

THE DEVELOPMENT OF THE REVISED PAVLOVIAN TEMPERAMENT SURVEY IN ENGLAND: CONTINUING RESEARCH*

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Summary—The 252-item Pavlovian Temperament Survey-Revised (PTS-R) was adapted for English speaking countries and then administered to 622 subjects (315 female and 307 male). Items for the final 160-item version were selected on the basis of the criteria outlined by Strelau *et al.* (1990; *European Journal of Personality*, 4, 209–235). A 78-item short form was also developed. Both inventories are scored on a 4-point Likert scale.

INTRODUCTION

The Strelau Temperament Inventory (STI; Strelau, 1972) was developed as a self-report measure of the nervous system properties elaborated by Pavlov (1951, 1955). It should be pointed out here that the name (STI) was not given to the inventory by Strelau. He called it the TI and it was Western workers who associated Strelau's name with the STI. This point is important because the inventory seeks to provide a diagnostic tool of Pavlovian typology and not Strelau's (Strelau, 1983) Regulative Theory of Temperament and by using Strelau's name in the STI's title some confusion arises. It is therefore more appropriate to refer to the instrument as the Pavlovian Temperament Survey (PTS). Therefore, throughout this paper STI will be used when referring to the original inventory and PTS will be used when referring to the revised versions.

Pavlov's concept of type of nervous system (TNS) will not be discussed in any great detail here since Pavlov's typology has been reviewed many times (see Strelau, Angleitner, Bantelmann & Ruch, 1990; Strelau, 1983; Corulla, 1989 for a review of current thinking on Pavlovian typology). However, it would be useful (1) to re-state Pavlov's descriptions of the properties, (2) to briefly introduce the additions to Pavlovian typology by neo-Pavlovian typologists, and (3) to re-state the hypotheses which generated much of the Western interest in Pavlovian typology.

Strength of Excitation (SE), was described as the capacity of the nervous system to endure long-lasting or short-lived but intense stimulation. Strength of Inhibition (SI), was described as the system's capacity for conditioned inhibition and is manifested in the capacity to refrain from action, to delay action or to interrupt action. Mobility of Nervous Processes (MO) was described as the system's capacity for rapid changes in behaviour following rapid changes in environmental stimulation. Balance (B) of nervous system processes is described and estimated by the ratio of SE/SI.

Perhaps the most noted neo-Pavlovians are Teplov (1963) and Nebylitsyn (1963). The work of these authors has been discussed in detail elsewhere (cf. Strelau, 1983; Corulla, 1989; Strelau, Angleitner & Ruch, 1989). It will therefore suffice to say that this group (the Moscow Group) developed and/or elaborated many psychophysiological and psychophysical measures for the diagnosis of nervous system properties in man and to remind the reader of the additional properties postulated by these workers which include, as the most important: Concentratability, Activatability, Dynamism and Lability. It is important to point out that the STI and the PTS do not purport to be measures of these neo-Pavlovian additions to Pavlovian typology.

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Since its advent, the STI has gained a degree of international popularity and has been used many times in research programmes (Carlier, 1985; Stelmack, Kruidenier & Anthony, 1985; Corulla, 1989).

Much of the interest in Pavlovian typology and the STI stems from the Eysenckian (Eysenck, 1966) hypothesis that there exists a commonality between Eysenckian and Pavlovian typology. The substance of this hypothesis is that the Strong TNS resembles the Extravert while the Weak TNS resembles the Introvert and Gray's (Gray, 1964) arousability postulate which states that low arousability resembles the Strong TNS and high arousability resembles the Weak TNS.

However, research by Strelau *et al.* (1989) found that the STI lacks the psychometric characteristics necessary to accept this instrument as a valid measure of Pavlovian typology. In order to rectify this situation, Strelau *et al.* (1990) embarked upon a revision of the STI.

The first step in this programme of the inventory's revision was the generation of a 377-item pool (152 items for the SE scale, 113 items for the SI scale, 112 items for the MO scale along with 15 original items from the STI). Step two involved scrutinizing the items for each of the respective scales. Only those items that were fully agreed upon by four independent judges were finally selected. This procedure resulted in a 252-item pool (SE = 90 items, SI = 84 items, MO = 78 items). The authors point out that this version contains more items than intended. The following criteria were employed for a revised and reduced PTS; an item was deleted if (1) corrected item-total correlation was <0.15 , (2) item correlation with the corresponding scale was less than the correlation with the other scales, or (3) an item correlation with its respective scale was not significant. This procedure resulted in 86 items being excluded from the 252-item pool leaving a total of 166 items in the final full version.

A short form of the inventory (PTS-S) was also developed by selecting the four best items of each component based upon item-total correlation. This procedure resulted in an 84-item PTS-S.

Since the construction of the PTS, the present author has become involved in an international research programme, the aim of which is the construction and validation of the PTS-S in several different countries.

The first step in the present study was the adaptation of the 252-item PTS, so as to make it more comprehensible in English speaking countries, in which English is the first language.

Having accomplished this, a project aimed at reducing the 252-item inventory was undertaken employing the criteria set out by Strelau *et al.* (1990).

METHOD

The adapted English version of the 252-item PTS was administered to 622 Ss (315 female and 307 male). The age range for the female sub-sample was 17 to 63 years with a mean age of 28.9, $SD = 14.1$. The age range for the male sub-sample was 17 to 65 years with a mean age of 30.2, $SD = 12.8$. The combined sample consisted of university students, college students, nurses, police personnel, technicians, construction workers and a variety of miscellaneous workers in employment. Therefore the present sample was fairly heterogeneous.

RESULTS AND DISCUSSION

Cronbach alpha was computed for each component of the three scales using the SPSSx Reliability sub-routine (SPSS, 1983). This sub-routine provides item to item correlation, item to scale corrected alpha and coefficient alpha.

This procedure resulted in the deletion of 100 items based upon the criteria established by Strelau *et al.* (1990). That is, 43 items were deleted because they did not reach significant correlations with their respective scales, 41 items fell below the cut off criterion of 0.15 for corrected item-total correlation and 16 items correlated more strongly with other scales than they did for their own putative scale. Facets SE4 and MO5 were eliminated because their respective scale reliabilities were below 0.30 (0.28 and 0.24, respectively). It is interesting to note that these are the same facets lost in the Strelau *et al.* (1990) study. However, item 136 from facet SE4 (item 10 on the English version

PTS) correlated quite strongly with SE5 (0.73) and so was retained on this facet. This resulted in the retention of 52 SE items, 51 SI items and 46 MO items; totalling 149 items. 3 additional items were retained (12, 74 and 86—the present PTS) as possible social desirability (SD) items on the grounds of over 90% endorsement. From this analysis only these three items from the 252-item PTS emerged as possible SD items. Therefore, 8 items having the highest loadings on the EPQ-R Lie scale were incorporated into the English version. This results in a 160-item version for English speaking countries.

The next stage in the present study was the calculation of means, standard deviations and alpha coefficients for the scales and facets for males and females, separately. These are shown in Table 1.

An inspection of Table 1 will show that the means and standard deviations obtained in the present study are well in keeping with the Strelau *et al.* (1990) study. Sex differences have been found with males scoring significantly higher on SE and SI than females. There was no difference found for the MO scale. Most studies using the original STI (Strelau, 1983; Corulla, 1989) have reported sex differences between these scales in the same direction. Therefore this result is not very surprising. The alpha reliabilities obtained in the present study are also in keeping with those reported by Strelau *et al.* (1990). It is also noted that these alphas are higher than those obtained for the original STI (Corulla, 1989). Of particular interest is the reliability of the SE scale for both sexes (0.91 and 0.87 compared with 0.80 and 0.73, PTS and STI for males and females, respectively). It will also be noted that the SD scale shows a moderately high internal consistency (0.79 and 0.77, males and females, respectively).

Presented in Table 2 are the intercorrelations between the facets, scales and social desirability (SD) for the male sub-sample ($n = 307$).

Presented in Table 3 are the intercorrelations between the facets, scales and SD for the female sub-sample ($n = 315$).

An inspection of Tables 2 and 3 shows that almost all of the correlations are somewhat stronger for the male sub-sample. Of particular interest are the correlations with SD for male Ss with the other variables. Almost all of these are stronger than those obtained for the female sub-sample. It was noted that the mean for SD was also higher for males. Combining these two findings a tentative explanation can be offered for this result. It may be the case that the male Ss in the present sample care slightly more about what others think of them, and in so thinking tend to score higher on SD scales than do females. Thus, a stronger commonality between SD and temperamental characteristics may exist for male Ss. It will also be noted that for both sub-samples SE, SI and MO correlate to some extent. The correlation between MO and SE is stronger than with SI for both males and females. That these scales seem to be oblique rather than orthogonal is not surprising given Pavlov's original postulate. Pavlov stated that it is a combination of the nervous system properties which determine type of nervous system.

Table 1. Means, standard deviations, t -statistic and alpha separately for males and females ($n = 622, 315, F$ and 307 M)

Facet/s	No. items	Male		Female		Male Alpha	Female Alpha	t	P
		\bar{X}	SD	\bar{X}	SD				
SE1	6	4.20	1.37	3.15	1.94	0.62	0.64		
SE2	8	3.62	2.09	2.72	1.83	0.65	0.63		
SE3	10	5.81	3.11	4.69	2.74	0.78	0.74		
SE5	12	5.20	2.59	4.83	2.02	0.87	0.81		
SE6	9	4.15	1.91	3.71	1.97	0.81	0.77		
SE7	7	3.84	2.02	3.64	1.41	0.62	0.67		
SE	52	26.71	13.06	22.87	12.01	0.91	0.87	5.07	0.001
SI1	11	7.46	2.31	6.34	2.07	0.63	0.60		
SI2	9	5.31	2.98	5.21	1.97	0.68	0.65		
SI3	8	5.58	2.11	4.97	2.48	0.71	0.63		
SI4	11	7.21	2.58	6.98	2.12	0.67	0.62		
SI5	12	6.26	2.08	6.11	2.67	0.81	0.76		
SI	51	32.03	12.08	29.47	11.27	0.87	0.81	3.06	0.01
MO1	12	10.51	2.98	10.49	2.79	0.76	0.71		
MO2	12	9.67	3.02	9.37	2.98	0.81	0.78		
MO3	12	8.92	2.71	8.81	2.67	0.69	0.64		
MO5	10	7.21	2.98	7.03	3.01	0.81	0.74		
MO	46	36.28	11.70	35.70	11.47	0.87	0.82	0.01	NS
SD	11	13.71	4.78	11.98	3.92	0.79	0.77	3.35	0.01

Table 2. Intercorrelations between scales and facets for males (decimal points omitted, $r = 0.14, P < 0.01$)

	SE	SI	MO	SD
SE	1			27
SI	16	1		42
MO	62	25	1	22
SE1	27	09	35	1
SE2	41	08	21	15
SE3	46	10	27	36
SE5	42	17	48	27
SE6	51	14	32	37
SE7	49	23	37	10
SI1	-12	36	12	19
SI2	18	37	24	24
SI3	21	28	22	33
SI4	16	46	11	40
SI5	22	35	19	21
MO1	35	19	54	61
MO2	28	08	38	34
MO3	36	22	57	40
MO4	24	28	36	22

Table 3. Intercorrelations for the female subsample (decimal points omitted, $r = 0.14, P < 0.01$)

	SE	SI	MO	SD
SE	1			16
SI	12	1		32
MO	47	20	1	18
SE1	30	-07	40	09
SE2	38	09	18	13
SE3	41	12	22	27
SE5	36	14	41	21
SE6	48	11	27	33
SE7	52	26	35	14
SI1	08	32	-08	21
SI2	16	41	13	30
SI3	-13	23	20	23
SI4	11	41	19	32
SI5	18	37	10	17
MO1	27	16	27	41
MO2	33	-02	61	26
MO3	26	23	53	32
MO4	20	12	36	19

Shown in Table 4 are the intercorrelations between the 15 facets of the 160-item PTS.

As can be seen from Table 4, there are quite a number of significant correlations (given that for 622 Ss the critical value of $r = 0.11$ to reach 0.01 significance). However, this magnitude is much too low to suggest a really significantly strong relationship. It will be noted that while some significant correlations have been obtained between the SE, SI and MO facets, the strongest correlations are between the facets of their respective scales. For example, the SE facets have stronger correlations among themselves than they do with the other facets. This result is in keeping with those reported by Strelau *et al.* (1990). It is important to recall the above Pavlovian statement when inspecting these intercorrelations.

A short form of the English version PTS was also developed. This was done to keep within the international agreement on this research and, more importantly, for some types of research a short scale is more appropriate than the long form.

The criterion of selecting items based on the highest item-scale correlation was employed. This procedure resulted in an SE scale consisting of 24 items, an SI scale consisting of 24 items, an MO scale consisting of 24 items and an SD scale consisting of 6 items. The English version PTS-S thus consists of 78 items.

Presented in Table 5 are the scale means, standard deviations and Cronbach alpha obtained for the combined sample ($n = 622$).

It can clearly be seen from Table 5 that the means and alpha coefficients are well within the range of those reported by Strelau *et al.* (1990). It is worth pointing out, however, that Cronbach's alpha is reduced on all short scales and this is almost certainly due to the reduction in scale size. The magnitude of the reliabilities suggests that the short form may be a useful instrument, when time limits dictate.

Table 4. Intercorrelations between the 15-point English version (combined sample $n = 622$, decimal points omitted, $r = 0.11, P < 0.01$)

	SE1	SE2	SE3	SE5	SE6	SE7	SI1	SI2	SI3	SI4	SI5	MO1	MO2	MO3	MO4
SE1	1														
SE2	10	1													
SE3	35	27	1												
SE5	23	51	20	1											
SE6	40	16	28	51	1										
SE7	27	12	25	37	50	1									
SI1	-08	-09	-10	00	00	-03	1								
SI2	-02	00	-05	16	12	14	31	1							
SI3	08	00	-06	17	11	13	37	28	1						
SI4	09	-00	00	-09	16	12	45	35	33	1					
SI5	01	03	01	10	-10	17	19	41	30	42	1				
MO1	20	21	25	27	20	37	01	17	14	15	23	1			
MO2	31	19	31	22	31	28	00	20	10	06	11	42	1		
MO3	19	25	19	37	32	26	-06	16	26	09	09	51	40	1	
MO4	17	18	27	25	19	20	12	14	17	10	19	55	38	42	1

Table 5. Combined sample scale means, standard deviations and alphas

Scale	No. items	\bar{X}	SD	Alpha
SE	24	10.01	4.67	0.77
SI	24	13.23	5.78	0.72
MO	24	15.21	3.89	0.77
SD	6	5.36	2.18	0.68

Table 6. Intercorrelations between the 4 scales (combined sample, $n = 622$, $r = 0.11$, $P < 0.01$)

	SE	SI	MO	SD
SE	1			
SI	24	1		
MO	62	21	1	
SD	27	35	41	1

Table 7. Short and long scale intercorrelations shown on the diagonal (s = short scale)

	SEs	SI	MOs	SDs
SE	94			
SI	35	88		
MO	62	22	95	
SD	27	21	32	93

Presented in Table 6 are the intercorrelations between the 4 short scales.

It can be seen quite clearly that this pattern of correlations is close to those reported above and by Strelau *et al.* (1990).

For completeness, intercorrelations were run between the short scale scores and the long form scale scores. These are shown in Table 7.

These rather strong correlations suggest that the short form can be used quite legitimately when needed and that they are measuring to a very large extent the properties measured by the PTS.

CONCLUSION

The results reported above suggest that the English version of the PTS represents a welcome improvement on the original STI in terms of its psychometric properties. This has been shown in the somewhat higher internal consistency of the new scales, improved distributions and pattern of correlations.

It is also worthwhile pointing out that 96% of the respondents said that the 4-point Likert scale used was easier to use and seemed much more appropriate than a forced choice yes/no response format. This was found by asking the *S*, in a covering letter, for comments concerning the response format.

The next stage in the English series of studies is a project aimed at validation of the PTS. At present, a large study is underway in which approx. 750 *Ss* from the 5 British socio-economic classifications are completing the following inventories; the PTS, Eysenck's revised EPQ-R (Eysenck, Eysenck & Barrett, 1985), the revised Dimensions of Temperament Survey (DOTS-R; Windle & Learner, 1986), the Sensation Seeking Scale (Form V; SSS; Zuckerman, 1979), the Questionnaire for the Structure of Temperament (QST; Rusalov, 1989), The EASI (Buss & Plomin, 1975) and the UWIST Mood Adjective Checklist (Matthews, Jones & Chamberlain, 1990).

Copies of the English version PTS-R and the short form, along with scoring keys are available from the senior author upon request.

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