HRM 727: Theory & Practice of Measurement

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Office: 293 Wellington St N, Suite 132
Fridays: 9am-12pm

Course overview:
This course introduces students to important theoretical concepts and practical methods in the measurement of subjective states including attitudes, feelings, perceptions, function, beliefs and aptitude. Topics are based on areas of importance in the design, development and validation of a measure and will include principles from both educational and psychological measurement. Students will be introduced to the statistical underpinnings of scale measurement and applications of both traditional and modern measurement approaches. The primary concepts explored in the measurement of latent traits are reliability and validity as they apply to instrument design and evaluation. Examples will be drawn from the fields of health, psychology and educational assessment.

Course objectives:
1) Understand how to measure subjective states using measurement theory and related procedures.
2) Define types of validity and reliability and understand approaches to their evaluation.
3) Be able to critically evaluate a measure, interpreting reports of psychometric properties.
4) Gain practical experience in designing a new measurement scale and developing procedures to evaluate its measurement properties.
6) Conduct statistical analyses including descriptive statistics, correlations, factor analysis, and ANOVA.

Course description:
Course materials will be taught using a combination of assigned readings, structured presentations, worked examples, student-led presentations, discussions and assessments. Class lectures will cover selected topics that are generally applicable to measurement theory and practice. They will also include practical, worked examples of measurement development and evaluation. Student-led presentations, discussions and assignments will require an understanding of content covered in the readings that is not always covered in class. Students are expected to do this learning independently. Students should be familiar with basic statistical procedures in a statistical software of their choice. They will be provided with opportunities to develop their skills through practice problems using existing data but must also use acquired knowledge and skills to create a new measurement instrument for their final assignment. Students must seek instructor approval for final assignment topics. Quizzes will take place during class time. Assignments and practice problems are considered homework, outside of class time. Additionally, office hours may be scheduled to review concepts and application. Avenue to Learn will be used as the web platform to access course content (readings and lectures). Practice problems should be emailed to the TA and assignments should be emailed to the instructor via their McMaster emails.

Statistics knowledge prerequisites: Requires an understanding of core concepts in descriptive and inferential statistics and ANOVA. Please review the following online tutorials to be sure you understand the basic concepts as these will not be covered in class:
Descriptive statistics: https://www.youtube.com/watch?v=AUHwZ3m6HZ4
Inferential descriptives: https://www.youtube.com/watch?v=jDRawkgsoUA
ANOVA: https://www.youtube.com/watch?v=TKTWIyC3LOQ

Course format:
Lecture time will be structured as follows:
Part 1: Structured lecture followed by brief discussion session
Part 2: Workshop session providing worked example of applied concept or statistical analysis procedure
Part 3: Student presentations and/or in-class discussion

The order and length of the lecture and each of the parts will vary from week to week. When scheduled, quizzes will take place at the start of class.

Evaluation:
There are 3 components for assessment of learning:

(1) Participation (20%)
This will be assessed in the following two ways:

- Practice Problems (5%) All students will be assigned practice problems to conduct analyses (descriptive statistics, internal consistency reliability, factor analysis, item response theory) and interpret results. Proof of completion of the practice problems will constitute 5% of the participation grade. These may be completed individually or in groups, however each student must submit their own proof of completion. Practice problems must be handed in prior to or during class.
- In-class presentations & discussion (15%): Students will be assigned to groups and will lead an in-class presentation on an existing measurement tool. The topic should be different to the students final assignment topic. Students will also be asked to peer-evaluate other group presentations. Marking rubrics will be provided. Some weeks will include an in-class discussion that students will be expected to participate in.

In-class presentation guidelines: This component of the course challenges students to work through the flowchart (Figure 1.1) from the Health Measurement Scales textbook. Students present their findings to the class, identify challenges encountered and lead the class in a discussion on key issues. Working in a group, select a subjective state to measure - emotions, satisfaction, patient safety, clinical competence, reflection skills, quality of evidence in guidelines, comfort with uncertainty. This state should not be the same as the one used in your final assignment. Develop a hypothetical study goal that describes why you are interested in measuring the subjective state, which population you have selected and why. Using only the last 5 years of literature, determine answers to the questions posed by the flowchart. In particular:
1. Determine if there is a need for a new scale or a validation study of an old scale
2. Determine if the existing evidence establishes validity and/or reliability for your population
3. Conduct a critical evaluation of the prior uses or evaluations of existing scales or current lack of measurement scale. What are the implications of this not being measured before? What are the implications of existing data?
Note: a 5-year review of the literature may only produce 1 or 2 articles or it may produce 50. It is still possible to summarize the evidence related to the measurement properties of the selected latent trait. The grade will be assigned to the group incorporating class feedback on the presentation. Groups will be given 10 minutes to present and 5 minutes for class discussion/questions. Out of fairness to all groups, presentations that go over time will be cut short and the groups ability to deliver the presentation within the time limit will be considered in the grading.

(2) Quizzes (30%)
Short quizzes (multiple choice and short answer) will be given throughout the course and will cover content from the *key readings, lectures*, and *discussions*. Each quiz is worth 10% of the final grade and will be completed in class.

- Quiz 1 will cover content from Week 1, 2 and 3 and will take place in **Week 4**
- Quiz 2 will cover content from Week 4, 5 and 6 and will take place in **Week 7**
- Quiz 3 will cover content from Week 7, 8 and 9 (readings only) and will take place in **Week 9**

(3) Final assignment – Measurement instrument development & evaluation (50%)
The final assignment requires students to design a new measurement instrument, collect data using the instrument, and assess and evaluate its measurement properties. The first step towards completing the

assignment requires an approval form that outlines the trait or state being measured, the population of interest, ethics review requirement and whether existing data will be used or if new data collection will be conducted. The second step is to submit a written description (template provided) of the purpose of the measurement instrument, a description of its development and the plan for evaluation, including data collection strategy. The final project is a complete report on the development and evaluation of the new measurement instrument. Appropriate statistical analysis must be selected and justified to fit with the purpose of the measurement instrument. Students will also be required to select and interpret relevant statistics as part of their results.

The submission and assessment of this assignment will happen in four parts:

- Approval form (5%): Due **Week 3.**
- Outline and plan (5%): Due **Week 5.** A written description of the plan for your final project. This should include a description of the a) the concept/construct selected; b) the plan for developing the measure; c) the plan for data collection and measurement evaluation (i.e. what properties will you evaluate, what analyses will you use to evaluate them).

  Final project (30%): Due **Week 12.** Your final project should address: a) the development of a measure assessing your selected concept/construct of interest; and b) the evaluation of a measure. The measure being evaluated can either be the measure you developed in part a) for which you will use to collect your own data, or a different 'in development' measure for which you already have the data. If you want to use already collected data, the measure should not be well-known and well validated but either in development, an amended version of another measure, or an existing measure being used and evaluated in a very different population.

  For the development part of your project, you should briefly describe the construct, the rationale for selecting it and why it is important. You should describe the process used to generate, review, evaluate and select items, explain why the response options selected are appropriate, perform and report content validation and produce a 'final scale' for further evaluation. You should describe which theory(ies) guided the conceptualization and operationalization of your scale. You should explain whether your scale is unidimensional or multidimensional based on your theory(ies) and whether you were able to confirm this empirically. You should include a one-page appendix or your measurement scale, formatted for administration, with thought to the item format, any instructions or stem, the order of items and the response options.

  For the evaluation part of your project, if you are evaluating a different measure from the one you used in the first part, include a brief description of the measurement scale and include the instrument as an appendix. Everyone should describe the sample (who, when, where, how, what) and the design of your measurement study. Outline the psychometric properties you are evaluating and the analyses you will use to do that. You don't need to do a specific set of analyses or use all the analyses, select the ones that are the most relevant to your project and that make sense given the length constraints. Be sure to specify the evaluation criteria you will be applying. Present your key tables within the 10-page limit. Supplementary tables can go into your appendix. All tables should be properly formatted and not just be the output from statistical software. Interpret your results and discuss what they tell you about the properties of the measure. Do the results suggest you should make any changes to your measure? This paper (assigned in the final week) will help with guiding your thinking for the final assignment:

  Flake, J. K., & Fried, E. I. (2020). Measurement schmeasurement: Questionable measurement practices and how to avoid them. *Advances in Methods and Practices in Psychological Science*, *3*(4), 456-465.

  It is recommended to use the headings from the rubric as headings in your final assignment.
- Oral presentation (10%): Presentations will be scheduled to occur during class time in **Week 10, 11 and 12**. Presentations are to be 10 minutes with 5 minutes for questions. Students going over time will be cut off and marks will reflect ability to deliver the presentation within the time limit. Marking rubrics will be provided. Students will be required to demonstrate how they integrated

principles of measurement from the design, data analysis and interpretation phases of their final assignment.

Important dates:

Quizzes:	Jan 26, Feb 16, Mar 8 (in class)
Practice problems due in class:	Jan 19, Jan 26, Feb 9, Feb 16, Mar 1
In-class presentation:	Assigned in week 1
Approval form due:	Jan 19 by 5pm*
Outline & plan due:	Feb 2 by 5pm*
Final project due:	Apr 5 by 5pm*
Final project presentations:	Assigned in week 1

*You can submit later than 5pm but I will not be available after 5pm to answer assignment questions, confirm/flag issues with submissions or deal with last minute requests.

Course readings:
Primary readings for the course are from "Health Measurement Scales: A practical guide to their development and use" (5th edition) by Streiner/Norman/Cairney (HMS), which is available in the Health Sciences bookstore and as an e-book through the library. Highly recommended is the DeVellis textbook listed below that covers the material in a different way and includes additional content. *Supplementary readings* by topic area are also assigned to augment student learning and offer alternate perspectives or deeper context for the relevant concepts. Where appropriate, papers that provide applied examples of the concepts in action will also be provided. These will be posted on Avenue to Learn.

Useful websites & resources:
1) DeVellis, R. F. (2016). Scale development: Theory and applications (Vol. 26). Sage publications.

2) Special Journal Issue that has papers specific to different topics in the course: Psychological Assessment (2019) Vol 31(12): *Special issue on Methodological and Statistical Advancements in Clinical Assessment*. Includes articles about reliability, item response theory, factor analysis, scale development, construct validity, clinical decision making, multicultural/diversity contexts, response bias, neuroscience, and experience sampling.

Course policies:
Content: This syllabus is subject to change. Students are responsible for finding out about announced changes if they miss class. Updated versions will be posted on the Avenue to Learn website for the course. The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

Late assignments: No late assignments will be accepted. Assignments are due by 5pm on the day of class. Late assignments received within 24 hours of the due date will be docked 5% of the grade assigned. Assignments received between 24 and 48 hours will be docked 10% after which late assignments will no longer be accepted. If you anticipate having problems meeting these deadlines, please contact the instructor before the assignment is due to discuss your situation.

Special needs: Students with documented special needs will be accommodated as much as possible. Please see the instructor in the first few weeks of the semester if you anticipate needing special accommodations.

Missed classes: Class attendance is crucial to your success and is expected of all graduate students. Students who miss class will need to make their own arrangements for covering material covered in class. Students cannot miss more than 2 classes and successfully pass the course.

Academic Integrity: Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. It is your responsibility to understand what constitutes academic dishonesty. However, if you have questions regarding a particular assignment, it is always best to ask me prior to completing the assignment. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at
http://www.mcmaster.ca/academicintegrity
The following illustrates only three forms of academic dishonesty:
1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained, including the use of generative AI tools such as ChatGPT to complete course assignments.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

Lectures/Topics:
This is an approximate schedule and list of topics. Changes may be made to respond to the needs and progress of the class.

Date	Week	Theme	Practice Problem/ Assignments due
Jan 5	1	Introduction to measurement: concepts, theories & statistical underpinnings ***Student-led presentation example***	
Jan 12	2	Validity ***In-class discussion***	
Jan 19	3	Reliability ***Student-led presentation (15%)***	Descriptives (1%) Topic Approval Form (5%)
Jan 26	4	***Quiz 1(10%)*** Item generation & methods of test development ***Student-led presentation (15%)***	Internal consistency & correlations (1%)
Feb 2	5	Item evaluation & analysis ***Student-led presentation (15%)***	Assignment Outline & Plan (5%)
Feb 9	6	Item Response Theory (IRT) ***Student-led presentation (15%)***	PCA (1%)
Feb 16	7	***Quiz 2 (10%)*** Measuring change & choosing a measurement framework ***Student-led presentation (15%)***	IRT (1%)
Feb 23		***No lecture***	
Mar 1	8	Structural Equation Modelling (SEM) for Confirmatory Factor Analysis	Framework & Analysis selection and preliminary analysis (1%)
Mar 8	9	***Quiz 3 (10%)*** Practical considerations	
Mar 15	10	Student Oral Presentations (10%)	
Mar 22	11	Student Oral Presentations (10%)	
Mar 29		***Good Friday-no lecture***	
Apr 5	12	*Student Oral Presentations (if needed)*	Final Assignment (30%)

Week 1: Introduction to measurement: concepts, theories & statistical underpinnings

Learning objectives:
1) Review course outline, assignments and dates
2) Introduce context and objectives of measurement of subjective states
3) Outline importance/relevance of measurement in health research & systems
3) Define concepts of the latent trait, validity & reliability
4) Review student areas of measurement interest/focus and software preference

Workshop: Review of descriptive and inferential statistics

Primary reading: HMS: Chapters 1, 2
Supplementary reading:
A short and simple introduction to health measurement scales:
Keszei, A. P., Novak, M., & Streiner, D. L. (2010). Introduction to health measurement scales. *Journal of Psychosomatic Research*, *68*(4), 319-323.
Good overviews and discussions of the concepts you will encounter during the course:
DeVon, H. A., Block, M. E., Moyle-Wright, P., Ernst, D. M., Hayden, S. J., Lazzara, D. J., ... & Kostas-Polston, E. (2007). A psychometric toolbox for testing validity and reliability. *Journal of Nursing Scholarship*, *39*(2), 155-164.
Cook, D. A., & Beckman, T. J. (2006). Current concepts in validity and reliability for psychometric instruments: theory and application. *The American Journal of Medicine*, 119(2), 166-e7.
Applied example:
Kwan, B., Rickwood, D.J., & Telford, N.R. (2018) Development and validation of MyLifeTracker: a routine outcome measure for youth mental health. *Psychol Res Behav Manag,* 11, 67-77.

In-Class Presentations & Groups Assigned (Example given)

Week 2: Validity

Learning objectives:
1) Review the traditional and modern conceptualizations of validity
2) Understand how to assess and evaluate different types of validity (validation)
3) Define quantitative approaches to validation
4) Introduce statistical methods used to assess validity

Workshop: Multitrait multimethod (MTMM) approaches to assessing convergent & discriminant validity

Primary reading: HMS: Chapter 10
Supplementary Reading:
Outline of traditional and modern approaches:
Goodwin, L. D. (2002). Changing conceptions of measurement validity: an update on the new standards. *Journal of Nursing Education*, *41*(3), 100-106.
A review of the most recent approaches to validity including details on scale development which will be useful in Week 4. The section starting 'Psychometric evaluation: An iterative process' to the end is the most relevant to this week:
Clark, L. A., & Watson, D. (2019). Constructing validity: New developments in creating objective measuring instruments. *Psychological Assessment*. *31*(12), 1412–1427.

Applied example:
Bonomi, A. E., Patrick, D. L., Bushnell, D. M., & Martin, M. (2000). Validation of the United States' version of the World Health Organization Quality of Life (WHOQOL) instrument. *Journal of Clinical Epidemiology, 53*(1), 1–12

Following the lecture there will be a student-led in-class discussion on Goodwin and Clark & Watson readings.

Practice Problem 1: DESCRIPTIVES
Using the data set provided, generate a total scale score by adding together the scores from the individual items in the scale for parent and youth respondents. Then estimate the mean and standard deviation for the total scale scores for parent and youth respondents and the possible and observed score range. Hand in the statistical software output showing the means, standard deviations, possible and observed ranges. What do these estimates tell you about the distribution and variability of the scale scores?

Week 3: Reliability

Learning objectives:
1) Review different types of reliability in quantitative measurement
2) Understand how to assess and evaluate different types of reliability
3) Review connection between validity and reliability

Workshop: Calculating and selecting correlation coefficients & internal consistency

Primary reading: HMS: Chapter 8
Supplementary reading:
Explanation of the statistical definition of reliability:
Traub, R.E. and Rowley, G.L. (1991), An NCME Instructional Module on Understanding Reliability. Educational Measurement: Issues and Practice, 10: 37-45.
Review of coefficient alpha and how to use it:
Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of \ Applied Psychology*, *78*(1), 98.
Introduction to the kappa statistic:
Sim, J., & Wright, C. C. (2005). The kappa statistic in reliability studies: use, interpretation, and sample size requirements. Physical therapy, 85(3), 257-268.

First round of student-led presentations
Practice Problem 1 due
Topic Approval Form due (by 5pm)

Practice Problem 2: INTERNAL CONSISTENCY & CORRELATIONS
Using the data set provided, compute the internal consistency of the parent scales at Time 1 and Time 2. Estimate the test-retest reliability of the scale scores using a correlation coefficient. Hand in the statistical software output showing the internal consistency estimate and the estimate of test-retest reliability. What do these estimates tell you about the reliability of the scale scores?

Week 4: Item generation & methods of test development

Learning objectives:
1) Review different approaches to generating and selecting items
2) Outline general processes of test development
3) Understand different approaches to scaling
4) Understand the potential impact of different types of response bias and how to mitigate this

Workshop: Item development & selection

Primary reading: HMS: Chapters 3,4,5,6
Supplementary reading:
A nice review of what to take into consideration when creating items and scales:
Knäuper, B., & Turner, P. A. (2003). Measuring health: improving the validity of health assessments. Quality of Life Research, 12(1), 81-89.
A good overview of the various biases that can result from different types of administration:
Bowling, A. (2005). Mode of questionnaire administration can have serious effects on data quality. Journal of Public Health, 27(3), 281-291.
Applied example:
Bennett, R. J., & Robinson, S. L. (2000). Development of a measure of workplace deviance. *Journal of Applied Psychology, 85*(3), 349.

Student-led presentations
QUIZ 1 will be held at the start of class (covering weeks 1, 2 & 3)
Practice Problem 2 due

Week 5: Item evaluation & analysis

Learning objectives:
1) Review different approaches to item evaluation and analysis
2) Understand application of different measurement theories to item analysis
3) Outline basic principles of factor analysis
4) Introduce alternate approaches to item analysis

Workshop: Factor analysis, principal component analysis, exploratory vs confirmatory factor analysis

Primary reading: HMS: Chapter 7
Chapter 6 Factor Analysis in DeVellis, R.F. (2016). Scale development: Theory and applications (Vol. 26). Sage Pubs.
Supplementary reading:
A short practical guide to factor analysis:
Streiner, D. L. (1994). Figuring out factors: the use and misuse of factor analysis. *The Canadian Journal of Psychiatry*, *39*(3), 135-140.
Intro guide including an SPSS tutorial:
Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. Tutorials in Quantitative Methods for Psychology, 9(2), 79-94.
Applied example:
Bergmann, P., Lucke, C., Nguyen, T., Jellinek, M., & Murphy, J. M. (2020). Identification and Utility of a Short Form of the Pediatric Symptom Checklist-Youth Self-Report (PSC-17-Y). *European Journal of Psychological Assessment. 36*(1), 56-64.

Student-led presentations
Assignment 1 due (by 5pm)

Practice Problem 3: FACTOR ANALYSIS
Using the data set provided, conduct a factor analysis. Hand in statistical software output of a scree plot, original and rotated component matrix with a brief interpretation of what the output tells you. How many factors were extracted?

Week 6: Item Response Theory

Learning objectives:
1) Contrast classical test theory (CTT) with IRT approaches
2) Review basic principles of IRT and how it is used
3) Understand advantages & limitations
4) Understand how to conduct and evaluate IRT parameters

Workshop: Item difficulty & discrimination parameters and creating item characteristic curves

Primary reading: HMS: Chapter 12
Supplementary reading:
An overview of key uses and issues in IRT:
Edelen, M.O., Reeve, B.B. (2007). Applying item response theory (IRT) modeling to questionnaire development, evaluation, and refinement. *Qual Life Res 16*(5).
A thorough and current review of IRT applications in clinical assessment:
Thomas, M. L. (2019). Advances in applications of item response theory to clinical assessment. *Psychological Assessment*. *31*(12), 1442–1455.
A good introduction to how Item Response Theory works, worth watching:
Item Response Theory tutorial: https://www.youtube.com/watch?v=QHIKJlcniHA
Applied example:
Yang, F. M. (2014). Item response theory for measurement validity. Shanghai Archives of Psychiatry, 26(3), 171.

Student-led presentations
Practice Problem 3 due

Practice Problem 4: ITEM RESPONSE THEORY ANALYSIS
Using the data set and software provided generate item characteristic curves for two of the items. What do the curves show?

Week 7: Measuring change & choosing a measurement framework

Learning objectives:
1) Understand issues associated with measuring change
2) Review approaches to measuring change
3) Consider advantages and disadvantages of CTT, IRT & Generalizability theory frameworks
4) Understand factors that contribute to selection of measurement framework

Workshop: Choosing measurement frameworks and identifying research goals

Primary reading:
Change: HMS: Chapter 11 *Measurement frameworks:* HMS: Chapter 9
Measurement frameworks: HMS: Chapter 9
Supplementary reading:
Change:
Stratford, P. W., Binkley, J. M., & Riddle, D. L. (1996). Health status measures: strategies and analytic methods for assessing change scores. *Physical therapy*, *76*(10), 1109-1123.
Excellent overview of considerations and issues when measuring change:
Beaton, D. E., Bombardier, C., Katz, J. N., & Wright, J. G. (2001). A taxonomy for responsiveness. *Journal of Clinical Epidemiology, 54*(12), 1204–1217
Measurement frameworks:
An intro to G-theory and how it works:
Evans, W. J., Cayten, C. G., & Green, P. A. (1981). Determining the generalizability of rating scales in clinical settings. *Medical Care,* 1211-1220.
An article contrasting issues with and differences between different frameworks:
Cano, S. J., & Hobart, J. C. (2011). The problem with health measurement. *Patient Preference and Adherence, 5*, 279-290.
Applied example:
Poonam K. Pardasaney, Nancy K. Latham, Alan M. Jette, Robert C. Wagenaar, Pengsheng Ni, Mary D. Slavin, Jonathan F. Bean, Sensitivity to Change and Responsiveness of Four Balance Measures for Community-Dwelling Older Adults, *Physical Therapy*, 92(3), 388-397

Student-led presentations
QUIZ 2 will be held at the start of class (covering weeks 4, 5 & 6)

Practice Problem 5: FRAMEWORK & ANALYSIS SELECTION
Based on your final assignment plan, identify the appropriate measurement framework and analysis for your objectives. Identify: 1) the key parameters/metrics of interest; and 2) the criteria you will use to evaluate them—you will need to include this in your final assignment. You don't need to hand anything in for this, it is to ensure that you are on track for your final assignment. If you can't complete it, set up a time with the TA to discuss.

Week 8: Structural Equation Modelling (SEM) for Factor Analysis

Learning objectives:
1) Understand basics of Structural Equation Modelling
2) Review steps for using SEM to conduct CFA
3) Consider advantages and disadvantages of SEM
4) Understand how to conduct an SEM analysis in MPlus

Workshop: SEM analysis in MPlus

Primary reading:
An introduction to structural equation modeling. SEM what is it and what can we use it for? (National Centre for Research Methods) https://www.youtube.com/watch?v=eKkESdyMG9w
Chapter 17: Path Analysis & Structural Equation Modelling in Norman, G. R., & Streiner, D. L. (2003). PDQ Statistics (3rd edition).
Streiner D. L. (2006). Building a better model: an introduction to structural equation modelling. *Canadian Journal of Psychiatry. 51*(5), 317–324

SEM is a powerful analytical tool for measurement development and more. For those interested in learning more, the following resources are recommended:
Key ideas, terms, and concepts in SEM (National Centre for Research Methods)
https://www.youtube.com/watch?v=NOWdrfQVWAI
Hox, J. J., & Bechger, T. M. (1998). An introduction to structural equation modeling.
Schmitt, T. A. (2011). Current methodological considerations in exploratory and confirmatory factor analysis. Journal of Psychoeducational Assessment, 29(4), 304-321.

Week 9: Practical considerations

Learning objectives:
1) Understand broader practical and ethical issues in measurement
2) Consider some of the consequences of measurement
3) Review approaches to translation and interpretation in cross-cultural situations
4) Understand related issues such as copyright, adaptation & data-sharing

Workshop: Review 'big measurement' examples

Primary reading: HMS: Chapters 13, 14,
Supplementary reading:
A concise overview of the importance of measurement context in development and evaluation:
Chapter 8 in DeVellis, R.F. (2016). Scale development: Theory and applications (Vol. 26). Sage Pubs.
An illustration of how measurement considerations are everywhere in health research:
Monga, S., Offringa, M., Butcher, N. J., & Szatmari, P. (2020). From Research to Practice: The Importance of Appropriate Outcome Selection, Measurement, and Reporting in Pediatric Mental Health Research. *Journal of the American Academy of Child and Adolescent Psychiatry, 59*(4), 497-500.
Flake, J. K., & Fried, E. I. (2020). Measurement schmeasurement: Questionable measurement practices and how to avoid them. *Advances in Methods and Practices in Psychological Science*, *3*(4), 456-465.

Applied example of unintended consequences of measuring intelligence:
Radiolab podcast episode: G: The Miseducation of Larry P
https://www.wnycstudios.org/podcasts/radiolab/articles/g-miseducation-larry-p
From 5min20sec onwards

QUIZ 3 will be held at the start of class (covering weeks 7, 8 & reading from week 9)

Week 10: Student Oral Presentations

Learning objectives:
1) To defend the design & implementation of an instrument to measure subjective states. To describe the data, analysis, and interpretation of the survey results.
2) Formulate measurement-based questions after presentations of other students

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Week 11: Student Oral Presentations

Week 12: Student Oral Presentations (if needed)

Assignment 2 due (by 5pm)
