SOME INTRO NOTES FOR SCALING

What if you want to "scale" 4 different objects (books) in terms of weight? We could put each book on a weight scale, read off the values, and then put them on the PHYSICAL weight scale as follows.

```
      1 lb        2 lb        3 lb        4 lb            5 lb

     _____
A
        A           B           C                 D
       1.6         2.7         3.5               4.9
```

But, what if no physical weight scale existed; Toledo was on strike! We could get people to "psychologically" estimate the weights and then, based on averages across people for the same book, order the books on a psychological scale of weight as follows.

```
      1 lb        2 lb        3 lb          4 lb          5 lb

     _____
B
        A           B             C           D
       1.4         2.5           3.8         4.6
```

As you can see, the relative positioning of the books is the same when using the physical scale versus the psychological scale but, there still is some discrepancy between the EXACT placements under the two systems.

PSYCHOPHYSICAL methods examine the relationship between the placement of objects on the two scales and attempts to establish principles or laws that connect the two.

On the other hand, many stimuli or scalings we want to do involve some psychological (latent) dimension of people without any connection to a direct counterpart "physical" dimension. That is, we are interested in the second scale without any reference to the first scale. Such interests are called PSYCHOLOGICAL SCALINGS, and this is what this course is primarily about. A psychological scale looks similar to what is above and may be generically represented as follows:

```
      Low                       Medium                  High
C
     _____
           A             B                       C    D
```

If the "dimension" is permissiveness or dogmatism or intelligence or introversion ... where do people A, B, C, and D fall along this scale? Are they in the positions shown above ... or located differently? If their relative positions are correct, are the DISTANCES amongst them correct? In general, the goals of psychological scaling are: 1) to create a meaningful and valid scale, 2) to locate persons [or objects] in their correct relative positions, and 3) to arrive at distances amongst persons [or objects] that reflect true differences amongst them. A scaling MODEL is a plan to develp a scale on which to place people or objects. For example, a scale could be:

    permissiveness
    or intelligence
    or introversion

    Low _____ High
                  (permissiveness)

Where do people A, B, C, and D fall on this scale? That is the task of developing a scale using some scaling method or model. While we normally want to scale people, scaling is not limited to that. Concepts or notions could be scaled: where do different educational philosophies fit in on the scale of "permissiveness"?

If your ultimate goal is to scale people on some scale (permissiveness for example), how can we do it? One way of course would be to DIRECTLY ASK THEM to place themselves on the scale. You could give them the scale above with several reference points, and then see where they place themselves. Another way would be to DIRECTLY OBSERVE them in situations where permissiveness plays a role, and then make an assessment of the extent to which he or she is "permissive". Another way would be to develop stimulus items that have been calibrated for their "degree of permissiveness" and then see which items he or she agrees with or feels are most like themselves. In this way, the subject him or herself is NOT the one to decide on the extent of permissiveness but rather, some totalling of the item calibration values. There are positives and negatives with all these approaches; what are some?

        Responses

```
                    _____
                    _____
              _   _   _    _    _     _       _
People/       _____
Objects       _   _   _    _    _     _       _
              _____
              _____
              _   _   _    _    _     _       _
              _____
              _   _   _    _    _     _       _
              _____
```

                              Stimuli

A general schematic for a scaling problem can be represented (in
a simple form) as above. When scaling, there are at least 3
diminsions that come into play: people or objects, stimuli, and
responses. "People" are those who you want to scale (P1, P2,
etc.), by presenting them with various stimuli (S1, S2, etc.),
and based on that ... people make responses (R1, R2, etc.) to
the stimuli.

One example would be the presentation of the S1 ... "A good
teacher gives assignments back in a timely manner"; that you
give to P1 (Joe), who then makes R1 ... "I agree with that".
Another example would be to present S1 and S2 simultaneously
(two different objects) to P1, and ask which object is heavier
... "P1 says S2 is heavier".

It would be advantageous in this model to be able to simplify it
by "collapsing" one of the 3 dimensions. For example, it is
common to keep the response format or type CONSTANT in a given
study; each item may be responded to on a Likert-type scale
where 1 means "Strongly Disagree" up to 7 that means "Strongly
Agree". In this case, there is only one type of R ... R1 is it.
Thus, instead of having multiple possible responses (rating
scale, observable response to stimulus that occurs in realistic
context, writing an essay self describing how one views him or
herself on the dimension, etc.), there is only ONE slice on the
R dimension. If the response dimension is collapsed, then this
model becomes primarily a two dimensional model, looking like
the following.

                           Stimulus
                1   2   .   .   kth

              _____   _

```
         1  _    _     _     _       _       _  X 1k
            _____ _
         2  _    _     _     _       _       _  X 2k
            _____ _
Person   .  _    _     _     _       _       _  X 3k
            _____ _
         .  _    _     _     _       _       _  X 4k
            _____ _
    n th    _    _     _     _       _       _  X nth kth
            _____

            _     _     _      _      _
            X n1  X n2  X n3   X n4   X nth kth
```

There are several basic and universal steps involved in a scaling problem. First and foremost is the "scale concept". What is it that you are trying to scale people or objects on? Intelligence? Dogmatism? Attitudes about statistics? Second, what is the "target" of the scaling? People or objects? Third, what is the plan or method by which the scaling will take place? If people, direct questioning, observation, or using calibrated stimulus items? Fourth, what instrument and/or collection of stimulus items will be used? Fifth, what is the mechanism by which scale values or scores for people (or objects) be determined and assigned? And finally, given the purpose of the scaling, how does one determine if the scaling model is implemented in a reliable and valid way? Does this scaling model or plan accomplish what it is suppose to do?

Well, the above are SOME initial things to worry about!!!!!