

Topics in Philosophy of Cognitive Science (HPS 2634)

Measurement of the Mind

Prof. E. Machery

Spring 2021

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Class Meetings

T 2:20am-4:50 pm

online

Office Hours

By appointment, online.

Course Description/Goals

In this course we will focus on issues related to measurement in general as well as in the context of psychology. We will examine topics such as the history and philosophy of the foundations of measurement, key psychometrics concepts such as validity, the justification of psychological measurement, operationalism, the nature of quantities, and so on. Most examples will be drawn from psychological measurement or from historical case studies (e.g., temperature), but we may also look at physical examples such as time.

Prerequisites

Graduate standing or permission of instructor.

Texts

Readings will be available on a shared Dropbox folder. You will receive an invitation to join this folder by email. Please **do not drag and drop files** in the shared folder: you would delete them. **Do not annotate these files** either.

Relevant introductory articles include:

Tal, E. (2015) "Measurement in Science", *Stanford Encyclopedia of Philosophy*, Zalta E., (ed.) <http://plato.stanford.edu/entries/measurement-science/>.

Chang, H. and Cartwright, N.L. (2008) Measurement. In S. Psillos and M. Curd (eds.), *The Routledge Companion to Philosophy of Science* (pp. 367–375). New York: Routledge.

Assignments

- (1) Readings and participation;
- (2) A research paper due at the end of the term.

Research paper

The research paper may be on any subject of relevance to the seminar. To assist you in commencing work, you should submit a brief essay proposal by **March 23**. It should contain a short paragraph describing the topic to be investigated and give a brief indication of the sources you intend to use. It may, but need not, be based on the seminar presentation. I advise you to talk to me about possible topics as soon as possible. The paper should have the form and the length of a short journal article (no less than 3500 and no more than **6500 words**). The deadline is **April 27, 12:00 pm (send it by e-mail)**. **I do NOT issue incomplete grades**, save in extraordinary circumstances. In return for the rigidity of the deadline, the seminar will not meet in the final week of term (i.e., *no class April 27*).

Assessment

Your seminar grade will be based on the quality of your research paper due at the end of the term and on your participation.

Class Organization

This course will be based on the discussion of the readings. I will lead the discussion. Participation in class discussion is expected. Reading the articles is of course mandatory. You are expected to attend every class.

Special Needs

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, 412 648 7890, drsrecep@pitt.edu, 412 228 5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

COURSE SCHEDULE **(Subject to revision as the semester proceeds)**

Tuesday 01/19

Topic: Syllabus

Tuesday 01/26

Topic: What is Measurement?

Readings:

Nagel, E. (1931). Measurement. *Erkenntnis*, 2, 313-333.

Campbell, N. R. (1938). Measurement and its importance for philosophy. *Proceedings of the Aristotelian Society, Supplementary Volumes*, 17, 121-142.

Stevens, S.S. (1946). On the theory of scales of measurement. *Science*, 103, 677-680.

Additional Readings:

Campbell, N. R. (1920). *Physics: The Elements*. Cambridge at The University Press. Chapter 10.

Michell, J. and Ernst, C. (1996). The axioms of quantity and the theory of measurement. *Journal of Mathematical Psychology*, 40, 235–252.

Michell, J., & Ernst, C. (1997). The axioms of quantity and the theory of measurement. *Journal of mathematical psychology*, 41(4), 345-356.

(translation into English of an excerpt from Hölder, O. 1901, Die Axiome der Quantität und die Lehre vom Mass.)

Tuesday 02/02

Topic: Classical Test Theory

Readings:

Traub, R. E. (1997). Classical test theory in historical perspective. *Educational Measurement*, 16, 8-13.

Borsboom, D. (2005). *Measuring the mind: Conceptual issues in contemporary psychometrics*. Cambridge University Press. Chapter 2.

Lord, F. M., & Novick, M. R. (2008). *Statistical theories of mental test scores*. IAP. Chapter 2.

Tuesday 02/09

Topic: Item Response Theory

Readings:

Hambleton, R. K., Swaminathan, H., & Rogers, H. J. (1991). *Fundamentals of item response theory*. Sage. Chapter 2.

Borsboom, D. (2005). *Measuring the mind: Conceptual issues in contemporary psychometrics*. Cambridge University Press. Chapter 3.

Wednesday 02/16

Topic: Representational Theory of Measurement

Readings:

Narens, L., & Luce, R. D. (1986). Measurement: The theory of numerical assignments. *Psychological Bulletin*, 99(2), 166-180.

Borsboom, D. (2005). *Measuring the mind: Conceptual issues in contemporary psychometrics*. Cambridge University Press. Chapter 2.

Additional Readings:

Díez, J. (1997). A hundred years of numbers. an historical introduction to measurement theory 1887–1990: Part I: the formation period. two lines of research: axiomatics and real morphisms, scales and invariance. *Studies in History and Philosophy of Science Part A*, 28(1), 167-185.

Diez, J. A. (1997). A Hundred Years of Numbers. An Historical Introduction to Measurement Theory 1887-1990-Part II: Suppes and the Mature Theory. Representation and Uniqueness. *Studies in History and Philosophy of Science Part A*, 28(2), 237-265.

Tuesday 02/23 NO CLASS

Tuesday 03/02

Topic: What's the Point of the Representational Theory of Measurement?

Readings:

Cliff, N. (1992). Abstract measurement theory and the revolution that never happened. *Psychological Science*, 3(3), 186-190.

Michell, J. (1999). *Measurement in psychology: A critical history of a methodological concept* (Vol. 53). Cambridge University Press. Chapter 8.

Baccelli, J. (2020). Beyond the metrological viewpoint. *Studies in History and Philosophy of Science Part A*, 80, 56-61.

Additional Reading:

Heilmann, C. (2015). A new interpretation of the representational theory of measurement. *Philosophy of Science*, 82(5), 787-797.

Tuesday 03/09

Topic: Relation Between Measurement Approaches

Readings:

Borsboom, D., & Mellenbergh, G. J. (2004). Why psychometrics is not pathological: A comment on Michell. *Theory & Psychology*, 14(1), 105-120.

Angner, E. (2011). Current trends in welfare measurement. In *The Elgar companion to recent economic methodology*. Edward Elgar Publishing.

Vessonen, E. (2020). The complementarity of psychometrics and the representational theory of measurement. *The British Journal for the Philosophy of Science*, 71(2), 415-442.

Additional Reading:

Michell, J. (2000). Normal science, pathological science and psychometrics. *Theory & Psychology*, 10(5), 639-667.

Wednesday 03/16

Topic: Conventionalism and Coordination

Readings:

Poincaré, H. (1898). The measure of time. In *The Value of Science* (pp. 26-36). New York: Dover, 1958.

Chang, H. (2004). *Inventing temperature: Measurement and scientific progress*. Oxford University Press. Chapter 2.

Van Fraassen, B. C. (2010). *Scientific representation: Paradoxes of perspective*. Oxford University Press. Chapter 5.

Tuesday 03/23

Topic: Operationalism

Readings:

Bridgman, P. W. (1927). *The logic of modern physics*. New York: Macmillan. Chapter 1.

Chang, H. (2004). *Inventing temperature: Measurement and scientific progress*. Oxford University Press. Chapter 4.

Feest, U. (2005). Operationism in psychology: What the debate is about, what the debate should be about. *Journal of the History of the Behavioral Sciences*, 41(2), 131-149.

Isaac, A. M. (2019). Epistemic loops and measurement realism. *Philosophy of Science*, 86(5), 930-941.

Additional Readings:

Stevens, S. S. (1935). The operational definition of psychological concepts. *Psychological Review*, 42(6), 517-527.

Stevens, S. S. (1935). The operational basis of psychology. *The American Journal of Psychology*, 47(2), 323-330.

Vessonen, E. (In press) Respectful operationalism.

Tuesday 03/30

Topic: Validity

Readings:

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological bulletin*, 52(4), 281.

Borsboom, D., Mellenbergh, G. J., & Van Heerden, J. (2004). The concept of validity. *Psychological review*, 111(4), 1061.

Alexandrova, A., & Haybron, D. M. (2016). Is construct validation valid? *Philosophy of Science*, 83(5), 1098-1109.

Additional Reading:

Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American psychologist*, 50(9), 741.

Tuesday 04/06

Topic: Measurement and Values

Readings:

Hunter, J. E., & Schmidt, F. L. (1976). Critical analysis of the statistical and ethical implications of various definitions of test bias. *Psychological Bulletin*, 83(6), 1053.

Alexandrova, A. (2018). Can the science of well-being be objective? *The British Journal for the Philosophy of Science*, 69(2), 421-445.

Tuesday 04/13

Topic: The Measurement of Sensation: Fechner and Stevens

Readings:

Fechner, G. T. (1987). Outline of a new principle of mathematical psychology (1851). *Psychological Research*, 49(4), 203-207.

Stevens, S. (1959). The quantification of sensation. *Daedalus*, 88(4), 606-621.

Laming, D. R. J. (1997). *The measurement of sensation* (No. 30). Oxford University Press. Chapter 13.

Additional Reading:

Stevens, S. S. (1961). To honor Fechner and repeal his law. *Science*, 133(3446), 80-86.

Tuesday 04/20

Topic: Measurement and the Replication Crisis

Readings:

Loken, E., & Gelman, A. (2017). Measurement error and the replication crisis. *Science*, 355(6325), 584-585.

Hussey, I., & Hughes, S. (2020). Hidden invalidity among fifteen commonly used measures in social and personality psychology. *Advances in Methods and Practices in Psychological Science*, 3(2), 166-184. Machery, E. Forthcoming. A mistaken confidence in data. *European Journal for Philosophy of Science*.

Additional Reading:

Lilienfeld, S. O., & Strother, A. N. (2020). Psychological measurement and the replication crisis: Four sacred cows. *Canadian Psychology/Psychologie canadienne*.

Tuesday 04/27 No Class—Deadline for the term paper