

THE FACTOR STRUCTURE OF THE GRAY-WILSON PERSONALITY QUESTIONNAIRE IN HUNGARY



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SUMMARY

Background and aims. The aim of this study has been to examine the psychometric characteristics of the Hungarian translation of the Gray-Wilson Personality Questionnaire (GWPQ-H) within a Hungarian sample, including the exploration of the factor structure, relationships among the facet scales, sex differences in scale scores and relationships with the Hungarian version of the Eysenck Personality Questionnaire (EPQ-H).

Methods. The GWPQ-H was administered to an opportunity sample consisting of 203 male and female subjects. Reliability analyses and exploratory factor analyses were executed at item and scale level.

Results. Males scored higher on Fight, while females were higher on Active avoidance, Passive avoidance, Extinction, and Flight. There was a tendency for Approach scores to decline with age, while Extinction increased, particularly in males. Alpha reliability scores were acceptable given the test's rationale and requirement of balancing for direction of scoring. Item level factor analysis revealed three main factors, interpreted as (I) Sensitivity to criticism, (II) Carefulness, and (III) Irresponsibility. Analysis at the scale level suggested the predominance of two major factors, corresponding to Behavioral inhibition and Behavioral activation respectively. EPQ-H Extraversion was positively related to Approach and negatively related to Passive avoidance and Extinction. Neuroticism was associated with Passive avoidance, Extinction, Flight and Fight. Psychoticism was positively related to Fight and Approach and negatively related to Active avoidance and Flight. *Discussion.* These findings, contradicting in part with the original construction of GWPQ, are generally in accord with those reported in UK and other European countries, Russia, and India.

Keywords: Gray-Wilson, Personality Questionnaire, GWPQ, Eysenck Personality Questionnaire, EPQ, explorative factor structure, sex differences



INTRODUCTION

The Gray-Wilson Personality Questionnaire (GWPQ; Wilson, Barrett & Gray, 1989; Wilson, Gray & Barrett, 1990) was devised to measure, at the human level, personality variables derived from the animal learning paradigms upon which Gray's theory of personality is based (Gray 1982, 1987). Gray postulates that three fairly independent brain/emotional/behavioral systems underlie the basic dimensions of individual differences as conceptualized by Eysenck's PEN system (Eysenck, 1991), albeit rotated so as to correspond better with the results of animal learning and neuropsychological studies, including those concerning psychotropic drug effects. Each of the three main systems is described as having two subdivisions as follows:

1. The *Activation* system organizes behavior directed towards conditioned signals of reward as well as the active avoidance of punishment. Its two main components are therefore *Approach* and *Active avoidance*, both positive forms of behavior. This system is said to underlie the personality traits of Impulsivity, which corresponded to Neurotic-Extraversion within Eysenck's original two-factor quadrants, but is recognized as nearer to Psychoticism within Eysenck's later three-factor structure (Diaz & Pickering, 1993).

2. The *Inhibition* system organizes behavior directed towards conditioned signals of punishment. This comprises the abandoning of behaviors that are not rewarded (*Extinction*) and the avoidance of punishment by inaction (*Passive avoidance*). This system is said to mediate the basic trait of Anxiety, corresponding to Neurotic-Introversion in Eysenck's system (though nearer to N than I).

3. The *Fight/Flight* system organizes behavior in response to unconditioned aversive events, including punishment and the frustrative non-reward. According to Gray's theory, escape from the source of punishment (*Flight*), and attack against it, known as „defensive aggression” (*Fight*), are functionally equivalent manifestations of the same brain/behavioral system.

Any instrument designed to measure the main descriptive dimensions of this model should, ideally, satisfy two criteria: (1) the facet scales pertaining to different domains (e.g., Approach and Passive avoidance) should be largely uncorrelated, and (2), the facet scales pertaining to the same domain (e.g., Approach and Active avoidance), should be substantially correlated. Unfortunately, these requirements were not satisfied either within the original British sample (Wilson, Gray & Barrett, 1990) or in other cultures in which translated versions were applied: Japan (Wilson, Barrett & Iwawaki, 1995), India (Corr, Kumari & Wilson, 1997) and Russia (Slobodskaya, Safronova, Knyazev & Wilson, 2001). In each of these diverse cultures, Approach tended to correlate positively with Fight and negatively with Active avoidance, both relationships contradicting Gray's theory. In addition, the correlation between Fight and Flight, although positive, was very low. Hence, the basic structure of individual differences as described by Gray was not confirmed in these studies. Nor has item level factor analysis (Wilson et al. 1990; Wilson et al., 1995; Slobodskaya et al., 2001) clearly reproduced the theoretical structure of the GWPQ. As a result, Slobodskaya, Knyazev, Safronova & Wilson (2003), developed a short-form of the GWPQ in the Russian context, which collapsed the three main fac-

tors and six subscales down to just two major scales, Behavioral activation and Behavioral inhibition. Item reduction was based partly on factor analysis, and partly on previously validated criteria (adolescent conduct and emotional problems respectively).

Regarding the relationship between the Gray and Eysenck theories, the interaction of the biological systems postulated by Gray is hypothesized as the basis of the Eysenckian superfactors, Extraversion and Neuroticism. High Activation combined with low Inhibition determines Extraversion, and low Activation combined with high Inhibition determines Introversion, i.e., the Extraversion-Introversion dimension is in a position almost diagonal to Activation (Impulsivity) and Inhibition (Anxiety). Therefore, Extraversion should correlate positively with measures of Activation, and negatively with measures of Inhibition. Neuroticism should be correlated positively with both Inhibition and Activation measures. The position of Psychoticism within Gray's three-factor-model is less clear, but it might be expected to connect in some way with Fight/Flight, therefore positive correlations might be expected between P and both Fight and Flight.

The actual correlations between GWPQ scales and the EPQ (Eysenck and Eysenck, 1975) that have been reported in the studies cited above are not entirely consistent with these expectations. Certainly, N does go with Passive avoidance, but it seems just as strongly associated with Active avoidance and Flight as it does with Extinction. Correlations with E have not been consistent across cultures, but it does tend to go with Approach and (negatively) with Active avoidance and

Extinction. P does correlate positively with Fight, but is more commonly associated with Approach than with Flight.

Sex differences were found in all countries, men being higher in Fight and Approach, and women in Flight, Passive avoidance, Active avoidance and Extinction. This is consistent with a large body of evidence that men are higher in Activation (and Eysenck's P) while women are higher in Inhibition (and Eysenck's N) (Costa, Terracciano & McCrae, 2001).

The present study examines the psychometric characteristics of the GWPQ within a Hungarian sample, including its factor structure, relationships among the facet scales, sex differences in scale scores and relationships with the Hungarian version of the Eysenck Personality Questionnaire (EPQ-H¹; Eysenck & Matolcsy, 1984). A joint factor analysis involving the scales of both the GWPQ-H and the EPQ-H is also presented.

METHOD

The items of the GWPQ questionnaire were translated into Hungarian by the first author (JN), then back-translated by an independent, professional translator. The back-translated items were then examined by the second author (GW), one of the original constructors of the test, and several of the items modified so as to correspond better with the content of the original items.²

The sample comprised 203 subjects, 90 males, 111 females, and 2 unspecified. Their ages ranged from 16 to 81, with a mean of 32.3 years (s.d. = 13.6). Age distributions

¹ This was not referred as EPQ-H, but only EPQ in the original Hungarian article.

were similar for male and female Ss. They were recruited with the help of psychology students of the ELTE (Eötvös Loránd University, Budapest), who were asked, as part of their psychometrics course, to involve family members and friends so as to obtain a wide age range of subjects for this study. As regards education, 4.9% of the sample had completed only primary school (leaving school at the minimum age of 14), 54.7% had completed secondary school or were university students at the time of investigation, and 30.5% had university degrees. We also selected a reduced sample of 150, constructed so as to be demographically comparable to that used in the British study (Wilson et al 1989), and repeated all analyses. The results were so similar to those obtained with the full sample that they will not be described further.

Instruments used were the GWPQ-H, as described above, and the EPQ-H (Eysenck & Matolcsy, 1984).

RESULTS

Means and s.d.s of the six subscales are shown separately for men and women in *Table 1*. Women were significantly higher

on Active avoidance, Passive avoidance, Extinction and Flight, whereas men scored higher on Fight.

Table 2 shows the effect of age on each of the GWPQ-H scales. There was a tendency for Approach scores to decline with age in both males and females, while Extinction scores increased with age in men only.

Alpha reliabilities of the GWPQ-H scales are shown in *Table 3*. These range from .36 to .69. Correlations between the positive and negative scored halves of the six scales are shown in *Table 4*. Entries in the leading diagonal (the reversed halves of the same scales) are significant, but generally lower than overall scale alphas (ranging from .37 to .43). Correlations among the positive and negative scored subscales for different scales in the same theoretical domain are around zero in the case of Approach and Active avoidance, and Fight and Flight. With respect to Active avoidance (+ve) and Approach (-ve), there was actually a negative correlation (-.26).

Intercorrelations among the six GWPQ-H scales are shown in *Table 5*. As expected, Passive avoidance and Extinction are positively correlated. However, Approach was not correlated with Active avoidance (the

Table 1. Means and s.d.s for men and women on the six GWPQ-H scales

Scale	Males (N = 90)		Females (N = 111)		F	p	t	p
	Mean	SD	Mean	SD				
Approach	15.1	5.2	15.7	5.5	.03	.864	-.77	.441
Active avoidance**	22.5	5.7	26.1	5.3	1.61	.205	-4.62	< .001
Passive avoidance**	15.7	5.5	20.0	5.8	.48	.489	-5.39	< .001
Extinction**	17.2	5.7	19.6	6.3	.18	.668	-2.79	.006
Fight*	18.9	6.8	16.9	5.5	2.70	.102	2.36	.019
Flight**	16.3	5.2	20.3	6.1	2.87	.091	-4.91	< .001

(*: $p < 0.05$; **: $p < 0.01$)

correlation actually being negative, though non-significant), nor were Fight and Flight correlated significantly. Flight was actually correlated with Passive and Active avoidance and with Extinction. When these inter-correlations were calculated separately for

men and women, certain sex differences emerged. Fight and Approach were significantly correlated for women only ($r = .40$, $df = 110$, $p < .01$), whereas Fight and Flight were related in men only ($r = .22$, $df = 89$, $p < .05$).

Table 2. Correlations between age and GWPQ-H scales.

	Total (N = 203)	Males (N = 90)	Females (N = 111)
Approach	-0.28**	-0.35**	-0.23*
Active Avoidance	0.12	0.19	0.09
Passive avoidance	-0.00	-0.06	0.05
Extinction	0.13	0.27**	0.04
Fight	-0.09	-0.01	-0.18
Flight	0.13	0.11	0.16

Table 3. Cronbach-alpha reliability coefficients of GWPQ-H scales.

	Total sample (N = 203)	Males (N = 90)	Females (N = 110)
Approach	.53	.49	.57
Active Avoidance	.50	.54	.36
Passive avoidance	.59	.50	.56
Extinction	.61	.55	.64
Fight	.62	.69	.52
Flight	.64	.48	.68

Table 4. Correlations between the scales computed from the positive and negative scored items (N = 203).

	Approach (-ve)	Active avoid. (-ve)	Passive avoid. (-ve)	Extinction (-ve)	Fight (-ve)	Flight (-ve)
Approach (+ve)	0.43**	0.03	-0.03	-0.08	0.12	-0.02
Active avoid. (+ve)	-0.26**	0.40**	0.15*	0.07	-0.28**	0.05
Passive avoid (+ve)	-0.00	-0.12	0.39**	0.26**	-0.03	0.16*
Extinction (+ve)	-0.06	0.00	0.24**	0.39**	-0.06	0.26**
Fight (+ve)	0.13	-0.09	-0.24**	-0.00	0.42**	0.05
Flight (+ve)	-0.10	0.14*	0.24**	0.13	-0.07	0.37**

Table 5. Intercorrelations of the six GWPQ-H scales (N = 203)

	Approach	Active avoidance	Passive avoidance	Extinction	Fight
Active avoidance	-0.12				
Passive avoidance	0.02	0.10			
Extinction	-0.01	0.09	0.45**		
Fight	0.22**	-0.16*	-0.11	0.06	
Flight	0.01	0.29**	0.36**	0.35**	0.09

Table 6. Summary of the content of the highest loading items in the first three varimax rotated principal components of the GWPQ-H (the item number, the scale containing the item and the direction of scoring are shown in brackets)

Factor I (Sensitivity)	
.59	Easily upset by embarrassing situations (Item No. 111, Passavoid+)
.59	Avoid competitive games/sports if likely to lose (82, Extinct+)
-.58	Relaxed in TV interview (57, Passavoid-)
-.56	Remain controlled and clear-thinking under threat (30, Flight-)
.53	Lost for words in public speech (51, Passavoid+)
-.52	Little affected by opinions of others (117, Passavoid-)
-.48	Carry on asking for pay rise despite past refusal (112, Extinct-)
.48	Fall to pieces with criticism (75, Passavoid+)
-.44	Enjoy challenge of games against superior players (88, Extinct-)
.43	Call police rather than chase burglars (95, Fight-)
Factor II (Carefulness)	
-.50	Inclined to forget unpleasant appointments (15, Passavoid+)
.48	Put safety first when driving (55, Approach-)
-.48	Often unprepared for bad weather (26, Actavoid-)
.48	Carry umbrella if rain likely (20, Actavoid+)
-.45	Felt like killing someone (113, Fight+)
.43	Dental attention sought immediately (21, Passavoid-)
-.43	Wait for appliances to break down before servicing (14, Actavoid-)
.42	Feed parking meter diligently (116, Actavoid+)
.42	Avoid talking with sore throat (23, Fight-)
-.41	Lax about security (50, Actavoid-)
Factor III (Irresponsibility)	
.46	Blame others when hurt (77, Fight+)
.40	Yelp with pain with twisted ankle (84, Flight+)
.40	Go through with concert despite bad feedback (4, Extinct-)
.39	Leave restaurant if meal slow in coming (12, Flight+)
.39	Open present in advance of day (85, Approach+)
.38	Flinch with medical injection (72, Flight+)
.37	Walk around ladder rather than under (92, Actavoid+)
.37	Yell abuse at other drivers (53, Fight+)
.37	Curse audibly if thing go wrong (5, Fight+)
.35	Assume fire alarm is false (74, Actavoid-)

Table 7. The first two principal components of GWPQ-H subscale scores, varimax rotated.

	Factor I	Factor II
Extinction	.76	.08
Flight	.76	-.02
Passive avoidance	.75	-.07
Fight	.07	.75
Approach	.06	.69
Active avoidance	.35	-.52

Table 8. Intercorrelations between GWPQ-H and EPQ-H scales (N = 159)

	E	N	P	L
Approach	0.32**	0.12	0.23**	-0.25**
Active avoidance	0.02	0.07	-0.39**	0.25**
Passive avoidance	-0.30**	0.48**	-0.09	0.08
Extinction	-0.30**	0.30**	-0.04	0.12
Fight	0.14	0.21**	0.28**	-0.24**
Flight	-0.09	0.29**	-0.17*	0.19*

Investigation of the factor structure of the GWPQ-H began with a principal components analysis conducted at the item level. A scree test suggested the predominance of three factors, the first ten eigenvalues being 8.05, 5.42, 4.96, 3.59, 3.18, 3.04, 2.86, 2.77, 2.53, 2.50. The highest loading items on these three, after varimax rotation, are shown in *Table 6*.

Factor I features items from the Passive avoidance scale, and could be labeled „Sensitivity to Punishment”. Since most high loading items concern social situations, it might alternatively be called „Sensitivity to Criticism”. Factor II loads mainly on items from the Active avoidance scale, and might be labelled „Carefulness”. Factor III loads primarily on items from the Fight and Flight scales, and could be called „Irresponsibility”. These three factors are reminiscent of the three main Gray factors (Anxiety, Impulsiveness, and Psychoticism), with the Impulsiveness factor reversed. The first two of these factors include items that are scored in both directions, but Factor III contains items that are scored in one direction only.

Since some might argue that the ratio of subjects to items was insufficient to justify item-level factor analysis, we also conducted a principal components analysis starting from the six subscale scores. This time the scree test favored a two-factor solution (eigenvalues of 1.87, 1.31, .94, .82, .57, .48, etc.). Loadings on these two factors are shown in *Table 7*. Extinction, Flight and Passive avoidance (and to a lesser extent Active Avoidance) are loaded on one factor, while Fight, Approach and Active avoidance (reversed sign) load on the other. These two broad factors could be characterized as „Inhibition” and „Activation” respectively.

Intercorrelations between GWPQ-H and EPQ-H scales are shown in *Table 8*. E is positively correlated with Approach and negatively correlated with Passive avoidance and Extinction. N is positively correlated with Passive avoidance and Extinction, also Fight and Flight. P goes with Fight and Approach and is negatively correlated with Active avoidance and Flight. There were interesting differences in these correlation patterns

between males and females. The correlation between E and Extinction applied primarily to women (-.40) rather than men (-.20). N correlated more with Fight in men (.32) than women (.18). N also correlated with Extinction and Passive avoidance more strikingly in women (.61, .40) than men (.32, .16).

To clarify the factor structure of the GWPQ-H, a principal components analysis, followed by Varimax rotation, was conducted on the scales of the GWPQ-H and EPQ-H jointly. Here, a three-factor solution was indicated, which corresponded fairly well to Eysenck's PEN system. *Table 9* shows that Passive avoidance, Extinction and Flight form a constellation with N, Approach and Fight go with E (and the Lie scale negatively), and Active avoidance goes (negatively) with P.

DISCUSSION

This study examines the psychometric characteristics of the GWPQ within the Hungarian context. Results are generally similar to those obtained in other countries and question the details of Gray's three-dimensional conception of personality. In particular, Ap-

proach and Active avoidance do not cohere at the human personality level (if anything, they are negatively related). In addition, the correlation between Fight and Flight is negligible. Rather, the factor structure of the GWPQ points to an alternative three-factor solution, similar to Eysenck's „giant three” but with the first two factors rotated almost at 45 degrees toward Anxiety and Impulsivity. Alternatively, the scale scores may be reduced to two broad factors corresponding to Activation (comprising Extinction, Flight and Passive avoidance) and Inhibition (comprising mainly Fight and Approach). In other words, Gray's general theory concerning the priority of anxiety and impulsiveness, and their rotated position in relationship to Eysenck's major factors, does obtain support from these data, though not their precise composition as derived from animal learning studies. Approach and Active avoidance do not appear (at least at in humans) to derive from the same brain systems, and nor do Fight and Flight. At the level of personality analysis, it seems that the distinctions between these alternative modes of behavior are of greater importance.

Reliabilities for the six subscales reported here (*Table 3*) are fairly low, as indeed they

Table 9. Varimax rotated principal components of the GWPQ-H and EPQ-H scales.

	Factor 1	Factor 2	Factor 3
Passive avoidance	.78	-.08	.08
N	.73	.07	-.10
Extinction	.72	-.14	.01
Flight	.62	.11	.40
E	-.36	.77	.19
Approach	.18	.69	-.14
L	.19	-.58	.26
Fight	.25	.49	-.37
Active avoidance	.14	-.04	.83
P	.02	.28	-.71

were in the original British study (Wilson et al., 1989), and in Russia (Slobodskaya et al., 2001). This is not surprising given the authors' insistence that items should not overlap unduly in content and that, for each item, there should be a near-equivalent one reversed for direction of scoring. The power of response biases derived from the direction in which items are scored is evidenced by the fact that correlations between the positive and negative scored halves of the same subscales (*Table 4*) are substantially lower than subscale alphas based on all items. They are, nevertheless, higher than correlations with other subscales, which reassures us that it is possible to measure approach and avoidance tendencies as something more than simple reflections of each other. Similarly, it is reassuring that the item level factor analysis (*Table 3*) yields at least two factors (Sensitivity and Carefulness) that mix positive and negative wording about evenly. The third factor (Irresponsibility) contains only positively worded items, and therefore may carry with it a component of endorsement bias (such as willingness to admit anti-social tendencies, in addition to variations in the extent to which anti-social tendencies are actually present).

The sex differences found here are fairly consistent with those identified in other countries and add to a large body of evidence that females tend to be more anxious and avoidant than males (Costa, Terracciano & McCrae, 2001). The tendency for males to be more assertive and aggressive (higher in Approach and Fight), noted in some countries (e.g.

Japan: Wilson et al., 1995), failed to achieve significance in the present study. The tendency for Approach tendencies to diminish with age has not been documented previously, but is consistent with the fact that E and P scores also decline with age (Eysenck & Eysenck, 1975). The reason may be found in changing brain chemicals relating to adventurousness and sensation-seeking, such as increases in the neurotransmitter modulator enzyme monoamine oxidase (Zuckerman, 1991).

The present results, together with those obtained previously, raise questions as to the usefulness of the GWPQ as currently scored, and seem to argue for a reduction of the item pool so as to measure just two or three broader factors. This, indeed, is a reasonable way to proceed, and has been done in the Russian context (Slobodskaya et al., 2003). There may, nevertheless, be an argument for retaining the original structure of the text. For one thing, the subscale scores appear to measure variance with predictive value beyond that of the EPQ (Slobodskaya et al., 2001).

For another, the GWPQ provides scores, balanced for direction of wording, that relate directly to the laboratory tasks that are often used with human subjects as parallels to animal paradigms, and therefore may be a useful adjunct to standard personality tests like the EPQ. Even if the way in which the subscales interrelate does not correspond exactly with Gray's theory of the underlying brain systems, this remains a useful function of the test.

ÖSSZEFOGLALÓ

A Gray–Wilson személyiség-kérdőív GWPQ faktorstruktúrája magyar mintán

Háttér és célkitűzések: A tanulmány célja a Gray–Wilson személyiség-kérdőív magyar változata (GQPQ-H) pszichometriai jellemzőinek, faktorszerkezetének, facet-skálái kapcsolatának, nemek közötti eltéréseinek, valamint az Eysenck-kérdőív (EPQ-H) skáláival való összefüggéseinek vizsgálata. *Módszer:* A GWPQ-H-t 203 fős vegyes összetételű kényelmi mintán vettük fel. *Eredmények:* A férfiak magasabb értéket adtak a harc skálán, míg a nők az aktív elkerülés, a passzív elkerülés, a kioltás és a menekülés skálán adtak magasabb értéket. Az életkorral a megközelítés csökkent, a kioltás pedig nőtt, különösen a férfiak csoportjában. Az alfa-reliabilitás értékek elfogadhatóak voltak figyelembe véve a teszt szerkesztésének elveit és a pontozás irányának kiegyenlítésére való törekvést. A tételszintű faktorelemzés három fő faktort mutatott ki, amelyek a (I) bírálatra való érzékenység, a (II) gondosság és a (III) felelőtlenség címkékként voltak értelmezhetők. A skálaszintű elemzésben két fő faktor emelkedett ki, amelyek a viselkedésgátlással és a viselkedéses aktivitással voltak összefüggésbe hozhatók. Az EPQ-H extraverzió pozitívan kapcsolatban volt a megközelítéssel és negatívan a passzív elkerüléssel és a kioltással. A pszichoticizmus pedig harc és a megközelítés skálákkal pozitívan és az aktív elkerüléssel és meneküléssel pedig negatívan korrelált. *Következtetések:* Ezek az eredmények részben ellentmondanak a GWPQ eredeti konstrukciójának, ugyanakkor összhangban vannak az angliai, a más európai országokban és Indiában kapott eredményekkel.

Kulcsszavak: Gray–Wilson személyiség-kérdőív, GWP-H, Eysenck személyiség-kérdőív, EPQ-H, exploratív faktorszerkezet, nemi különbségek

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