Sexual Attraction to Others: A Comparison of Two Models of Alloerotic Responding in Men

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Relation of My Talk to Conference Theme

- *What is sexual orientation?*
- Maximum value of an erotic stimulus generalization gradient

The theme of this conference, as we all know, is the disputed question, "What is sexual orientation?" The research I will present today presupposes one particular answer to that question, namely, "Sexual orientation, in men, is the maximum value of an erotic stimulus generalization gradient." I will expand on this statement at the end of my talk. By that time, I hope to have made the case that this formulation is justified by the quantitative research that can be built on it.

How Do Men Respond to Other People Sexually?

- Summation model: Men respond to a potential sexual object as a compound stimulus made up of an age component and a gender component
- Bipolar model: Men respond to a potential sexual object as a gestalt, which they evaluate in terms of global similarity to other potential sexual objects
- Models compared using phallometric methodology described next and analytic strategy described immediately after

The departure point for my talk, however, is not the big question, "What is sexual orientation?" but rather a smaller question, "What do men seem to be doing when they respond sexually to other people?" There are at least two different ways in which men's behavior might be described. I have labeled these on the screen as the *summation* model and the *bipolar* model.

Phallometry (or penile plethysmography) is the most convenient, valid, and objective way of measuring sexual response in males. It is actually a type of psychophysiological procedure. The test stimuli are potentially erotic objects or activities, and the measured response is penile tumescence. The degree of penile tumescence reflects the subject's relative attraction to the test stimuli. Most of this audience will already be familiar with the general methodology, so I will present only a few slides to show my lab's equipment and stimulus materials.

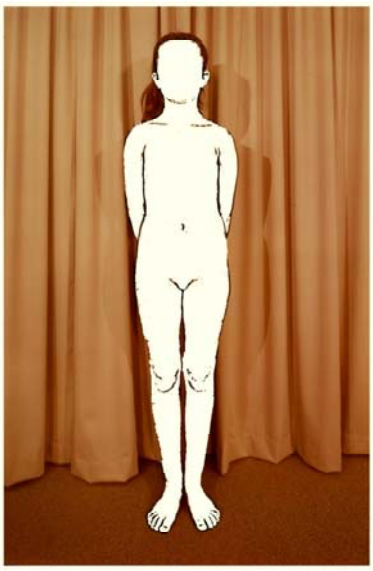
CUFF

Our laboratory uses volumetric phallometry. This uses an inflatable cuff that fits over the penis, which is represented in the slide by a piece of wooden doweling.

CYLINDER OVER CUFF

A glass cylinder fits over the cuff, which is then inflated to isolate the air inside the cylinder from the outside atmosphere. A larger gauge tube leads from the nipple of the cylinder to a pressure transducer, which senses increases in air pressure caused by increases in penile blood volume.

SAMPLE STIMULUS MATERIALS

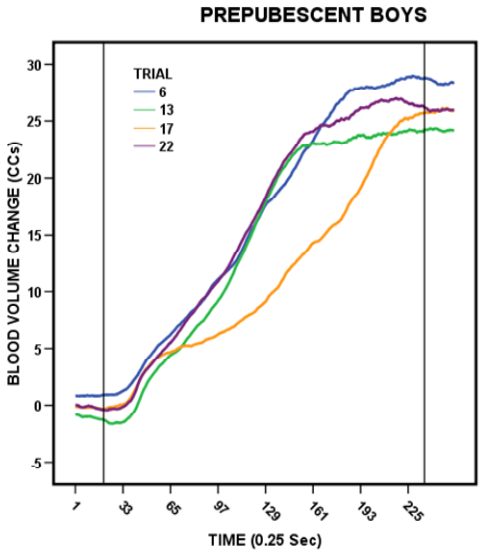


- *Audiotaped narrative*
- "You are watching a late movie on TV with your neighbours' 12-year-old daughter. You have your arm around her shoulders, and your fingers brush against her chest. You realize that her breasts have begun to develop…."

The test stimuli consist of photographic slides accompanied by audiotaped narratives. The photographs resemble illustrations in an endocrinology textbook. The present screen shows a sample photograph of a pubescent female. I have whited out the details to anonymize the model. The narratives that accompany the slides describe activity involving a person of the same gender and approximate age. A sample narrative about a pubescent female is shown on the present screen.

The test used in this study has seven stimulus categories: adult men, adult women, pubescent boys, pubescent girls, prepubescent boys, prepubescent girls, and neutral stimuli (landscapes). Representatives of each stimulus category are presented in four separate trials.

Penile Responses of Self-Admitted Homosexual Pedophile to Depictions of Prepubescent Boys



Here are the responses of a self-admitted homosexual pedophile during the four trials depicting prepubescent boys. Penile blood volume increases throughout the trail, leveling off at about 25 cc. This would represent full erection for the average male.

Subjects

- Male patients administered the same phallometric test for erotic object (gender and age) preferences at the Kurt Freund Laboratory of the CAMH
- *N* = 2,278
- Assigned to one of six groups according to their highest response on the phallometric test

I'm now ready to start talking about the specific study I conducted for this conference. This was carried out on the archived assessment data of patients who had given consent for their phallometric results to be used for research purposes. Most of these patients were referred for clinical assessment because of sexual offenses. All of these 2,278 patients had the same phallometric test for erotic gender–age preference.

Patients who responded most to stimuli depicting adult women were classified as heterosexual teleiophiles, those who responded most to stimuli depicting pubescent girls were classified as heterosexual hebephiles, and so on.

Group Assignment

Preferred stimulus category (i.e., highest response)	Group	*n*
Adult women	Hetero teleiophiles	1066
Pubescent girls	Hetero hebephiles	761
Prepubescent girls	Hetero pedophiles	159
Prepubescent boys	Homo pedophiles	110
Pubescent boys	Homo hebephiles	86
Adult men	Homo teleiophiles	96

This screen shows the name of each group, the number of subjects in each group, and the stimulus category that elicited their greatest responses.

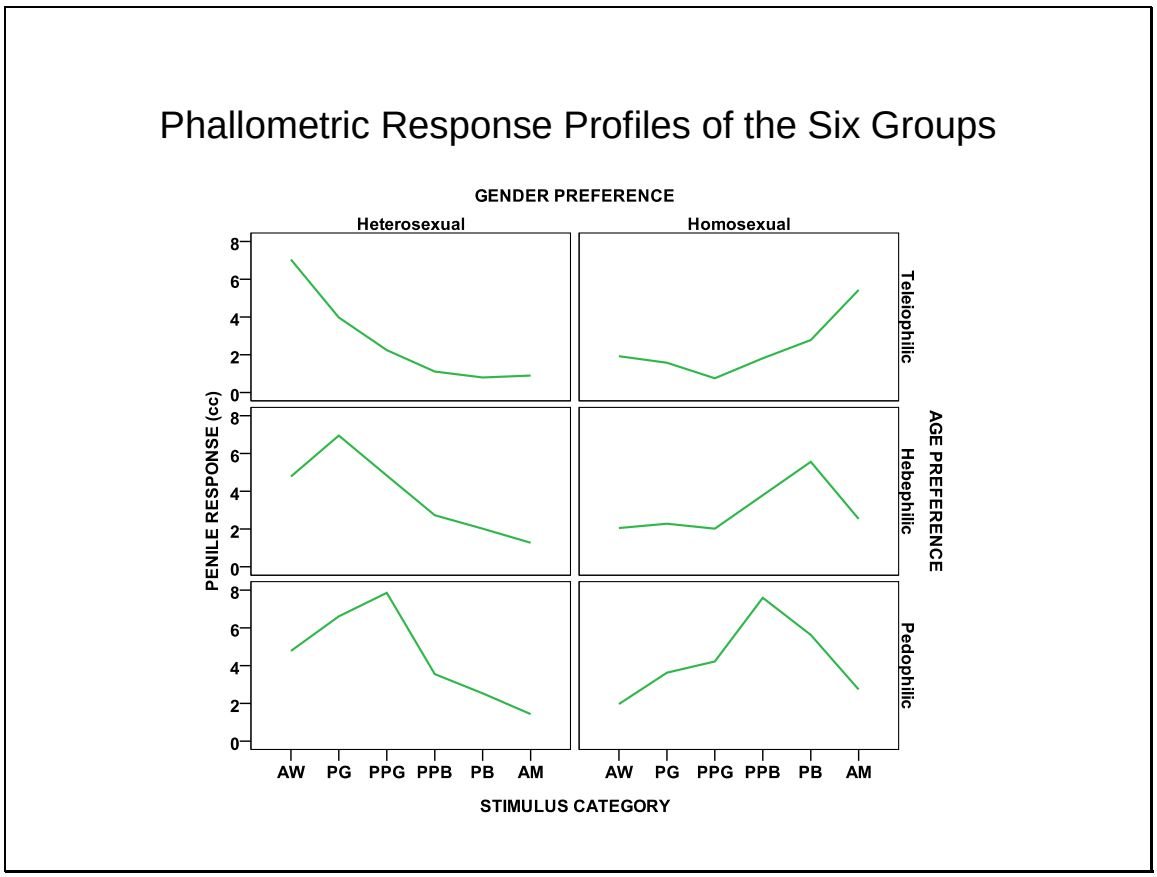


Figure 1 shows the phallometric response profiles of the six groups. The abbreviations along the X-axis are read as follows: AW, adult women; PG, pubescent girls; PPG, prepubescent girls; PPB, prepubescent boys; PB, pubescent boys; AM, adult men.

The shapes of these curves suggest that phallometric profiles are essentially similar to stimulus generalization gradients—although this does not imply that erotic preferences are established by classical or operant conditioning.

By definition, the highest response of the heterosexual teleiophiles was to adult females, the highest response of the heterosexual hebephiles was to pubescent females, and so on. Our primary interest, therefore, will not be in the subjects' highest responses but rather in their lower responses—their responses to their *nonpreferred* stimulus categories. I will explain on the next screen how the subjects' responses to *nonpreferred* stimuli relate to the main question addressed by this study.

Analytic Strategy

- Compare accuracy of two equations (models) in predicting a man's penile response to each of his less arousing (nonpreferred) stimulus categories from his response to his most arousing (preferred) stimulus category.
- Summation model/equation: Penile response should vary inversely as the sum of stimulus differences on separate dimensions of age and gender
- Bipolar model/equation: Penile response should vary inversely as the distance between stimulus categories on a single, bipolar dimension of morphological similarity (children in middle, male and female adults at ends)

The theoretical question posed in this study is: What do men act like they're doing when they respond sexually to another person? Do they act as if they respond separately to the person's age and gender, or as if they respond to the global anatomic configuration? The technical question is: How do we go about picking the better description? My solution was to compare the performance of equations that represent the two different descriptions. This is explained more fully on the screen.

Bipolar Model

$$\hat{C}_i = P \times b^{M_i}$$

- $\hat{C}_i$ — predicted response to criterion stimulus *i*
- P — observed response to preferred stimulus
- M_i — morphological distance between preferred stimulus and criterion stimulus *i*
- b — parameter to be estimated

This is the equation I wrote to represent the bipolar model. The terms are defined on the screen.

The terms of the equation are all pretty straightforward except for one thing: Where do we get the morphological distance between an adult woman and a pubescent girl? Or between an adult woman and a prepubescent boy? Or between any pair of stimulus categories, for that matter?

The answer is simply this: As a first approximation, I assigned an integer unit distance between every pair of adjacent categories. This is shown on the next screen.

Morphological Distances (M_i) from the Preferred Stimulus to the Criterion Stimuli for Each Group

	Group					
Stimulus category	Het teleios	Het hebes	Het pedos	Hom pedos	Hom hebes	Hom teleios
Adult women	0	1	2	3	4	5
Pubescent girls	1	0	1	2	3	4
Prepubescent girls	2	1	0	1	2	3
Prepubescent boys	3	2	1	0	1	2
Pubescent boys	4	3	2	1	0	1
Adult men	5	4	3	2	1	0

Here is how one reads this table. Heterosexual teleiophiles, by definition, respond most to adult women. Therefore the distance between their preferred stimulus and adult women is 0. The distance between their preferred stimulus and pubescent girls is 1. The distance between their preferred stimulus and prepubescent girls is 2, and so on, reading down the column.

This can be thought of as a look-up table. If the subject is a heterosexual pedophile and you want to predict his response to adult men, you go to the table and see that adult men are three units away from his preferred stimulus category.

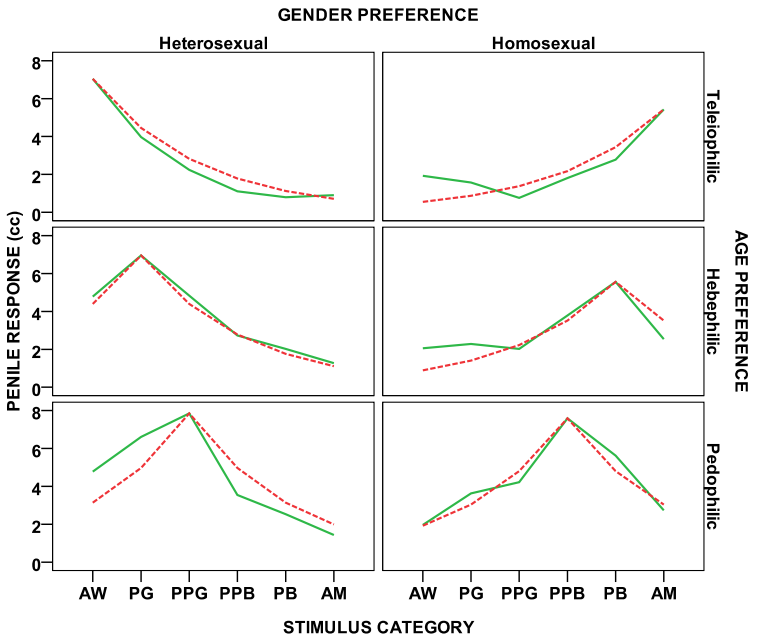
Parameter Estimate for Bipolar Model

$$\hat{C}_i = P \times .633^{M_i}$$

Even though I had to estimate only one parameter, the procedure for doing so was rather complicated and I will not described it in any detail. It involved restructuring the data file so that a case (or record) represented one pair of observations rather than one subject, yielding a data file with 13,668 records. I then ran a nonlinear regression analysis on the restructured file. The result of all this was the number .633.

I will show you the results on the next screen.

Observed Phallometric Profiles and Profiles Predicted by the Bipolar Model



Using the foregoing equation, I computed, for each subject, his predicted response to each of his five nonpreferred stimulus categories. This figure shows the mean penile responses predicted by the bipolar model for all stimulus categories and for all groups. The predicted data (in red) have been superimposed over the observed data (in green).

The equation performs fairly well, especially in light of its extreme simplicity. There seems to be a systematic error, however. The equation predicts that heterosexual pedophiles should respond equally to prepubescent boys and pubescent girls, because they are equidistant from the preferred category of prepubescent girls. Similarly, homosexual pedophiles' response to prepubescent girls should be equal to their response to pubescent boys. The bottom panels of the figure indicate that neither is the case. In order to correct this error (and for other reasons I can't go into here), I developed a revised version of the bipolar equation.

Revised Bipolar Model

$$\hat{C}_i = P \times b_1^{(M_i + (b_2 \times G_i))}$$

- G_i — gender distance between preferred stimulus and criterion stimulus *i*
- b_2 — to be estimated
- *G* input requires another look-up table

The bipolar equation was revised by adding a term, G_i, *to* represent the gender distance between the preferred stimulus and criterion stimulus *i* and a corresponding coefficient, b_2. The gender distance was taken from another look-up table, which I will show in the next screen.

Gender Distances (G_i) from the Preferred Stimulus to the Criterion Stimuli for Each Group

	Group					
Stimulus category	Het teleios	Het hebes	Het pedos	Hom pedos	Hom hebes	Hom teleios
Adult women	0	0	0	1	1	1
Pubescent girls	0	0	0	1	1	1
Prepubescent girls	0	0	0	1	1	1
Prepubescent boys	1	1	1	0	0	0
Pubescent boys	1	1	1	0	0	0
Adult men	1	1	1	0	0	0

The Gender Distance table is read column-wise, like the Morphological Distance Table. Heterosexual teleiophiles, by definition, respond most to adult women. Therefore the distance between their preferred stimulus and adult women is 0. The distance to females of other ages is also 0, and the distance to males of all ages is 1.

Revised Morphological Distances (M_i) from the Preferred Stimulus to the Criterion Stimuli

	Group					
Stimulus category	Het teleios	Het hebes	Het pedos	Hom pedos	Hom hebes	Hom teleios
Adult women	0	1	2	3+b_2	4+b_2	5+b_2
Pubescent girls	1	0	1	2+b_2	3+b_2	4+b_2
Prepubescent girls	2	1	0	1+b_2	2+b_2	3+b_2
Prepubescent boys	3+b_2	2+b_2	1+b_2	0	1	2
Pubescent boys	4+b_2	3+b_2	2+b_2	1	0	1
Adult men	5+b_2	4+b_2	3+b_2	2	1	0

It is difficult to see what the revised bipolar model does from inspection of the equation, but it is easy to understand if one goes back to the table of morphological distances.

The revised equation adds some constant, b_2, to every morphological distance M_i that crosses the gender line. It is a kind of "gender-correction" factor. Thought of geometrically, it add an additional distance, b_2, to the interval between prepubescent girls and prepubescent boys. How much additional distance should it add? That, fortunately, can be estimated by the new equation.

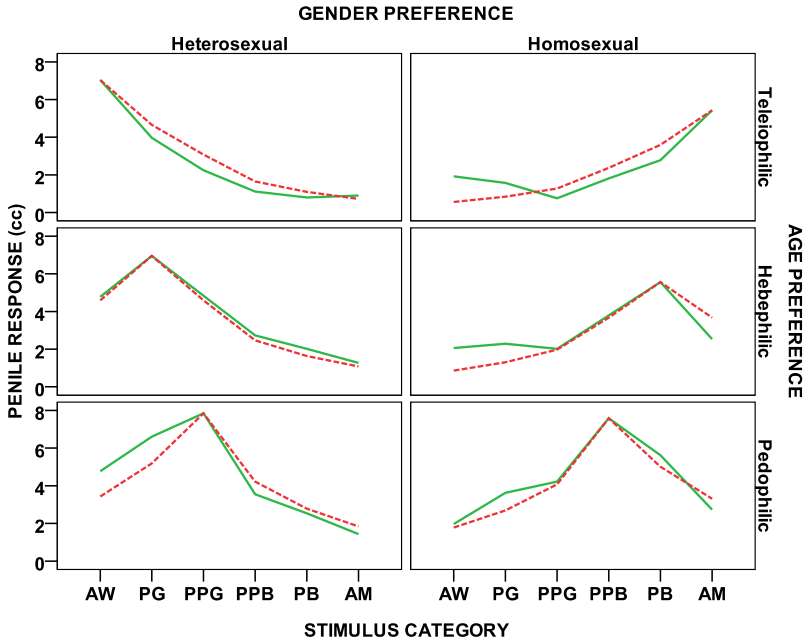
Parameter Estimates for Revised Bipolar Model

$$\hat{C}_i = P \times .661^{(M_i + (.502 \times G_i))}$$

The parameters were estimated using nonlinear regression, as before. The value of the original parameter changed little with the addition of the new parameter.

The estimate of .502 for the b_2 parameter is of some theoretical interest. This suggested that the stimulus distance between prepubescent girls and prepubescent boys should be about one and a half times greater than the distance between other adjacent stimulus categories.

Observed Phallometric Profiles and Profiles Predicted by the Revised Bipolar Model



This screen shows the mean penile responses predicted by the revised bipolar model for all stimulus categories and for all groups, superimposed over the observed means. The visible difference between the revised bipolar model and the original one is small and mostly concerns the pedophilic groups.

Abbreviations for stimulus categories: AW, adult women; PG, pubescent girls; PPG, prepubescent girls; PPB, prepubescent boys; PB, pubescent boys; AM, adult men.

Summation Model

$$\hat{C}_i = P \times b_1^{G_i} \times b_2^{A_i}$$

- $\hat{C}_i$ — predicted response to criterion stimulus *i*
- P — observed response to preferred stimulus
- G_i — gender distance between preferred stimulus and criterion stimulus *i*
- A_i — age distance between preferred stimulus and criterion stimulus *i*
- b_1, b_2 — parameters to be estimated

Here is the equation I wrote to represent the summation model. The terms are defined on the screen.

The input for the *G* variable comes from the Gender Distance look-up table that I have already shown you. The input for the *A* variable comes from an Age Distance look-up table, which I will show on the next screen.

Age Distances (A_i) from the Preferred Stimulus to the Criterion Stimuli for Each Group

	Group					
Stimulus category	Het teleios	Het hebes	Het pedos	Hom pedos	Hom hebes	Hom teleios
Adult women	0	1	2	2	1	0
Pubescent girls	1	0	1	1	0	1
Prepubescent girls	2	1	0	0	1	2
Prepubescent boys	2	1	0	0	1	2
Pubescent boys	1	0	1	1	0	1
Adult men	0	1	2	2	1	0

The Age Distance table is read column-wise, like the other distance tables.

Heterosexual teleiophiles, by definition, respond most to adult women. Therefore the distance between their preferred stimulus and adult women is 0. However, the age distance between their preferred stimulus and adult men is also 0. Their maximum age distances are to prepubescent girls and prepubescent boys.

Notes on Labeling of Summation Equation

- Summation equation at logarithmic level: $\ln(C) = \ln(P) + G \cdot \ln(b_1) + A \cdot \ln(b_2)$
- Bipolar equation (without gender correction term) at logarithmic level: $\ln(C) = \ln(P) + M \cdot \ln(b)$

You might be wondering why I use the label *Summation Equation* even though the equation looks multiplicative. The answer can be explained with the help of this screen.

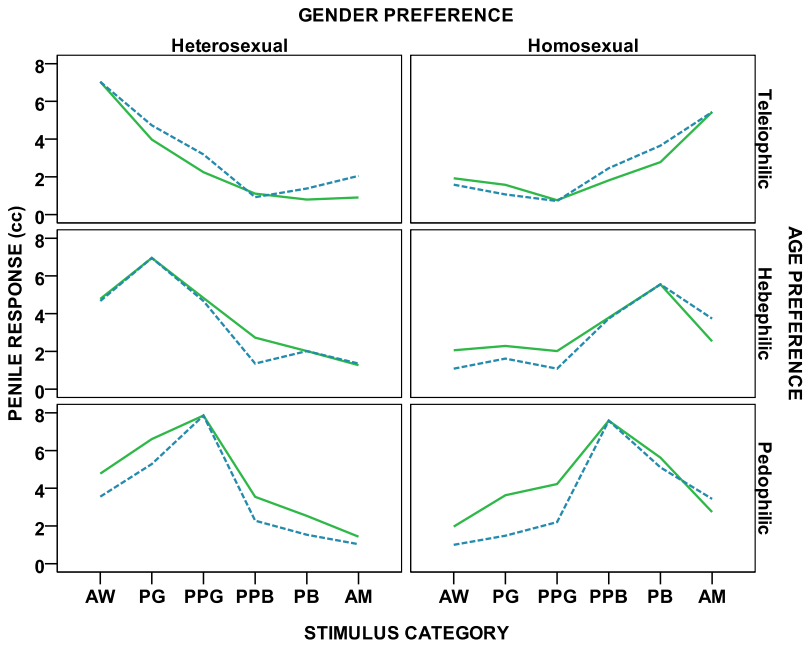
The summation model was written as an exponential equation to make it analogous to the bipolar equation, for which that form had already been chosen. For related reasons, the relation between the age term and the gender term was written as a product rather than a sum. The theoretical notion that differences in gender and in age are somehow additive manifests at the logarithmic level, where both the summation and bipolar models look more like familiar linear regression equations.

Parameter Estimates for Summation Model

$$\hat{C}_i = P \times .291^{G_i} \times .672^{A_i}$$

The gender and age parameters were estimated using nonlinear regression, as with the previous equations.

Observed Phallometric Profiles and Profiles Predicted by the Summation Model



This screen shows the mean penile responses predicted by the summation model for all stimulus categories and for all groups, superimposed over the observed means. The predicted data are shown in blue. As before, the observed data are shown in green. There is no visibly obvious improvement in fit from handling age and gender as separate predictors.

Abbreviations for stimulus categories: AW, adult women; PG, pubescent girls; PPG, prepubescent girls; PPB, prepubescent boys; PB, pubescent boys; AM, adult men.

First Comparison on Goodness of Fit

- Measure of how well each subject's profile was predicted from his highest response—*Profile Discrepancy Index*
- Average of the absolute values of the differences between the subject's observed response to each of his nonpreferred stimulus categories and the predicted response
- Profile Discrepancy Index computed separately for the summation and bipolar equations
- Overall comparison
- Individual groups

We now come at last to the main empirical question of the study: Which model does a better job of predicting the subjects' penile responses? My approach was based on the unstandardized residuals from the nonlinear regression analyses. Basic information about my goodness-of-fit measure is shown on the screen.

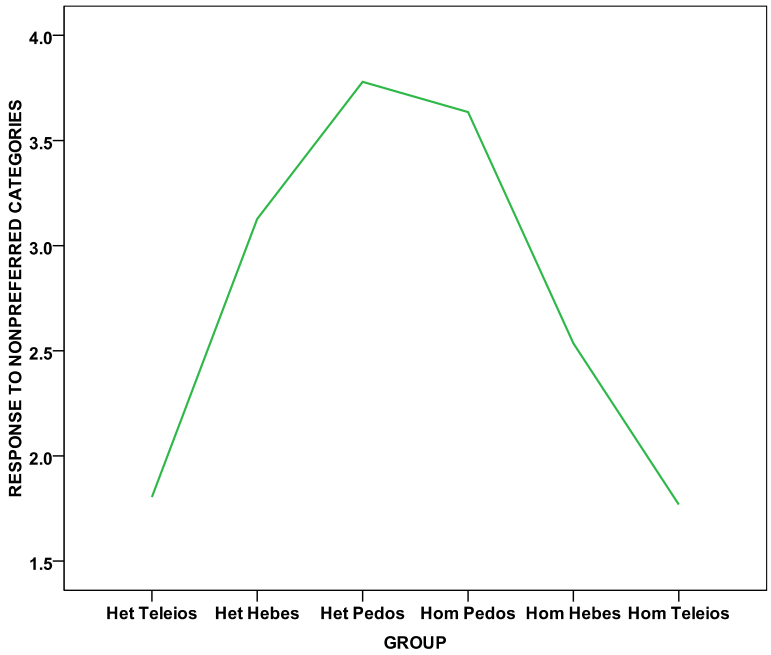
Statistical testing showed that the bipolar model provided a better fit to the observed data for the sample as a whole. Analyses carried out on the six separate groups showed that the bipolar model provided a significantly better fit for the heterosexual teleiophiles, the heterosexual hebephiles, and the homosexual pedophiles. For the remaining three groups, it was not possible to demonstrate any superiority of one model over the other.

Second Comparison on Goodness of Fit

- Not based on comparing residuals
- New derived variable—for each subject, a single score equal to the average of his observed responses to his five nonpreferred stimulus categories

I also tried an indirect approach to assessing the predictive accuracy of the two models, an approach that was not based on comparing the residuals generated by the summation and bipolar models. The calculation of the dependent measure is shown on the screen. The subject's averaged responses to his nonpreferred stimulus categories can be thought of as something like the area under his phallometric profile.

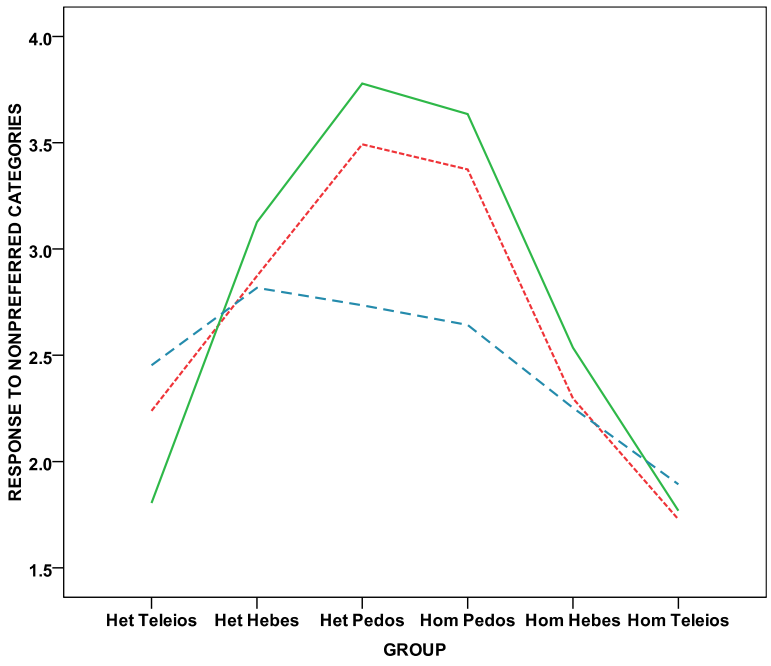
Average of Observed Responses to the Five Nonpreferred Stimulus Categories



This screen shows the average of observed responses to the nonpreferred stimulus categories for the six groups. The metric for the Y-axis is cubic centimeters of blood volume increase.

Statistical testing showed that the two pedophilic groups differed significantly from the two teleiophilic groups. The two hebephilic groups, whose means fell between those of the pedophiles and the teleiophiles, did not differ significantly from either. This result seems to show that the pedophiles manifested more stimulus generalization, but there is a strong alternative interpretation, as I will explain shortly.

Average Responses to Nonpreferred Categories—
Observed, Summation-Predicted, Bipolar-Predicted



It is readily possible, using either the bipolar equation or the summation equation, to predict what a subject's averaged response to his five nonpreferred stimulus categories should be. I calculated these predicted values and plotted them along with the observed data. Statistical testing showed that the observed responses did not differ from those predicted by the bipolar model. The observed responses did, however, differ significantly from those predicted by the summation model. Thus, the bipolar model again appeared superior to the summation model.

Before moving on, I will address the side issue of pedophiles' relative tendency toward stimulus generalization. In brief, a mathematical model that describes pedophiles and teleiophiles as behaving in exactly the same way also predicts that pedophiles will seem to show more stimulus generalization (or less discrimination), if that is quantified as their averaged response to all of their nonpreferred stimulus categories. Thus, there is no evidence that they generalize more than hebephiles or teleiophiles.

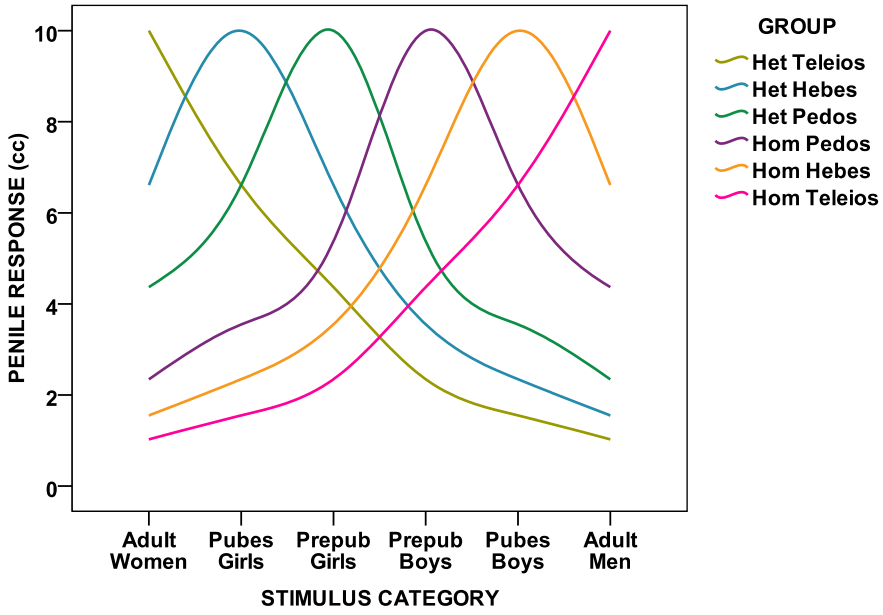
Conclusions

- Bipolar Model vs. Summation Model
- *What is sexual orientation?* Maximum value of an erotic stimulus generalization gradient—shape approximated by simple exponential equation

The results favored the bipolar model. Men act more like they respond to a potential sexual object as a gestalt than as a compound stimulus made up of an age component and a gender component. I do not, of course, regard this as the final word on the subject. The topic would need to be explored in much more depth before final conclusions about the best model for alloerotic responding could be reached.

I stated at the beginning of this talk that I hoped my data would justified my assumptions regarding the central question of this conference. I also promised that I would explain my conceptualization of sexual orientation more fully. I will first do this verbally and then visually. Sexual orientation, in men, may be conceptualized as the maximum value of an erotic stimulus generalization gradient—a gradient whose shape can be approximated by an exponential equation with one or two estimated parameters.

Penile Response Profiles Predicted by the Revised Bipolar Model

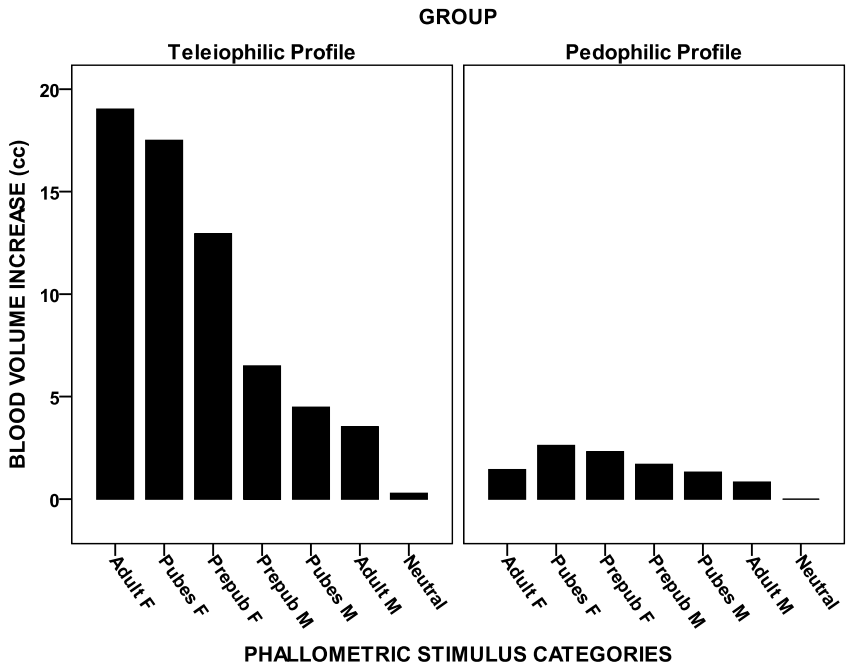


Here is the visual depiction of sexual orientations conceptualized as maximum values of overlapping stimulus generalization gradients. Penile response is expressed in cubic centimeters of blood volume increase.

The penile response profiles were calculated with an equation based on the notion that men respond sexually as if they perceive other humans as points along a single, bipolar dimension of morphological similarity—a dimension in which children are located near the middle, and adult men and women are located at opposite ends. Intervals along this stimulus dimension were “corrected” for gender by adding additional distance between prepubescent girls and boys. All profiles were calculated assuming a penile response of 10 cc to the preferred (highest) stimulus category.

Abbreviations for groups: Het, heterosexual; Hom, homosexual; Teleios, teleiophiles; Hebes, hebephiles; Pedos, pedophiles. Abbreviations for stimulus categories: Pubes, pubescent; Prepub, prepubescent.

High Teleio Responders (Blanchard et al., 2009)



The previous screen illustrates that the bipolar model predicts heterosexual teleiophiles will respond more to prepubescent boys than to pubescent boys, and more to pubescent boys than to adult men. This seems to contradict previously published data, which have indicated that men respond about the same to all age-categories of the nonpreferred sex.

It is possible that the theoretical curves are correct and that most published empirical data have been distorted by a floor effect. In one previous study, which was conducted to answer a completely unrelated question, a group of heterosexual teleiophiles with very high response levels did show an apparent difference in response to prepubescent, pubescent, and adult males.

What about Bisexual Teleiophiles?

- Profiles can be plotted like other men's
- Profiles can be mathematically described
- But…

The bipolar model not only accommodates bisexual pedophilia but suggests that it should be relatively common—which it is. At the same time, it problematizes bisexual teleiophilia. In might be noted that bisexual teleiophilia (in men) has been problematized by other researchers and for other reasons.

It would be perfectly possible to plot the phallometric profiles of bisexual teleiophiles using the graphical conventions of this study; the phallometric profile should be V-shaped or U-shaped. It should also be possible to describe that profile mathematically using an equation with only one or two estimated parameters. However, it seems inevitable that that equation would look very different from the equations that have served in this study to characterize the response profiles of a very diverse array of men.