

MSP Research Note

MQ Reliability, Validity and Norms

Introduction

This research note describes the reliability, validity and norms of the MQ. Evidence for these technical aspects of the instrument is presented against some of the key criteria in the EFPA Review Model for the Description and Evaluation of Psychological Tests (Bartram, 2002). The EFPA Review Model was produced to support and encourage the process of harmonising the reviewing of tests. It provides a standard set of criteria to assess the quality of tests. These cover the common areas of test review such as norms, reliability and validity.

Reliability

Internal consistency reliabilities

Table 1 presents internal consistency estimates based on Cronbach's Coefficient Alpha together with raw and Sten score SEMs for the MQ. Overall, the MQ has adequate internal consistency reliability with a median scale reliability of 0.66.

Fourteen scales have a reliability in the $0.6 < r < 0.70$ range which is rated as adequate in the EFPA Review Model. Six scales have a reliability in the $0.70 < r < 0.80$ range which is rated as good in the model.

Table 1. Internal consistency reliabilities for the MQ (n = 2,000)

Scale	Alpha	Mean	SD	Raw score SEM	Sten score SEM
Activity	0.63	15.52	3.07	1.87	0.94
Achievement	0.62	17.03	3.43	2.11	1.08
Competition	0.64	12.89	3.81	2.29	1.12
Fear of Failure	0.77	16.18	3.97	1.90	0.68
Power	0.66	14.77	3.18	1.85	0.96
Recognition	0.68	18.10	3.62	2.05	1.01
Status	0.64	16.54	3.26	1.96	0.99
Ethics	0.67	17.61	3.50	2.01	1.03
Interest	0.66	18.55	3.61	2.10	0.99
Flexibility	0.60	16.72	3.29	2.08	1.07
Progression	0.74	18.02	3.72	1.90	0.91
Pressure	0.64	13.31	3.75	2.25	1.08
Teamwork	0.66	12.54	2.99	1.74	0.82
Management	0.70	15.36	3.66	2.00	1.05
Customers	0.67	13.51	3.44	1.98	0.98
Business	0.72	14.63	2.86	1.51	0.69
Remuneration	0.62	15.25	2.74	1.69	0.85
Job Security	0.73	14.66	3.33	1.73	0.92
Autonomy	0.60	17.58	3.27	2.07	1.05
Growth	0.71	18.65	3.64	1.96	0.91

The MQ scale Sten score SEMs range from 0.68 to 1.12 with a mean SEM of 0.96. This indicates that there is a 68% likelihood that the person's true score on one of the key factor scales will about one Sten either side of the observed score.

Construct Validity

Scale intercorrelations

Intercorrelations indicate how closely related or independent the MQ scales are. This helps interpretation and throws light on construct validity. Table 2 shows the intercorrelations of the MQ primary scales. The correlations for the MQ range from -0.22 to 0.7 with one third fall between -0.2 and 0.2 and two thirds falling between -0.22 and 0.42.

In order to determine how well an assessment instrument differentiates between the different dimensions it is designed to measure, it is necessary to correct the correlations for unreliability. A correlation needs to be divided by the square root of the product of the two variables' reliability to determine what the correlation between the two variables would be if the variables' reliabilities were perfect. If two scales share less than 50% reliable variance, then we can be reasonably certain that they are independent.

Table 3 shows the percentage of common reliable variance for the MQ scales. Fifty percent of the MQ primary scale pairs share less than 25% common variance and 78% share less than 50% common variance. This indicates that the scales show a reasonable degree of independence.

Standard error of difference

The Standard Error of Difference (SEd) helps us determine the size of the gap that you need to see between a person's scores on any two scales before you can conclude that the difference is real. The SEd depends on the reliability of the scales – the higher the reliability the smaller the SEd is. If there are two full SEs between the scores on two scales, then there is a 95% likelihood that there is a real difference.

Table 4 shows the SEs for the MQ which range from 0.96 to 1.56. The median SEd for the MQ primary scales is 1.38 indicating that a difference of about 3 Stens is likely to indicate a real difference between one scale score and another. For example, you can see from Table 4 that you need to see a difference of 2.5 stens before you can say that job security is more important than remuneration to an individual.

Factor analysis

Principal components extraction with varimax rotation was performed on the MQ scales on a sample of 2,000 respondents. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.93, well above 0.6 required for a good factor analysis.

Four factors were extracted with eigenvalues of 1 accounting for 66% of the variance. The variables were on the whole well-defined by the factor solution. Community values were moderate (0.45) to fairly high (0.77) with a median value of 0.68. With a cut-off of 0.45 for the inclusion of a scale in the interpretation of a factor, all the twenty scales loaded on at least one of the four factors.

Table 2. Scale intercorrelations for the MQ (n = 2,000)

Scale	Activity	Achievement	Competition	Fear of Failure	Power	Recognition	Status	Ethics	Interest	Flexibility	Progression	Pressure	Teamwork	Management	Customers	Business	Remuneration	Job Security	Autonomy	Growth
Activity	1.00	0.52	0.30	0.27	0.29	0.24	0.36	0.44	0.42	0.16	0.31	0.48	0.29	0.45	0.37	0.35	0.26	0.08	0.32	0.36
Achievement		1.00	0.23	0.22	0.47	0.49	0.57	0.53	0.65	0.42	0.54	0.38	0.23	0.48	0.33	0.48	0.40	0.27	0.59	0.62
Competition			1.00	0.31	0.35	0.05	0.20	0.00	0.06	-0.13	0.21	0.41	0.21	0.27	0.27	0.25	0.25	-0.07	-0.03	0.03
Fear of Failure				1.00	0.11	-0.05	0.16	0.09	0.07	-0.11	0.01	0.42	0.00	0.18	0.20	0.27	0.06	0.03	0.00	0.00
Power					1.00	0.43	0.60	0.22	0.32	0.22	0.52	0.24	0.27	0.63	0.26	0.42	0.39	0.23	0.43	0.35
Recognition						1.00	0.59	0.40	0.53	0.48	0.59	0.00	0.08	0.32	0.06	0.36	0.45	0.40	0.55	0.58
Status							1.00	0.40	0.54	0.40	0.62	0.17	-0.05	0.46	0.21	0.66	0.44	0.42	0.56	0.57
Ethics								1.00	0.61	0.49	0.40	0.20	0.12	0.37	0.20	0.28	0.24	0.32	0.58	0.61
Interest									1.00	0.58	0.53	0.20	0.16	0.36	0.16	0.44	0.41	0.34	0.69	0.70
Flexibility										1.00	0.46	-0.09	-0.04	0.20	-0.01	0.28	0.35	0.36	0.64	0.62
Progression											1.00	0.09	0.11	0.42	0.13	0.46	0.54	0.45	0.54	0.63
Pressure												1.00	0.44	0.40	0.41	0.19	0.12	-0.14	0.06	0.09
Teamwork													1.00	0.48	0.27	-0.22	0.07	-0.18	0.03	0.07
Management														1.00	0.44	0.32	0.22	0.16	0.36	0.40
Customers															1.00	0.32	0.10	0.02	0.07	0.18
Business																1.00	0.45	0.33	0.40	0.46
Remuneration																	1.00	0.14	0.38	0.38
Job Security																		1.00	0.36	0.44
Autonomy																			1.00	0.68
Growth																				1.00

Table 3. Percentage of common reliable variance for MQ scales (n =2,000)

Scale	Activity	Achievement	Competition	Fear of Failure	Power	Recognition	Status	Ethics	Interest	Flexibility	Progression	Pressure	Teamwork	Management	Customers	Business	Remuneration	Job Security	Autonomy	Growth
Activity		0.69	0.22	0.15	0.21	0.13	0.32	0.45	0.42	0.07	0.21	0.57	0.20	0.46	0.33	0.26	0.17	0.01	0.27	0.30
Achievement			0.14	0.10	0.54	0.57	0.80	0.69	1.04	0.47	0.63	0.36	0.12	0.52	0.26	0.51	0.42	0.16	0.93	0.86
Competition				0.19	0.29	0.01	0.10	0.00	0.01	0.05	0.09	0.40	0.10	0.16	0.17	0.14	0.16	0.01	0.00	0.00
Fear of Failure					0.02	0.01	0.05	0.02	0.01	0.03	0.00	0.37	0.00	0.06	0.08	0.13	0.01	0.00	0.00	0.00
Power						0.40	0.87	0.11	0.24	0.12	0.55	0.14	0.16	0.85	0.15	0.37	0.38	0.11	0.47	0.25
Recognition							0.80	0.35	0.63	0.56	0.68	0.00	0.01	0.22	0.01	0.27	0.48	0.32	0.73	0.71
Status								0.37	0.69	0.42	0.82	0.07	0.01	0.48	0.10	0.95	0.50	0.39	0.81	0.71
Ethics									0.85	0.59	0.32	0.09	0.03	0.29	0.09	0.17	0.14	0.21	0.83	0.78
Interest										0.86	0.58	0.09	0.06	0.28	0.06	0.41	0.41	0.24	1.19	1.04
Flexibility											0.49	0.02	0.01	0.10	0.00	0.18	0.33	0.30	1.13	0.91
Progression												0.02	0.03	0.34	0.03	0.40	0.65	0.37	0.65	0.75
Pressure													0.46	0.35	0.39	0.08	0.04	0.04	0.01	0.02
Teamwork														0.49	0.17	0.10	0.01	0.07	0.00	0.01
Management															0.41	0.20	0.11	0.05	0.31	0.32
Customers																0.21	0.02	0.00	0.01	0.06
Business																	0.46	0.21	0.36	0.42
Remuneration																		0.04	0.39	0.33
Job Security																			0.29	0.37
Autonomy																				1.08
Growth																				

Table 4. SEd of MQ scales (n = 2,000)

Scale	Activity	Achievement	Competition	Fear of Failure	Power	Recognition	Status	Ethics	Interest	Flexibility	Progression	Pressure	Teamwork	Management	Customers	Business	Remuneration	Job Security	Autonomy	Growth
Activity		1.44	1.47	1.16	1.34	1.38	1.37	1.40	1.37	1.43	1.31	1.43	1.25	1.41	1.36	1.17	1.27	1.32	1.42	1.31
Achievement			1.56	1.28	1.44	1.48	1.46	1.49	1.47	1.52	1.42	1.53	1.36	1.51	1.46	1.28	1.38	1.42	1.51	1.41
Competition				1.31	1.47	1.51	1.49	1.52	1.50	1.55	1.45	1.55	1.39	1.53	1.49	1.31	1.41	1.45	1.54	1.44
Fear of Failure					1.17	1.22	1.20	1.23	1.20	1.27	1.14	1.27	1.07	1.25	1.19	0.96	1.09	1.14	1.25	1.14
Power						1.39	1.37	1.41	1.38	1.44	1.32	1.44	1.26	1.42	1.37	1.18	1.28	1.33	1.42	1.32
Recognition							1.41	1.44	1.42	1.47	1.36	1.48	1.30	1.46	1.41	1.22	1.32	1.37	1.46	1.36
Status								1.43	1.40	1.46	1.35	1.46	1.28	1.44	1.39	1.20	1.30	1.35	1.44	1.34
Ethics									1.43	1.49	1.38	1.49	1.32	1.47	1.42	1.24	1.33	1.38	1.47	1.37
Interest										1.46	1.35	1.46	1.29	1.44	1.40	1.21	1.31	1.35	1.45	1.35
Flexibility											1.41	1.52	1.35	1.50	1.46	1.27	1.37	1.41	1.50	1.41
Progression												1.41	1.23	1.39	1.34	1.14	1.25	1.30	1.40	1.29
Pressure													1.35	1.50	1.46	1.28	1.37	1.41	1.51	1.41
Teamwork														1.33	1.28	1.07	1.18	1.23	1.34	1.23
Management															1.44	1.25	1.35	1.39	1.49	1.39
Customers																1.20	1.30	1.35	1.44	1.34
Business																	1.09	1.15	1.26	1.14
Remuneration																		1.25	1.35	1.25
Job Security																			1.40	1.29
Autonomy																				1.39
Growth																				

Four of the variables in the solution loaded on more than one factor: Recognition, Pressure, Activity, and Progression. Table 5 shows loadings of variables on factors, communalities, and percents of variance and covariance. Variables are ordered and grouped by size of loading to facilitate interpretation. Loadings under 0.45 (20% of variance) are omitted.

Table 5. Rotated matrix for MQ motivation scales using principal components extraction, varimax rotation (n = 2,000)

Scale	F ₁ Competence	F ₂ People	F ₃ Rewards	F ₄ Security	Communality
Interest	0.81				0.77
Ethics	0.80				0.71
Flexibility	0.76				0.67
Autonomy	0.75				0.73
Growth	0.75				0.76
Achievement	0.65				0.72
Recognition	0.53			0.46	0.66
Teamwork		0.80			0.68
Management		0.75			0.73
Customers		0.64			0.50
Pressure		0.55		-0.47	0.66
Activity	0.47	0.55			0.60
Remuneration			0.67		0.62
Competition			0.63		0.59
Power			0.62		0.68
Status			0.55		0.74
Business			0.54		0.45
Progression	0.51		0.52		0.70
Job Security				0.74	0.61
Fear of Failure				-0.70	0.60
Percent of variance	40.29	13.53	6.24	5.87	
Percent of covariance	61.12	20.52	9.46	8.91	

Loadings below 0.45 omitted.

The MQ factor model shown in Table 1 provides the following picture of employee motivation and satisfaction consistent with motivation-hygiene theory:

- **Factor 1.** The first factor in the rotated solution contains 9 scales: Interest, Ethics, Flexibility, Autonomy, Growth, Achievement, Recognition, Progression and Activity. In brief, this factor portrays a motivated employee as one who has interesting and ethical work; is kept busy; has flexible working conditions, control over their work and the opportunity to develop and progress; and, gets recognition for their contributions. These factors appear to resemble Herzberg's (1982) "motivator factors" which Herzberg argues involve psychological growth. High scorers on this factor may be individuals seeking "mastery orientation" – that is, they are seeking feedback that implies that they are capable and competent.
- **Factor 2.** The second factor consists of 5 scales: Teamwork, Management, Customers, Pressure, and Activity. Factor 2 appears to be measuring how far a person finds interpersonal relationships via team working, management responsibilities and dealing with customers motivating factors. It seems to be distinguishing people who enjoy the social and people side of work as opposed to those who prefer to work in individual contributor positions.
- **Factor 3.** The third factor comprises 6 scales: Remuneration, Competition, Power, Status, Business, and Progression. Factor 3 seems to be measuring the monetary and non-monetary rewards from work as well as aspects of the work context – pay, the opportunity to progress in competition against others, power and status etc. High scorers on this factor may be individuals seeking "status orientation" – that is, they are seeking social comparison feedback indicating that they are superior to others.
- **Factor 4.** The fourth factor comprises 4 scales: Job Security, Fear of Failure, Pressure and Recognition. Job Security and Fear of Failure load highly on the factor. High scorers on Factor 4 are looking for employment providing job security and recognition where there is little pressure and there is little chance of failing. This seems to match Herzberg's concept of the hygiene factor which Herzberg claims involves physical and psychological pain avoidance.

Criterion-related validity

Table 6 shows the correlations between the MQ motivation and presence scale scores and job appraisal ratings. This is based on a sample of respondents who completed the MQ on the Internet. Respondents were asked to report how their manager assessed their performance at their last performance appraisal using a 4-point scale (excellent, good, satisfactory, poor). Four hundred and eighty three respondents provided this information.

There were small but statistically significant correlations between 0.09 – 0.2 in 11 out of the 20 MQ motivation scales. In the presence scales (ie those measuring the respondent's assessment of the extent to which the motivation factor was present in their current work), there were again small but statistically significant correlations between 0.09 – 0.2 in 15 out of 20 scales. Interestingly, remuneration did not

correlate significantly with performance either as a motivation factor or as a presence factor.

Regression analysis was used to help explore and understand the contribution of the different MQ scales on job appraisal ratings. A stepwise multiple regression was performed between reported managerially assessed job performance as the dependent variable and the MQ motivation and presence scales as the independent variables.

The best model accounting for 12% of the variability in job performance ratings was achieved when 5 variables were entered in the equation. These were 3 of the motivation factors (Activity, Recognition, and Interest) and 2 of the presence factors (Autonomy and Flexibility). $F(5, 477) = 13.62, p < 0.001$. Table 7 displays the correlations between the variables, the unstandardised regression coefficients (B), the semi-partial correlations (sr^2) and R, R^2 and adjusted R^2 .

Table 6. Correlations between MQ scales and job performance (n = 483)

Scale	Motivation Scale	Presence in Job
Activity	0.20**	0.20**
Achievement	0.16**	0.18**
Competition	0.10*	0.08
Fear of Failure	-0.07	0.04
Power	0.12**	0.17**
Recognition	0.19**	0.20**
Status	0.13**	0.20**
Ethics	0.10*	0.18**
Interest	0.02	0.19**
Flexibility	0.05	0.20**
Progression	0.07	0.16**
Pressure	0.15**	0.17**
Teamwork	0.01	0.08
Management	0.17**	0.12**
Customers	0.09*	0.06
Business	0.01	0.09*
Remuneration	0.01	0.08
Job Security	-0.01	0.13**
Autonomy	0.09*	0.21**
Growth	0.09*	0.17**

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Table 7. Multiple regression of MQ factors on job performance ratings (n=483)

Variables	Job performance (DV)	Autonomy in the job	Motivated by activity	Motivated by recognition	Motivated by interest	Flexibility in the job	B	Beta	Unique
Autonomy in the job	0.21						.05	.14	0.02
Motivated by activity	0.20	0.21					.05	.19	0.03
Motivated by recognition	0.19	0.13	0.30				.05	.19	0.03
Motivated by interest	0.02	0.27	0.43	0.45			-.05	-.20	0.03
Flexibility in the job	0.20	0.44	0.10	0.09	0.13		.04	.13	0.01
Intercept =							1.81		
Means	3.07	7.13	16.02	19.00	19.16	6.74	$R^2 =$ 0.12		
Standard deviations	0.76	2.23	3.02	3.10	2.87	2.32	Adjusted $R^2 =$ 0.13		
									$R =$ 0.35**

**p<.01

Norms

Norms for the MQ were collected on the Internet by offering free assessments. Internet users responding to the free offer completed the questionnaire and a personal details form and received a computer-generated feedback report. A sample of 2,000 respondents between the ages of 16 and 65 with equal numbers of men and women was created (Table 11). The age, racial and country characteristics of the sample are shown in Tables 8-10:

- The mean age of respondents was 33.7 with a standard deviation of 10.9. The majority of respondents was between the ages of 21 and 50 with the largest number in the 21-30 age group.
- Two thirds of respondents described themselves as White, 11% said they were Asian, 6% said they were Black, and 5% of a mixed background.
- Nearly 60% of respondents were from the United States and the United Kingdom with almost equal numbers from each country. The next largest group of people (16%) was from Australia and New Zealand.

Table 8. Age and gender characteristics of MQ norms (n = 2,000)

Gender	up to 20	21-30	31-40	41-50	51-60	over 60	Total
Women	97	361	276	191	65	10	1000
	4.9%	18.1%	13.8%	9.6%	3.3%	0.5%	50.0%
Men	98	350	276	188	79	9	1000
	4.9%	17.5%	13.8%	9.4%	4.0%	0.5%	50.0%
Total	195	711	552	379	144	19	2000
	9.8%	35.6%	27.6%	19.0%	7.2%	1.0%	100.0%

Table 9. Racial characteristics of MQ norms (n = 2,000)

Race	Female	Male	Total
White	649	670	1319
	32.5%	33.5%	66.0%
Spanish/Hispanic/Latino	23	18	41
	1.2%	0.9%	2.1%
Mixed	65	43	108
	3.3%	2.2%	5.4%
Chinese	20	9	29
	1.0%	0.5%	1.5%
Black	64	61	125
	3.2%	3.1%	6.3%
Asian	89	131	220
	4.5%	6.6%	11.0%
Other	90	68	158
	4.5%	3.4%	7.9%
All races	1000	1000	2000
	50.0%	50.0%	100.0%

Table 10. Country distribution of MQ norms (n = 2,000)

Country	Female	Male	Total
United States	325	273	598
	16.3%	13.7%	29.9%
United Kingdom	264	272	536
	13.2%	13.6%	26.8%
Trinidad and Tobago	34	34	68
	1.7%	1.7%	3.4%
India	29	53	82
	1.5%	2.7%	4.1%
Canada	58	32	90
	2.9%	1.6%	4.5%
Australia and New Zealand	141	168	309
	7.1%	8.4%	15.5%
Other	149	168	317
	7.5%	8.4%	15.9%
All countries	1000	1000	2000
	50.0%	50.0%	100.0%

Table 11. MQ general population norms (n = 2,000)

Scale	Sten										Scale	Mean	SD
	1	2	3	4	5	6	7	8	9	10			
Activity	0-8	9-10	11	12-13	14-15	16	17-18	19	20	21-24	Activity	15.52	3.07
Achievement	0-9	10-11	12	13-15	16-17	18	19	20-21	22	23-24	Achievement	17.03	3.43
Competition	0-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-24	Competition	12.89	3.81
Fear of Failure	0-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	Fear of Failure	16.18	3.97
Power	0-7	8-10	11	12	13-14	15	16-17	18-19	20-21	22-24	Power	14.77	3.18
Recognition	0-10	11	12-13	14-16	17	18-19	20-21	22	23	24	Recognition	18.10	3.62
Status	0-9	10-11	12	13-14	15-16	17	18-19	20	21-22	23-24	Status	16.54	3.26
Ethics	0-10	11	12	13-15	16-17	18-19	20	21-22	23	24	Ethics	17.61	3.50
Interest	0-10	11	12-14	15-16	17-18	19-20	21	22	23	24	Interest	18.55	3.61
Flexibility	0-9	10-11	12	13-14	15-16	17	18-19	20-21	22	23-24	Flexibility	16.72	3.29
Progression	0-10	11	12-13	14-16	17	18-19	20-21	22	23	24	Progression	18.02	3.72
Pressure	0-4	5-6	7-9	10-11	12	13-14	15-16	17-18	19	20-24	Pressure	13.31	3.75
Teamwork	0-5	6-7	8-9	10	11	12-13	14	15-16	17-18	19-24	Teamwork	12.54	2.99
Management	0-6	7-9	10-11	12-13	14	15-16	17-18	19-20	21	22-24	Management	15.36	3.66
Customers	0-5	6-7	8-10	11	12	13-14	15-16	17-18	19	20-24	Customers	13.51	3.44
Business	0-8	9-10	11	12	13	14-15	16	17-18	19-20	21-24	Business	14.63	2.86
Remuneration	0-9	10	11	12-13	14	15-16	17	18	19	20-24	Remuneration	15.25	2.74
Job Security	0-7	8-9	10-11	12	13	14-15	16-17	18-19	20	21-24	Job Security	14.66	3.33
Autonomy	0-10	11	12-13	14-15	16-17	18	19-20	21	22	23-24	Autonomy	17.58	3.27
Growth	0-10	11	12-14	15-17	18	19-20	21	22	23	24	Growth	18.65	3.64

References

Bartram, D. (2002). *EFPA Review Model for the Description and Evaluation of Psychological Tests: Notes for Reviewers*. www.efpa.be: European Federation of Psychologists' Associations.

Herzberg, F.I. (1982). *The managerial choice: To be efficient and to be human (2nd ed., Rev.)*. Salt Lake City, UT: Olympus.

© 2004-2010, myskillsprofile
www.myskillsprofile.com

