight with too many people around	3
21	The only way to get anything done is to make a tight schedule and stick to it	1
22	I get uncomfortable if there are too many people around	1
23	Having too much going on at once makes me anxious	5
24	Smaller groups of people are easier for me to deal with than large groups of people	2
25	Nowadays there is so much new information thrown at a person that it is impossible to keep up with things	1
26	Man was not made to handle the complexities of the modern world	2
27	I don't see how anyone can get anything done in a room full of other people	3
28	Things happen so fast nowadays that I cannot keep up with everything	3
29	People who are late for appointments really upset me	1
30	I can only do one thing at a time	3
31	When working on a project, I take one thing at a time	1
32	Most people are just not capable of dealing with more than one activity at a time	4
33	There is a place for everything and everything should be in its place	1
34	I really get disorganized if too many things are going on at once	4
35	Sometimes things are happening so fast that I can't seem to concentrate on anything	4
36	Too much information at once confuses me	4
37	I just can't concentrate well unless I have complete peace and quiet	5
38	There are times when so much is happening at once that I just can't think	3
39	I have no difficulty in keeping several projects going at the same time	4 [R]
40	I am a private person	1

(continued)

Table 2. (continued)

Environmental Preference Inventory		
Directions: You will find below a series of statements that allow you to record your preferences about a wide range of activities. Read each statement and decide whether you Strongly agree (1), Agree (2), are Neutral (3), Disagree (4), or Strongly disagree (5), with each statement. Enter your response by circling the appropriate response to the right of the question. There are no "right" or "wrong" answers to these questions; you need to only record your preferences.		
Item#	Item	Factor [Reverse]
41	I dislike large parties	2
42	I prefer solitary activities with little interruption from other people	1
43	Being kept waiting for an appointment does not upset me	5 [R]
44	I have no trouble at all carrying on more than one activity at a time	1
45	I like to go to bed at the same time every night	5
46	I prefer the peace and quiet of country living	2
47	The ability to make plans and stick to them is essential to success	4

Note. Factor allocation and item reversal [R] are denoted in the rightmost column. High scores indicate a high capacity for tolerating each form of stimulus load. Questionnaires printed for use should contain the SA A N D SD response options in the rightmost column.

Table 3. Designated Factor Item Content with Scoring Reversals.

Factor I: Information load	2, 8, 9, 10R, 11, 18, 21, 22, 25, 29, 31, 33, 40, 42, 44
Factor II: Interpersonal load	3, 13, 15, 16, 19, 24, 26, 41, 46
Factor III: Change load	4R, 6, 20, 27, 28, 30, 38
Factor IV: Time structure	1, 7, 14, 32, 34, 35, 36, 39R, 47
Factor V: Activity structure	5, 12, 17R, 23, 37, 43R, 45

has been included in Table 5. The EPI can, of course, be hand scored according to the factor-specific scoring key listed in the five rows of Table 3.

The Confirmatory Factor Structure of the EPI

The original intent of the EPI was to contain five distinct dimensions. Both exploratory and confirmatory factor analyses on the data of several previous samples (see Haase et al., 2014, for a summary of these analyses) suggested that a second-order factor defining two clusters of first-order factors was the most plausible factor structure of these concepts. Consequently, we fitted the confirmatory factor structure that is displayed in Figure 1 to a subset of 389 participants who had complete data on all subscales of the EPI. The model was fitted by maximum likelihood asymptotic distribution-free methods (Browne, 1984) as implemented in STATA 13.

The five-factor, second-order confirmatory factor analysis (CFA) fit the data well with a non-significant asymptotic distribution free , $\chi^2_{(6)} = 6.92$, $p = .075$, comparative fit index = .97, root mean square error of approximation = .06, and standardized root mean square residual = .06. The coefficient of determination (Acock, 2013) suggests that 90% of the available variance is explained by the model. All these indices of model fit are well within contemporary standards for a good fitting model (Hu & Bentler, 1999). These data clearly replicate previous analyses of the EPI constructs in which the five factors were found to constitute two conceptual clusters, namely, a cluster of information processing capacities and a cluster of tolerances for lack of structure in time and activities. The information processing capacities deal primarily with one's estimate of how easily they can

Table 4. The 42 Items of the Career Preference Inventory (CPI).

_____Auto mechanic	_____Real estate agent
_____Biologist	_____Credit manager
_____Architect	_____Plumber
_____Elementary school teacher	_____Plumber
_____Life insurance agent	_____Dentist
_____Accountant	_____Photographer
_____Carpenter	_____Social worker
_____Physician	_____Store manager
_____Graphic artist	_____Secretary
_____Nurse	_____Construction inspector
_____Salesperson	_____Medical technician
_____Bank manager	_____Journalist
_____Electrician	_____Speech pathologist
_____Pharmacist	_____Travel agent
_____Librarian	_____Financial analyst
_____High school counselor	_____Truck driver
_____Business executive	_____Veterinarian
_____Cashier	_____Actor
_____Farmer	_____Special education teacher
_____Computer programmer	_____Hotel manager
_____Musician	_____Bank teller

Note. This is a measure of your interests in a series of different occupations. Please read each item carefully and put a checkmark by those occupations that you would consider choosing or have chosen.

Table 5. Cross Classification of RIASEC Codes Obtained by the CPI and Actual Occupation.

	Actual Occupation							
CPI	Realistic	Investigative	Artistic	Social	Enterprising	Conventional	Total	KR21
Realistic	4	3	2	4	2	2	17	.80
Investigative	1	45	2	16	3	4	71	.58
Artistic	0	13	58	34	8	11	124	.64
Social	0	4	5	89	5	9	112	.74
Enterprising	0	1	2	5	35	5	48	.76
Conventional	1	1	1	3	9	44	59	.66
Total	6	67	70	151	62	75	431	

Note. A percentage correct classifications of CPI RIASEC to actual occupation is 64%. RIASEC = Realistic, Investigative, Artistic, Social, Enterprising, and Conventional; CPI = Career Preference Inventory; KR = Kuder–Richardson.

tolerate a variety of possibly intense sources of information from things, people, and rapid change. Higher scores on the second cluster define an individual who has little difficulty dealing with fluid time and activity structure. The lower scoring individual prefers much more structure and associates distress with the perceived chaos of unstructured time and activities. We anticipate that these two clusters may be differentially related to a variety of variables. We address these speculations in the validity sections mentioned subsequently.

The CPI

As part of our ongoing research program in this domain, it is our intention to be able to match magnitude estimation scaled profiles of the information processing demand characteristics of RIASEC

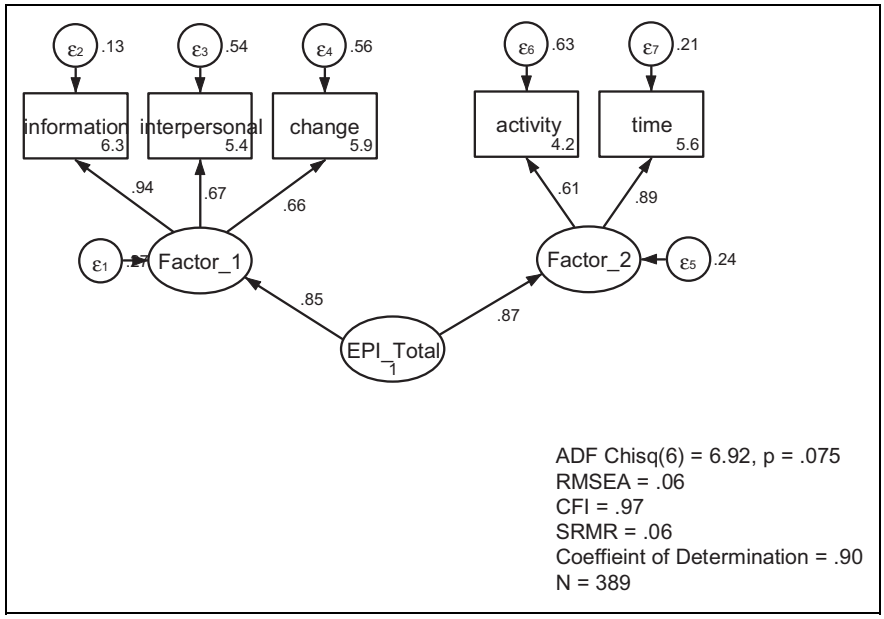

Figure 1. First- and second-order, 5-factor model of the information loads of the Environmental Preference Inventory (EPI).

occupations (see, e.g., Haase et al., 2011) with the same, but self-assessed, profile of information processing capacities of the individual as measured by the EPI. To accomplish these goals, we needed a simple method, similar to the method used by Holland's (1997) self-directed search, to assess interest in each of the six Holland RIASEC types. We included the same 42 occupation names that have elsewhere been magnitude estimation scaled for their information processing demand characteristics (see Haase et al., 2008; Haase et al., 2011).[1] We ensured that the occupation names chosen for the previous scaling (1) represented each of the RIASEC types, (2) existed in both Portugal and the United States, and (3) appear as occupation names on both the Strong Interest Inventory (SII; Harmon, Hansen, Borgen, & Hammer, 1994) and the Vocational Preference Inventory (VPI; Holland, 1997). The CPI shown in Table 4 is a list of those 42 magnitude estimation scaled occupations. In order for the EPI to be maximally useful, one must triangulate occupational interest (the CPI or other method of RIASEC classification), a profile of individual tolerances for information processing demands (the EPI), and a profile of occupational demand characteristics (the magnitude estimation scaled values of RIASEC occupations). In the study, we are reporting here, we have a unique opportunity to assess the validity of the CPI because we have the most appropriate criterion group—each of the respondents was an employed adult with anywhere from 1 to 40 years in that chosen occupation (median = 10 years) and who reported being generally satisfied with their work on a 1–4 Likert-type scale (median = 2.7). The CPI is scored by summing the checked occupations in each RIASEC category and scores can range from 0 to 7. The corresponding bivariate distribution of the RIASEC high-point code classification crossed with the actual RIASEC occupation of the respondents is shown in Table 5.

The Kuder–Richardson 21 internal consistency reliabilities range from .58 to .80 and suggest adequate reliabilities of the separate RIASEC occupation-to-CPI categories. The cross classifications by CPI and occupation are significantly related, $,\chi^2_{(25)} = 648.43$, $p < .001$ Cramer's $V = .549$, based on 63.8% of exact agreements among the two methods of classification that considerably exceed the chance expectation of 16.7% and are substantially larger than similar hit rates reported in the

literature that hover around .45. We further classified the respondents by Holland's congruence index and bifurcated the sample into one group where the CPI and actual occupation matched and into another group where the CPI and occupation were in disagreement. Multivariate analysis of variance on eight indices of satisfaction with work and quality of life revealed significant difference between congruent and incongruent participants, Pillai's Trace $V = .040$, $R^2_V = .04$, $F(8.397) = 2.25$, $p < .04$. The most significant contributors to the linear discriminant function separating the two groups included work satisfaction, total quality of life, and positive affect.

As part of the attempt to establish the construct validity of the EPI, we also hypothesized that individuals within different RIASEC occupations would possess different characteristic levels of capacity for tolerating information processing demands. We conducted a 6-group (RIASEC occupation) one-way, multivariate analysis of variance on the five subscales of the EPI. The results of this omnibus analysis based on 324 respondents with complete data revealed that the optimal linear combinations (Haase, 2011; Tabachnick & Fidell, 2007) of the EPI subscales significantly differentiated the occupational groups, Pillai's Trace $V = .16$, $R^2_V = .15$, $F(25, 1{,}590) = 2.10$, $p = .0012$. The canonical discriminant functions that maximally contribute to the group separation are the information and interpersonal load dimensions. Not surprisingly, the canonical correlation between the six RIASEC subscales of the CPI and the dimensions of the EPI reveal similar results, Pillai's Trace $V = .114$, $R^2_V = .15$, $F(30, 1{,}850) = 1.44$, $p = .057$. Conditional tests of the canonical loadings (Haase, 2011) reveal that the major relationship occurs between realistic, enterprising, and conventional interest scales of the CPI and the interpersonal load demands of the EPI.

We take these collective results as evidence of the construct validity of the CPI and conclude that its use in classifying future research participants in RIASEC categories is warranted. It can be used[2] in conjunction with the EPI to locate the individual within the RIASEC classification scheme and allow that person to select an occupationally matched magnitude estimated profile of demand characteristics of 42 occupations across the EPI load dimensions of information, interpersonal, and change loads, and time and activity structure.

The Relationships of the EPI to Measures of Pavlovian Temperament

Our primary conceptual assertions about the five dimensions of the EPI are that the constructs measured by that scale reveal a profile of the capacities of the individual to tolerate information overload. As such, we have hypothesized that the five dimensions of polychromic information processing capacity are rooted in the physiological arousal mechanisms of the individual. In his studies of classical conditioning, Pavlov (1951) articulated a system of biologically based temperament that he asserted was based on the operating capacity of the central nervous system capacity. He called this phenomenon strength of the nervous system and argued that these temperamental characteristics literally predicted the "working capacity of the cells of the central nervous system" (195, p. 213). Throughout Eastern Europe, and particularly in Russia and Poland, generations of scientific adherents to the Pavlovian system of temperament have generated extensive evidence of the behavioral and physiological correlates and consequences of variation in strength with respect to excitation (SE), inhibition (SI), and mobility (MO) of the nervous processes (Table 6; Nebylitsyn & Gray, 1972; Strelau, 1972, 1997). In Western psychology, these Pavlovian constructs are remarkably similar to, and highly correlated with, Eysenck's (1967) constructs of extroversion, neuroticism, and psychoticism in so far as Eysenck (1967) articulated his causal theory of personality in which he aligned extroversion to Pavlov's excitation–inhibition axis and related neuroticism to Pavlovian mobility of the nervous processes. In contemporary psychological science, Pavlovian constructs have been most clearly explained by Gray's neuropsychological theory of personality called reinforcement sensitivity theory (1975; Gray & McNaughton, 2000), as differential sensitivity to reward

Table 6. Facets of Strength of Excitation (SE), Inhibition (SI), and Mobility (MO) of the Strelau Temperament Inventory.

Scale	Characteristic Facets	Items/α/*n*
Strength of excitation	Capable of sustained and focused attention under high-stimulus load	22/.84/470
	Composure under pressure	
	Perseverance under dangerous or risky situations	
	Enjoys the pressure of a challenge	
	Resistant to distractions; highly focused attention	
	High tolerance for risk	
Strength of inhibition	Ability to delay speaking or acting	22/.73/469
	Capacity to resist interruption of activities	
	Resistance to expressing emotions; controlled	
	Patient and able to resist acting	
Strength of mobility	Ease and speed of changing activities	22/.86/475
	High tolerance of ambiguity in unfamiliar situations	
	Easily alters mood or emotional expression	
	Negative affective response to novel or unexpected stimuli	
	Ease of multitasking	

and punishment. Evidence for the neurophysiological basis of personality and temperament is reviewed by Corr and Perkins (2006).

In our studies with an earlier form of the 25-item EPI (Haase et al., 2014), we have found significant relationships between the five dimensions of the EPI and Strelau's (1972; Strelau, Angleitner, & Newberry, 1999) paper-and-pencil measure of Pavlov's excitation, inhibition, and MO. In this study, we have replicated that series of associations with the revised and augmented EPI. The characteristic facets of Pavlov's strength of excitation (SE), strength of inhibition (SI), and mobility (MO) are outlined in Table 5. It is clear that excitation—the capacity to withstand significant amounts of information overload without behavioral disruption—and mobility—the ability to rapidly shift attention and activities and multitask—should be related to our five dimensions that assess information processing capacity. We suspect that inhibition—the ability to ignore competing stimuli—will be less predictive of our polychromic constructs of information processing. The means, standard deviations, and bivariate correlations between the five dimensions of the EPI and Strelau, Angleitner, and Newberry's (1999) Pavlovian Temperament Survey measures of excitation, inhibition, and mobility based on a sample of 339 respondents with complete data are presented in Table 7. The internal consistency reliabilities reported in the rightmost column of Table 7 confirm that the generally respectable reliabilities of the three Pavlovian temperament scales reported by Strelau et al. (1999) were also found in the present data with Cronbach's $\alpha = .84$, .73, and .86, respectively, for the excitation, inhibition, and mobility scales.

The EPI dimensions are significantly related to all of the Pavlovian dimensions, but the relationships appear strongest for the information demands and the excitation and mobility factors. The optimal weighted linear combinations of these two sets of variables (l and m) established by the structure coefficients of the canonical correlation r_{lm}, Pillai's Trace $V = .52$, $R^2_V = .17$, $F(15, 999) = 13.98$, $p = .001F$. The first significant linear combination of the variables was,

$$l = .96(\text{Excitation}) + .46(\text{Inhibition}) + .80(\text{Mobility})$$

and,

$$m = .95(\text{Information}) + .72(\text{Interpersonal}) + .80(\text{Change}) + .48(\text{Time}) + .65(\text{Activity}).$$

Table 7. Correlations Between the Dimensions of the Environmental Preference Inventory (EPI) and Pavlovian Temperament

	Excitation	Inhibition	Mobility	Mean	*SD*
Information load	.61	.30	.50	43.22	6.77
Interpersonal load	.54	.30	.49	26.26	4.92
Change load	.61	.26	.55	23.35	3.95
Activity structure	.55	.26	.42	23.74	3.82
Time structure	.39	.15	.37	21.68	3.30
Mean	54.71	57.71	61.31		
SD	7.64	6.30	7.22		

Note. $N = 339$ employed adults. All correlations are significant at $p < .01$.

All three loadings of the Pavlovian temperaments are significantly different from zero by conditional tests of the canonical coefficients (Haase, 2011; STATA, 2013) but only the information, interpersonal, and change load factors of the EPI are significantly different from zero. Clearly, the first optimal relationship is defined by an underlying factor of information processing of the EPI and the excitation and mobility scales of the Pavlovian temperament instrument—both sets of scales focus on endurance and capacity for intense or prolonged stimuli. In this sense, the information processing capacities of individual as measured by the EPI appear to be closely related to the neurological capacity for tolerating stimulus load that is a biologically based, temperamental variable that is established early in life. There is mounting evidence in the neuroscience literature that such temperamental characteristics are related to brain function, which in turn can be shown to be conditioned by psychological and cultural experience (Kitayama & Park, 2010). The second significant canonical root of this analysis revealed that only the activity (+.16) and time (−.30) dimensions of the EPI and all three of the Pavlovian scales (excitation = +.13, inhibition = −.12, and mobility = −.10) were conditionally significant loadings on the second root. The bipolar root suggests that having no difficulty managing chaotic time structure is most related to the ability to tolerate intense and prolonged stimulation, while the ability to tolerate fluidity of activity schedules is most related to the neurological capacity to suppress interruption and to maintain cognitive focus in tasks as well as the ability to shift tasks and attention rapidly with no negative behavioral consequences. All in all, we take these findings as increased validity of the possible biological basis of the capacity to tolerate information processing demands as measured by the EPI.

The Relationships of the EPI to the Actual RIASEC Occupations

Our general hypothesis about the differences in self-assessed capacities for tolerating information loads across RIASEC occupations were tested by assessing EPI profile differences across the six actual occupational groups for the 324 respondents that had complete data. A 6 (RIASEC group) × 5 (EPI subscales) split plot analysis of variance revealed a significant main effect for RIASEC group, $F(5, 318) = 3.01$, $p = .011$, a significant main effect for EPI profile, $F(3, 1{,}272) = 1{,}119.72$, $p = .001$, and a significant RIASEC × EPI Profile interaction, $F(17, 1{,}272) = 2.01$, $p = .001$. The means of the RIASEC groups for each subscale in the profile are given in Table 8. One aspect of understanding the interaction is the switching rank order of self-estimates of the RIASEC groups depending on the load considered. For example, the electricians have the lowest tolerance of information load compared to the artistic journalists who have the highest capacity/tolerance for nonpersonal information loads. Conversely, real estate agents (an enterprising occupation) and teachers (a social occupation) have the highest capacity for tolerating high demands for interpersonal information, although the realistic electricians show far less capacity for this source of

Table 8. Means and Standard Deviations of the EPI Dimensions by RIASEC Group.

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Information	40.75 (2.06)	43.54 (6.55)	45.78 (5.26)	42.32 (7.75)	44.31 (6.79)	42.93 (6.85)
Interpersonal	22.75 (2.36)	27.34 (4.78)	27.26 (3.81)	25.22 (5.13)	27.71 (5.53)	26.25 (5.27)
Change	23.50 (3.87)	23.31 (3.55)	25.38 (2.79)	22.66 (4.00)	24.36 (3.51)	23.42 (3.84)
Activity	22.25 (1.89)	23.75 (2.74)	24.98 (3.11)	23.12 (4.22)	23.83 (4.01)	23.46 (3.84)
Time	21.50 (1.29)	21.90 (3.03)	22.91 (2.61)	21.70 (3.77)	21.95 (2.91)	21.37 (3.74)

Note. RIASEC = Realistic, Investigative, Artistic, Social, Enterprising, and Conventional; EPI = Environmental Preference Inventory.

stimulation. These distinctions make some intuitive sense given the differing interpersonal interactional demands of the realistic, enterprising, and social occupations. In yet another instance, artistic (journalists) and enterprising (real estate salespeople) occupations claim the highest capacity for tolerating rapidly changing stimulus conditions, while the social (teachers) and realistic (electricians) occupations report far less tolerance of this type of cognitive demand. Other instances can be found among the mean differences given in Table 8, but the above-mentioned examples should suffice to help further document the face, content, and construct validity of the EPI.

Discussion

We are encouraged by the initial evaluation of the reliability and validity of the new version of the EPI that has been reviewed here. The reliabilities of the subscales and the total score are certainly adequate for research purposes and the findings that the EPI can significantly discriminate between RIASEC occupational groups—both by the CPI and as measured by the RIASEC categories of the actual occupations held by the respondents studied here. Second, the scales of the EPI have been found to be significantly, and substantially, related to a series of biologically based Pavlovian temperaments that have been shown to be highly sensitive to central nervous system activity and the capacity to deal with intense environmental stimuli (Strelau et al., 1999). These results are consistent with the previous research that has also connected the EPI constructs and the Pavlovian temperament measures of excitation, inhibition, and mobility to cultural differences (Haase et al., 2014). Also consistent with previous research, and which adds to the construct validity of the EPI, is the very well-fitting CFA model of the five subscales of the EPI. The first- and second-order factor structures clearly replicate the structure found in previous samples and is conceptually meaningful. The tolerance of information, interpersonal, and change load factors are paramount in this scheme but clearly augmented by a distinct pair of capacities for tolerating fluidity in structuring time and activities in the occupational domain.

We are encouraged by the incipient development of this nomological network of validity found here and in other evaluations of the constructs (Fernandes, 2013). We feel confident enough at this point to share the items of the EPI (Tables 2 and 3) in the hopes that other researchers will find it useful and thereby add to the nomological network of validity that has begun here. In order to facilitate the use of the EPI, we have included the SPSS syntax (Table 9) that can be used to score the instrument.

In addition to the EPI, we are also encouraged by the content, concurrent, and construct validity of the CPI that is also presented here in its entirety (Table 9). The correspondence of RIASEC classification by the CPI and the actual occupation among our respondents who have been in the occupation for at least 1 year (median = 10 years) and who report being generally satisfied (median = 2.7 on a 1–4 Likert-type scale) is, in our judgment, impressive (68% correct classification rate), and naturally we find this to be encouraging. However, our main motivation in constructing the CPI with

Table 9. SPSS Syntax for Scoring the EPI.

```
*Item responses are entered verbatim from the EPI Likert-type 5-point response SA (1) A (2) N (3) D (4) SD (5)
*Data consist of a single row of 47 variables named i1 to i47 for each subject in the editor
*Necessary item score reversals are accomplished within each factor/scale (i.e., 6 item)
*The original items responses (unreversed) are preserved in the data file

Compute information = (i2 + i8 + i9 + (6 − i10) + i11 + i18 + i21 + i22 + i25 + i29 + i31 + i33 + i40 + i42 + i44)
Compute interpersonal = (i3 + i13 + i15+ i16 + i19 + i24 + i26 + i41 + i46)
Compute change = ([6 − i4] + i6 + i20 + i27 + i28 + i30 + i38)
Compute activity = (i1 + i7 + i14 + i32 + i34 + i35 + i36 + [6 − i39] + i47)
Compute time = (i5 + i12 + [6 − i17] + i23 + i37 + [6 − i43] + i45)
list var information to time
EXECUTE
```

Note. EPI = Environmental Preference Inventory.

its 42 occupations organized around the six RIASEC categories was to define a set of occupations that (1) existed in both the United States and Portugal, (2) appeared on both the SII and VPI, and (3) could be scaled by magnitude estimation with respect to the demand characteristics of each occupation with respect to the five factors of information load, interpersonal load, change load, time, and activity structure. Now that we have established confidence in the psychometric characteristics of the EPI, our ultimate goal is to match the profiles of the self-assessed capacity for tolerating information processing loads of an individual with the profile of each of these 42 occupations in terms of their demand characteristics on the same five dimensions—in essence, a person–environment (P-E) fit approach to matching individual capacities with the demand characteristics of RIASEC occupations. The magnitude estimation scaled values of the 42 occupations across these five information dimensions can be found in Haase et al. (2011).

It is our intention in the next phase of this program of research to augment these scaled values with additional data from employed adults in the United States in order to replicate, verify, and extend the utility of the P-E fit process we have presented here. When these scaled values are available, our ultimate goal is to create a tool that can be useful in career counseling by which individuals who differ in their self-assessed capacities for tolerating different types of information overload can be matched with one or more profiles of the 42 occupations that we have scaled to define the demand characteristics of that occupation across the same five dimensions of information processing load. Ultimately, we hope that this matching process will help individuals make even more informed vocational and career decisions.

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Notes

1. The magnitude estimation procedure we have used to establish scale values of information processing demand characteristics of the 42 occupations listed in the Career Preference Inventory (CPI) is a classical method of psychophysics for assigning ratio scale numeric values to objects that otherwise have no measurable underlying physical scale—a method that S. S. Stevens called ''scaling the social consensus'' (Stevens,

1966, 1975). Each of the 42 occupations of the CPI was scaled for the information processing demand that they place on the holders of each occupation. Each occupation was scaled relative to the remaining 41 occupations on five dimensions of nonpersonal information load, interpersonal information load, change load, activity structure, and time structure. For example, social occupations were found to place 1.8 times greater demand on its occupants for processing interpersonal information (64) than realistic occupations (35) and 1.4 times greater demand than conventional occupations (46). In like fashion, each of the 42 occupations was scaled for its relative standing on the demand characteristics for processing these five dimensions of information load. Having these profiles of the 42 occupations contained in the CPI allows us to match them to the same five-dimensional profile of individual capacity for tolerating information loads as measured by the Environmental Preference Inventory (EPI). An individual's response to the CPI gives a tentative classification of the RIASEC occupations and hence, for any given person, the match, or mismatch, of the information processing profile of that person on both the occupations of choice (CPI) and nonchoice is intended to aid in the narrowing of the selection of occupational pursuit for that person. Full details of the scaling process and results are given in the cited references.

2. Any extant method can be used to locate an individual within the RIASEC classification scheme. The use of the CPI could prove convenient in that the EPI and CPI could be administered simultaneously for any given participant. The CPI also has the advantage that the profile of magnitude estimated scale values of the same 42 occupations of the CPI are available (see Haase et al., 2014)

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