

The Everyday Scientific Reasoning Scale – How to guide

The Everyday Scientific Reasoning Scale measures how non-scientists understand and use science in everyday life. Science reasoning has been conceptualized as a sequence of skills supporting people in evaluating scientific research, rationalizing between competing pieces of evidence, and making informed decisions (Čavoјová et al., 2020; Drummond and Fischhoff, 2017; Kuhn, 2002). As science is prevalent in our daily lives and is often at the heart of much daily decision making, there is a growing need for examining peoples' scientific reasoning in the context of everyday life.

About the scale-

The Everyday Scientific Reasoning Scale is framed around an overweight man who wants to find a research-proven method to lose weight. It contains 11 items each describing different aspects of the man's search for an effective diet. The scale asks respondents to evaluate the different statements by responding to a related true or false question. Each item is based on one scientific concept (e.g., causality, control, consensus) which is both common in scientific practice and understanding its meaning can support everyday decision making.

The scale was developed, validated and tested within Israeli society. For more information see:

Golumbic, Y.N., Dalyot, K., Barel, Y. & Keller, M. (2022). [Establishing an everyday scientific reasoning scale to learn how non-scientists reason with science](#). Public Understanding of Science. 1-16

How to use the scale -

The Everyday Scientific Reasoning Scale can be administered as a descriptive or comparative measure of science reasoning. It should take between 10-15 minutes to complete and can be administered using an online platform or on paper. This version cannot be administered as a pre-post test, but such a version is currently in development.

The scale can be administered with binary variables - True or False, or categorically with the True, False or I don't know option. The decision should be based on what your aims are and will affect your analysis process.

Analyzing the data. Once the results from the scale have been collected and cleaned for analysis, scores can be calculated. First, for each item indicate if the response is correct (rate as "1") or incorrect (rate as "0"); make sure to score missings as such. Next, calculate the number and percent of correct answers. Average scores can be calculated on two levels:

1. Calculate an average score across all items for each respondent: this will give you an indication how each respondent performed on the test. This score, for instance, allows for between-person analyses such as investigating differences between respondents or subgroups of the respondents.

- Calculate average scores across all respondents for each item: this will give you an indication how difficult or easy the item was for your group of respondents. These scores, for instance, allow differential analyses across the items such as determining profiles across items illustrating which aspects were difficult to grasp for (some) respondents and which were rather easy.

The Everyday Science Reasoning Scale -

Scientific Concept	A man's search for an effective diet
<i>Preface</i>	<i>Amir is overweight and wants to find a research-proven method to lose weight. Below are 11 short questions about different aspects of Amir's search for an effective diet. For each question please answer: True or False.</i>
Blind/Double Blind	Amir joins a clinical trial testing a new diet pill. Half of the participants receive the pill and half receive a placebo. Both Amir's doctor and the researchers know which group Amir belongs to, but Amir himself does not know. This situation is insufficient to examine the effectiveness of the new pill. True or False? (<i>True</i>)
Casualty	It has been proven that people who have a diet rich in cucumbers weigh 20% less than people who don't eat cucumbers at all. Therefore, Amir can conclude that eating cucumbers is helpful for weight loss. True or False? (<i>False</i>)
Confounding variables	As part of Amir's attempts to lose weight, he decides to stop eating in between meals and to run on the beach. A week later he finds out he lost 5 kg. Amir can determine with certainty the cause of his weight loss. True or False? (<i>False</i>)
Construct Validity	Amir has been on a diet for a month and in support of this process visits a dietician to check whether he has lost weight. The dietician suggests that Amir test the activity of his digestive system. Healthy and proper digestive system activity can testify to weight loss. True or False? (<i>False</i>)
Control group	Amir read two studies examining the impact of carbohydrate consumption on weight loss. In study A, all participants stopped consuming carbohydrates for a month. In study B, half of the participants stopped consuming carbohydrates and half continued their regular diet. Only the findings of Study B allow the examination of the impact of carbohydrate consumption on weight loss. True or False? (<i>True</i>)
Ecological validity	Amir read an article about a study regarding candy consumption. In the study, those who managed to resist the temptation and not eat the candy – won a weekend in Eilat [a Beach resort]. Amir can be positive that if this method worked in the study, he could also use it in order to stop eating candies. True or False? (<i>False</i>)
History	An ad agency wants to examine the effectiveness of their six-month campaign promoting a low protein diet. For this purpose, they administer surveys before and after the campaign. During this time (and with no connection to the campaign), the media reported that the winner of a famous reality music competition had lost weight following a low protein diet. The survey at the end of the campaign showed an increase in awareness about low protein diets. The campaign may not have increased the awareness about this diet. True or False? (<i>True</i>)

Random assignment to condition	Amir joins a weight loss support group which explores the effectiveness of two different dieting methods. All participants who weigh over 120 kg try method A and all participants under 120 kg try method B. This way the group can tell which method is more effective for losing weight. True or False? (<i>False</i>)
Reliability	Amir buys a new digital scale. First thing every morning he weighs himself wearing his pajamas, and each time he sees different results. The only reason to explain the different results is that Amir gains and loses weight every day. True or False? (<i>False</i>)
Response Bias	Amir wants to join a gym. At the first gym, Amir was asked to check off if he was interested in a personal trainer. At the second gym, Amir was asked to check off if he was not interested in a personal trainer. The number of people that will request the services of a personal trainer will be different in the two gyms. True or False? (<i>True</i>)
Scientific Consensus	Amir has heard about Dr. Smith's diet and read a newspaper article summarizing it. In the article, it was written that the World Health Organization agreed that it was a safe and effective diet, but there were also two scientists who suggested that the diet may have dangerous health implications. From the information that was presented in the article, Amir can conclude that this diet is dangerous. True or False? (<i>False</i>)

References -

Čavojová V, Šrol J and Ballová Mikušková E (2020) How scientific reasoning correlates with health-related beliefs and behaviors during the COVID-19 pandemic? *Journal of Health Psychology*. <https://doi.org/10.1177/1359105320962266>

Drummond C and Fischhoff B (2017) Development and validation of the Scientific Reasoning Scale. *Journal of Behavioral Decision Making* 30(1): 26–38.

Golumbic, Y.N., Dalyot, K., Barel, Y. & Keller, M. (2022). Establishing an everyday scientific reasoning scale to learn how non-scientists reason with science. *Public Understanding of Science*. 1-16

Kuhn D (2002) What is scientific thinking and how does it develop? In: Goswami UC (ed.) *Blackwell Handbook of Childhood Cognitive Development*. Hoboken, NJ: Blackwell, pp. 371–393.