* Although numeracy was initially described as a unidimensional construct, more recent research suggests that it is more complex. For example, measures of subjective numeracy predict different behaviors than measures of objective numeracy, and research by Ellen Peters unpacks numeracy into numeric confidence and ability. Further, there are criticisms that measures of numeracy are conflated with literacy and logic given that numeracy is often assessed via word problems. Review the various measures of numeracy and discuss their predictive validity, considering a larger umbrella of related constructs including health literacy (which often involved comprehension of numerical information) and graph literacy. Which measure (or measures) would you recommend including in studies of medical decision making? (these recommendations may differ by context)

Comprehensive Exam Answers: Victoria Shaffer

What measurements of numeracy exist? (objective, subjective, numeric confidence, word problems, etc.)

Understanding of numerical information is vital in many fields, however, given that cross-communication in differing fields of research is not yet widespread and thorough, many different measures of numeracy therefore exist. It is important to note that for these various measures of what is considered under the umbrella macro-construct of ‘Numeracy’, that in many cases, they are measuring slightly different concepts. A brief review of some of the various measures of numeracy in contemporary literature follows.

One of the original measurements of numeracy in the field of psychometric measurement, Subjective numeracy is also seen as one of the easiest ones to measure (Thompson, Mielicki, Rivera, Fitzsimmons, Scheibe, Sidney, Taber, and Waters 2022). Subjective numeracy is defined by Dr. Angela Fagerlin as the “self-assessment of quantitative ability”. As subjective numeracy relies on a self-assessment and not on actual mathematical calculations, the measure can be administered more quickly, and is easy to adapt for digital use (Fagerlin, Zikmund-Fisher, Ubel, Jankovic, Derry and Smith 2007). It is noteworthy that the Subjective numeracy, as measured using Fagerlin’s Subjective Numeracy Scale (SNS), is significantly correlated with the Lipkus objective numeracy scale, yet regularly is seen by participants as both less stressful and less frustrating to complete. Regarding practical applications, high subjective numeracy scores don’t just measure self-assessment about the ability to work with fractions and percentages, but ‘numerical confidence’ as well (Peters, Tompkins, Knoll, Ardoin, Shoots-Reinhard, and Meara 2019). This numerical confidence even has an interaction effect with actual numerical ability, as Peters research on financial and medical outcomes indicates. Humans with high confidence and ability, have the best financial and medical outcomes, and those with high confidence and low ability, have the worst outcomes. Independently, low subjective numeracy also predicts less persistence with difficult or impossible mathematical problems.

Another of the early measures of numeracy in the field of psychology, Objective numeracy, defined as “The ability to understand and use probabilistic and mathematical concepts”, has been used by psychologists to develop greater understanding of risk communication, especially how it relates to healthcare (Tompkins 2015).