Cognitive Estimation Test- Spanish (CETSpan)

Background

The Cognitive Estimation Test (CET) was produced to measure the tendency of people with damage to the frontal lobes to produce unusual responses to questions when estimating things that would not usually be known as fact (Shallice & Evans, 1978). The researchers suggested that poor performance on their test, which included questions such as "*How many camels are there in Holland?*", indicates a break down of higher-level cognition. This is because to answer correctly one cannot simply access the answer in semantic knowledge, but instead one has to produce a cognitive plan or strategy to estimate the answer, and to check reality that the answer produced is realistic. More recently, the sensitivity of the CET to prefrontal dysfunction, and its independence from fluid intelligence, has added to the understanding of the CET as a measure of executive functioning (Cipolotti, et al., 2018).

The CET is a useful measure of executive function and/or prefrontal function for various reasons: A) It is simple to administer with no equipment needed, as it is simply a set of questions asked to the patient/participant. B) it is a very fast assessment. C) Unlike many tests of executive function, it does not stress test takers. D) it has some interesting aspects that set it apart from other executive function tests- it is not just measuring reduced fluid intelligence (Cipolotti et al, 2018) as many other executive functions tests may be (Roca, et al., 2010) and performance does not decline with normal ageing, in contrast to most executive functions (Hoffman & MacPherson, 2021). This latter observation may be due to the partial reliance on semantic knowledge for CET performance, in addition to executive functioning.

Development of the Cognitive Estimation Test – Spanish (CETSpan)

The CET described here (CETSpan) was developed in Quito, Ecuador by Dr Graham Pluck and his assistants Bernardo Ruales Chieruzzi and Sarahí Pontón. It is available for download and use, without cost, from www.gpluck.co.uk. For further information email graham@gpluck.co.uk.

Various versions of the CET have been produced and it has been normed in several countries. The most comprehensive version, in English, was produced by MacPherson et al., (2014), with British participants. However, the CET measures impairment, as being manifest by uncommon estimations to questions that few if any people would know the answer to. The problem has been how to define unusual responses. These will likely vary across cultures and languages, so the comprehensive data produced for the UK is unlikely to be valid for use with Spanish speakers in Latin America. Nevertheless, MacPherson et al., 2014 did provide a solid, structured method to define the normality and abnormality of individual responses on the CET.

Their method was to collect data for CET responses on a normal healthy sample, and then define level of abnormality of responses based on how far they are from the median in terms of percentiles. As an example, if a person was asked one of the CET items, and gave an answer that was within the 20th to 80th percentile range of the normal sample, they would receive zero error points. If their estimation was outside that range (either unusually low or high), it might earn one error point for an answer that was *quite extreme*, two points for an *extreme* estimation, or three error points for a *very extreme* estimation. There is therefore a range of 0-3 error points for each item in the CET.

The CETSpan described here used 9 different items that were previously used in a study of ADHD (Zamorano et al., 2011). Because there are 9 items, the total potential score range is from 0 to 27 points, with higher scores indicating more impaired performance. Those 9 items are shown below, along with the metric used. When administering the test, participants may answer in whatever metric they prefer (e.g., miles or kilometers), but the response should be converted to the format shown below for scoring.

1. ¿Qué altura tiene la torre Eiffel? (metros)
2. Qué tan rápido galopa un caballo? (kilometres/hora)
3. ¿En promedio ¿Cuánto mide una corbata? (centímetros)
4. En promedio ¿Cuál es el largo de la medula espinal de un hombre? (centímetros)
5. En promedio ¿Cuánto mide una mujer? (centímetros)
6. ¿Cuánto pesa un elefante adulto? (libras)
7. ¿A qué velocidad viaja un avión comercial? (kilometres/hora)
8. En promedio ¿Cuántos programas de T.V. hay en un canal entre las 6 pm y las 11 pm?
9. ¿Cuál es la temperatura promedio del desierto del Sahara al mediodía en verano? (centígrados)

To administer the CETSpan, simply read each question to the participant and record their response. Conversions to the set metric can be made later. If the participant is unsure, they should be encouraged to make a numerical estimate. It must also be a point estimate, ranges are not permitted. In the next step, each estimate must be scored for extremeness. The table below is based on the scores of 60 Ecuadorian adults, described in Pluck and Ruales-Chieruzzi (2021).

No.	Question	0 points (Normal)	1 point (Quite extreme)		2 points (Extreme)		3 Points (very extreme)	
	Percentile range	=20th – =80th	*Lower =>10th - <20th*	*Upper >80th - =<90th*	*Lower =>5th – 10th*	*Upper >90th - =<95th*	*Lower <5th*	*Upper >95th*
1	¿Qué altura tiene la torre Eiffel? (mts)	60.0 – 515.2	30.0 – 59.9	515.3 – 800.0	27.0 – 29.9	800.1 – 1000.0	0.0 – 26.9	1000.1 – ∞
2	Qué tan rápido galopa un caballo? (km/h)	14.6 – 50.0	9.0 – 14.5	50.1 – 60.8	3.8 – 8.9	60.9 – 80.0	0.0 – 3.7	80.1 – ∞
3	¿En promedio ¿Cuánto mide una corbata? (cm)	37.6 – 100.0	30.0 – 37.5	100.1 – 120.0	20.5 – 20.9	120.1 – 130.0	0.0 – 20.4	130.1 – ∞
4	En promedio ¿Cuál es el largo de la medula espinal de un hombre? (cm)	46.0 – 100.0	30.0 – 45.9	100.1 – 109.0	5.4 – 29.9	109.1 – 123.3	0.0 – 5.3	123.4 – ∞
5	En promedio ¿Cuánto mide una mujer? (cm)	155.0 – 165.0	155.0	165.1 – 167.5	150 – 154.9	167.6 – 170.0	0.0 – 149.9	170.1 – ∞
6	¿Cuánto pesa un elefante adulto? (lbs)	424.5 – 2080.0	221.9 – 424.4	2080.1 – 3000.0	113.0 – 221.8	3000.1 – 4616.0	0.0 – 112.9	4616.1 – ∞
7	¿A qué velocidad viaja un avión comercial? (km/h)	100.0 – 900.0	20.0 – 99.9	900.1 – 1000.0	5.0 – 19.9	1000.1	0.0 – 4.9	1000.2 – ∞
8	En promedio ¿Cuántos programas de T.V. hay en un canal entre las 6 pm y las 11 pm? (Num)	5.0 – 8.0	4.0 – 4.9	8.1 – 10.0	3.0 – 3.9	10.1	0.0 – 2.9	10.2 – ∞
9	¿Cuál es la temperatura promedio del desierto del Sahara al mediodía en verano? (°C)	40.0 – 50.0	35.0 - 39.9	50.0	31.0 – 34.9	50.1 – 60.0	0.0 – 30.9	60.1 – ∞

This criteria for normal, extreme etc. is the same as the percentiles used by MacPherson et al., (2014). This is color coded below to match the column headings in the table.

<5th   =>5th - <10th   =>10th - <20th   20th – 80th   >80th -=<90th   >90th - =<95th   >95th

To score, as an example, if a participant answered '300 meters' to the first item they would receive zero points for that. If the same participant said '100 km/h' for the second item, they would receive 3 points for that item. The total score is based on the sum of scores for all 9 items (range 0 to 27 points). A data collection table that could be used is provided on Page 4.

Based on the 60 participants used to produce the scoring table, the Cronbach's alpha = 0.56. Although that seems low, it is actually higher than that reported for other widely used versions of the CET (e.g., MacPherson et al., 2014 reported alpha values of .44 - .51).

Applicability and uses of the CETSpan

The test and scoring criteria described here will allow the CETSpan to be used with Spanish speakers, particularly in Latin America. The table should be used with caution in contexts other than Latin America. Note that the scoring table is only to judge the unusualness of individual responses. It is not normative data that can be used to decide whether an individual's performance is abnormal or not based on some cut-off. However, at a more heuristic level, higher total scores will be suggestive of impaired performance, and it could therefore be used to inform clinical opinion, provided that is performed within the context of a full neuropsychological assessment.

The main use of the test will be for research. By comparing groups, for example, a patient group and a control group, impaired performance can be identified at the group level. Similarly, the total scores can be used as continuous variables in correlational or regression-based research.

As this is such a fast executive function test to administer, it could be a useful addition to many cognitive and neuropsychological research studies.

How to cite the CETSpan

Pluck, G. & Ruales-Chieruzzi, C. B. (2021). Estimation of premorbid intelligence and executive cognitive functions with lexical reading tasks. Psychology & Neuroscience, 14(3), 358–377.

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Notes by

Dr Graham Pluck, 29/05/2022

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Data Collection Table

Item		Response	Converted response	Score (0-3)
1	¿Qué altura tiene la torre Eiffel? (mts)			
2	Qué tan rápido galopa un caballo? (km/h)			
3	¿En promedio ¿Cuánto mide una corbata? (cm)			
4	En promedio ¿Cuál es el largo de la medula espinal de un hombre? (cm)			
5	En promedio ¿Cuánto mide una mujer? (cm)			
6	¿Cuánto pesa un elefante adulto? (lbs)			
7	¿A qué velocidad viaja un avión comercial? (km/h)			
8	En promedio ¿Cuántos programas de T.V. hay en un canal entre las 6 pm y las 11 pm? (Num)			
9	¿Cuál es la temperatura promedio del desierto del Sahara al mediodía en verano? (°C)			
			Total =	

Note: The converted response column is only for use if the participant gives a response in a different metric. For example, for question 2, a response of 50 miles/hour could be converted to '80.5 km/hour'.

To cite the CETSpan:

Pluck, G. & Ruales-Chieruzzi, C. B. (2021). Estimation of premorbid intelligence and executive cognitive functions with lexical reading tasks. *Psychology & Neuroscience, 14*(3), 358–377.