Improvements in the Survey Quality Predictor (SQP) software: from SQP2 to SQP3

For more information visit sqp.upf.edu or contact sqp@upf.edu
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WHAT IS SQP?

- ☑ A survey quality prediction system for questions used in survey research
- ☑ A database containing survey items in different languages and their measurement quality.
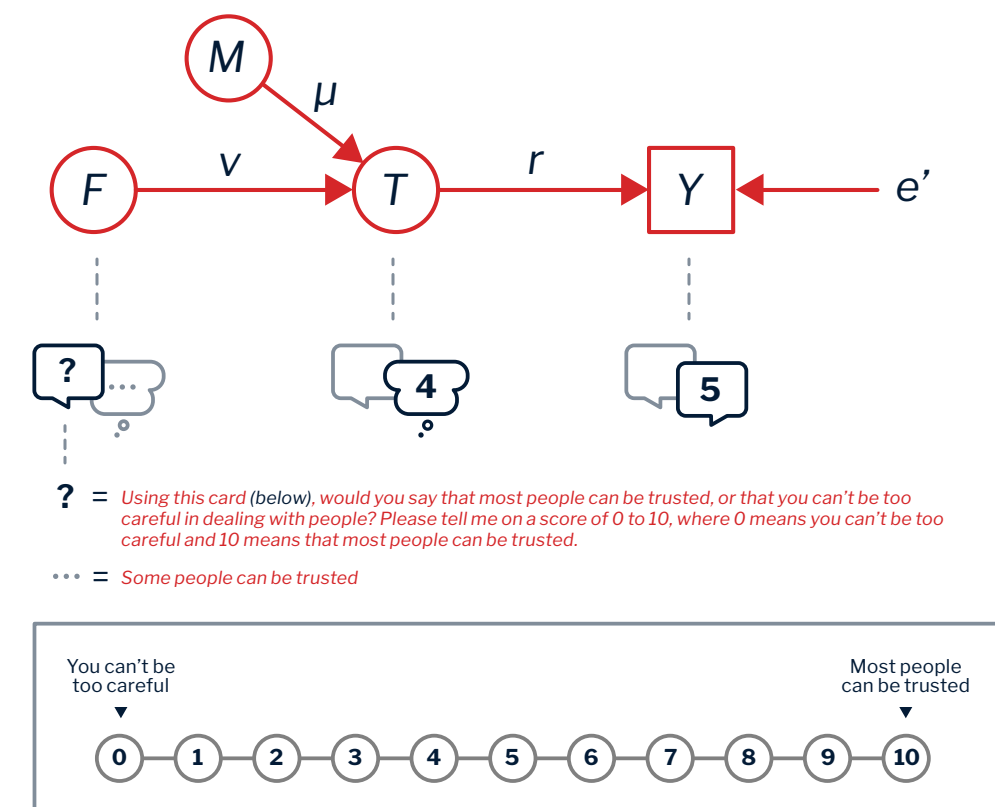- ☑ A free license software, available at sqp.upf.edu

Definitions

According to the *True Score model* of Saris and Andrews (1991):

Reliability (r^2) = 1- var(e') = strength of the relationship between the true score (T) and the observed answers (Y)

Validity (v^2) = 1- var(μ) = strength of the relationship between the latent concept of interest (F) and the true score (T)

Measurement quality (q^2) = reliability (r^2) * validity (v^2) = variance in the observed answers (Y) explained by the latent concept of interest (F).

? = *Using this card (below), would you say that most people can be trusted, or that you can't be too careful in dealing with people? Please tell me on a score of 0 to 10, where 0 means you can't be too careful and 10 means that most people can be trusted.*

••• = *Some people can be trusted*

Legend:
- F Concept of interest
- v Validity coefficient
- M Method factor
- μ Method effect coefficient
- T True score
- r Reliability coefficient
- Y Observed response
- e' Random error

I: Interviewer
R: Respondent
Speech bubble
Thought bubble

WHAT CAN I ACHIEVE WITH SQP?

1 Get information about the measurement quality of survey items

Consult

Consult the database of survey items in one or several languages and their measurement quality – SQP2 & SQP3
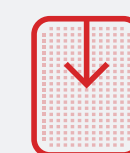
Consultation example

→ The quality prediction of this question is .534. This means that 53.4% of the variance in the observed answers is due to the latent concept of interest whereas 46.6% is due to measurement errors.

Add

Add a new survey item, code its characteristics and obtain its quality prediction. - SQP2 & SQP3

Download

Download any information from the database – SQP3

2 Improve survey items before data collection

Compare

A Compare survey items or different versions of survey items and their quality predictions. – SQP3

→ The one with the highest quality prediction can then be selected for the data collection; in that way measurement errors are reduced.

B Compare the formal characteristics of survey items in their source and translated version. – SQP3

→ If unexpected deviations are detected across languages, these can be solved before data collection. In that way, comparability across languages can be improved.

3 Correct for measurement errors after data collection

Example of correcting the correlations using SQP predictions
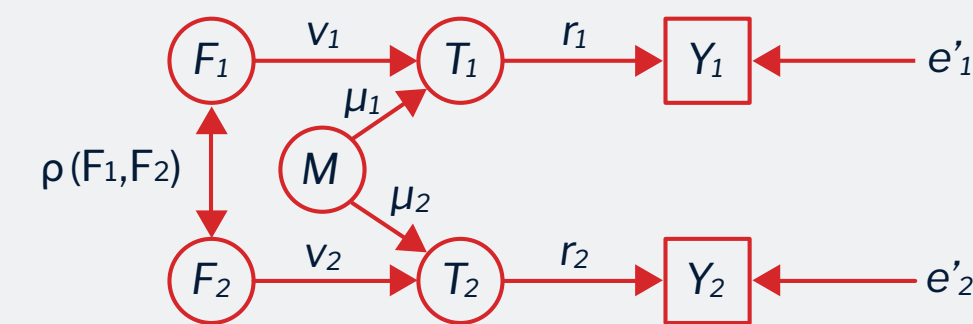
If we have two latent variables (F_1 and F_2) measured with the same method (M), we can express the observed correlation $\rho(Y_1, Y_2)$ as a function of the structural parameters:

$$\rho(Y_1, Y_2) = r_1\, v_1\, \rho(F_1, F_2)\, r_2\, v_2 + r_1\, \mu_1\, \mu_2\, r_2 \qquad \text{(equation 1)}$$

We can also reverse the formula to compute the true correlation $\rho(F_1, F_2)$ based on the observed correlation $\rho(Y_1, Y_2)$:

$$\rho(F_1, F_2) = \frac{\rho(Y_1, Y_2) - r_1\, \mu_1\, \mu_2\, r_2}{r_1\, v_1\, r_2\, v_2} \qquad \text{(equation 2)}$$

where $\quad \mu_i = \sqrt{1 - v_i}\ ;\ i = 1, 2 \qquad \text{(equation 3)}$

In order to recover the true correlation $\rho(F_1,F_2)$ we need estimates of the reliability coefficient r and the validity coefficient v.

In this illustration, let's consider that F_1 is the variable H29 (see the example for consultation) and F_2 is the variable H28, for which SQP provides the following information:

Moreover, we need the observed correlation between H28 and H29 that can be computed using the raw data from the European Social Survey (ESS) Round 1 (2002) in the United Kingdom. The Pearson correlation is .45. Using equations 2 and 3 we can recover the true correlation:

$$\rho(F_1, F_2) = \frac{.45 - .801 * \sqrt{1 - .907^2} * \sqrt{1 - .910^2} * .803}{.801 * .907 * .803 * .910} = .64,$$

The observed correlation is underestimated by almost .2.

WHAT IS BEHIND SQP?

Estimation of reliability, validity, and measurement quality

To estimate the reliability, validity, and measurement quality as defined by the True Score model, the most common method is the Multitrait-Multimethod (MTMM) approach, which consists in repeating questions measuring several correlated latent concepts of interest using different methods (e.g., different response scales).

Limits of the MTMM approach

The MTMM approach usually requires repeating the same questions several times to the same respondents, only varying the scales.

→ High cognitive burden
→ Long questionnaires needed to avoid memory effects

In practise, it is impossible to repeat all questions in a questionnaire.

Solution: SQP

Meta-analysis of MTMM quality estimates explained by different formal and linguistic characteristics.

In SQP2 3,483 survey items from 96 experiments in 29 countries and 29 languages analysed using Random Forest regression trees, the explained variance (R^2) for reliability (r^2) is .60 and for validity (v^2) is .85.

New development: SQP3 for an increased precision

To improve the precision of the predictions, a new version (SQP3 - forthcoming in 2021) with more data is under development. It will be based on 8,642 survey items from 120 experiments in 41 countries and 37 languages.

→ Users can code the formal and linguistic characteristics of their survey items and SQP will provide the predicted reliability, validity, and measurement quality for these items.