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Letter to the Editor

Reviving the Labial Thermistor Clip

The labial thermistor clip was first introduced as a physiological measure of female sexual arousal almost 30 years ago (Henson, Rubin, Henson, & Williams, 1977); however, only a few studies have subsequently reported on its use. The development of the clip was based on the idea that surface temperature reflects changes in blood volume such as what causes genital tumescence during physiological sexual arousal. To test this idea, Henson et al. examined the use of labial temperature as an indicator of physiological sexual arousal. For this purpose, they constructed a labial thermistor clip, which was fastened to the labium of 10 volunteers who watched two counterbalanced 10-min films: a nature film and an erotic film. Labial temperature increased for 9 out of the 10 participants during the erotic condition for a mean peak increase of 0.76°C compared with a mean peak increase of 0.34°C during the control film.

Since this initial publication, the labial thermistor has been compared simultaneously with vaginal blood volume (VBV) and vaginal pulse amplitude (VPA) (Henson & Rubin, 1978; Henson, Rubin, & Henson, 1979a, 1979b, 1982), has been used to compare erotic responses among diabetic women and controls (Slob, Koster, Radder, & van der Werff ten Bosch, 1990), and has also been used to examine the influence of the menstrual cycle on sexual arousal (Hoon, Bruce, & Kinchloe, 1982; Slob, Bax, Hop, Rowland, & van der Werff ten Bosch, 1996; Slob, Ernste, & van der Werff ten Bosch, 1991). Results from these studies indicated the following: (1) VBV, VPA, and labial temperature covaried in most but not all participants; (2) labial temperature was a more consistent measure between sessions; (3) labial temperature yielded higher correlations with subjective ratings of sexual arousal; (4) labial temperature had a slower response rate than VPA; and (5) unlike VBV, labial temperature was unaffected by orgasm.

Since 1996, there have been, to our knowledge, no other published studies reporting use of the labial thermistor clip. Possible reasons for this include concerns over the sensitivity of labial temperature to quickly detect a response and the inability of researchers to reliably work with the labial thermistor clip due to lack of information regarding various technical considerations. Through much trial and error, we were able to solve some of these problems and have now successfully tested over 40 premenopausal women (Payne et al., 2006).

The following is some useful technical information regarding working with the labial thermistor clip. The clip should be composed of a highly sensitive surface thermistor, such as the Yellow Springs Instruments model 427 probe (www.ysi.com/index.html). This pediatric thermistor consists of a surface probe with a stainless steel disk 4.8 mm in diameter attached to a Teflon-covered flexible wire terminating in a standard 1/4" phone plug. The 427 probe is accurate to within ± .01°C when recording between 25 and 45°C. For disinfection, the manufacturer recommends Cidex/glutaraldehyde for low level and Cidex/glutaraldehyde, dilute bleach, 70% isopropyl alcohol for high level. For sterilization, we have used ethylene oxide gas, STERIS™ System 10. The thermistor should be glued to one end of a small metal clip. Care should be taken to minimize the amount of adhesive used on the back of the disk itself. Rather, the adhesive can be used on the wire in an effort to minimize thermal mass. A silicone pad is fashioned on the other side of the clip directly perpendicular to the thermistor disk. The pad should be kept small so as to accommodate different sizes of labia minora.

Once the clip is made, it can be connected to an amplifier and data acquisition system. We have successfully used BIOPAC systems (www.biopac.com) and accompanying Acqknowledge software along with the MP100 data acquisition unit and SKT100C skin temperature amplifier module. A cable adaptor is also available from BIOPAC to connect the 1/4" thermistor cable into the two-piece lead inserts in the amplifier. The amplifier should be set to DC for absolute temperature measurement at a gain of 1 or 2 V/°C for a 27–37°C or 22–43°C range, respectively.

Participants can either be instructed to fasten the labial thermistor clip themselves or it can be fastened for them. They should be told to expect a slight tug while the clip is being placed, but that they will largely be unaware of the clip once it is fastened. Beginning with the clip in the open position (bead slid down), the two ends of the clips should be placed over the widest area of the labium minus. Although it remains to be determined what effect placement of the clip may have on the resulting recording, placing the thermistor facing the inside of the

labium (versus the more commonly used distal placement) may enhance the sensitivity of the measure and produce recordings of even greater temperature change. Once in position, the bead gently slides up the clip to tighten it. The clip should be tight enough so as not to fall off with a gentle tug, but not so tight as to cause any discomfort.

The positioning of participants is crucial to the reliable functioning of the labial thermistor clip. Any excessive ambient temperature created by closed legs or a blanket covering should be avoided as this can mask the relatively small increase in temperature that will be recorded. Therefore, participants must be sitting with their legs open, or optimally, lying down in a supine position with leg supports. For modesty, a paper covering can be used to cover the lower torso. It is also important to control for menstrual cycle as differences in labial temperature increase have been found between follicular and luteal phases (Slob et al., 1991, 1996).

After the participant has undressed and the clip has been attached, the researcher must allow for labial temperature to stabilize before beginning stimulus presentation. We have used a variability of less than 0.05°C for a duration of 2 min and found this to be typically achieved within 5–10 min in most participants. Three out of 40 participants did not achieve a stable baseline even after 15 min and also did not respond with an increase in labial temperature with exposure to the erotic stimulus. These participants may be similar to VPA non-responders.

When monitoring surface skin temperature, one should also attempt to maintain a controlled room temperature; however, because minor fluctuations in room temperature are often difficult to avoid, room temperature should be carefully monitored. This can be accomplished with a highly sensitive room thermostat or by simply purchasing a second thermistor and placing it on the wall (facing outward) of the experimental room. This second option allows for the simultaneous continuous recording of both labial and ambient temperature in one data file. Mean room temperature and fluctuations in room temperature can then be compared between conditions and groups to ensure that there are no significant differences. If ambient temperature is found to vary systematically, this can be covaried out of the labial temperature data.

The labial thermistor clip yields an absolute temperature value, which allows for between-subject and group comparisons in addition to the computation of between-subjects correlations of subjective and physiological arousal; however, for researchers who would like to conduct repeated-measures designs, selecting the number and length of stimulus conditions is an important consideration. Although both labial thermistor clip and VPA signals seem to have difficulty returning to baseline levels after an erotic stimulus condition, the VPA signal seems to decrease at a faster rate. This is an important consideration as it allows researchers to conduct more stimulus conditions during one experimental session, thus minimizing testing sessions and subject attrition. However, because both devices do not easily return to baseline, this likely reflects a naturally occurring phenomenon. The challenge is then to find a careful balance between ecological validity and ease of research design. The use of multiple brief consecutive film segments, though methodologically preferable, may not be empirically sound. Furthermore, use of short film segments may be responsible for the low concordance ratings observed between subjective ratings of sexual arousal and VPA.

For the researcher who would still like to conduct a repeated-measures design during the same testing session, a couple of alternatives are available for use with the labial thermistor clip. First, although peak response is not achieved until 10 min (Henson et al., 1979a, 1979b), a satisfactory response capable of distinguishing between arousal and non-arousal conditions should be attainable within 5 min. Furthermore, even after peak labial temperature response was achieved by Henson et al. (1977), most participants returned to baseline within 15 min, with the notable exception of peak responders. With a briefer exposure to the stimulus film, the inter-stimulus interval to allow for return to baseline will also likely be shorter. Second, if one would like to further minimize this interval, a small fan can be used (e.g., Slob et al., 1996) to cool off the genitals for a period of 30 s between stimulus films.

Figure 1 presents a labial temperature recording from a participant after exposure to both erotic and neutral stimulus films. Analyses of labial temperature data have typically been conducted using peak temperature achieved during the stimulus film. This may not be optimal as it does not allow for the measurement of overall decreases in labial temperature such as that which we have commonly observed across neutral film exposures. Therefore, it is recommended that a repeated-measures analysis be conducted on baseline and peak delta labial temperature (whether positive or negative). In addition, although between-subjects correlations on subjective and physiological sexual arousal can be computed with labial temperature data, within-subjects can also be computed if desired.

Initial studies of the labial thermistor clip as a measure of physiological sexual arousal in women are promising. Labial temperature has been shown to reliably increase with exposure to erotic stimuli and correlate significantly and highly with subjective reports of sexual arousal. The labial thermistor clip also offers some advantages over vaginal photoplethysmography: (1) It yields

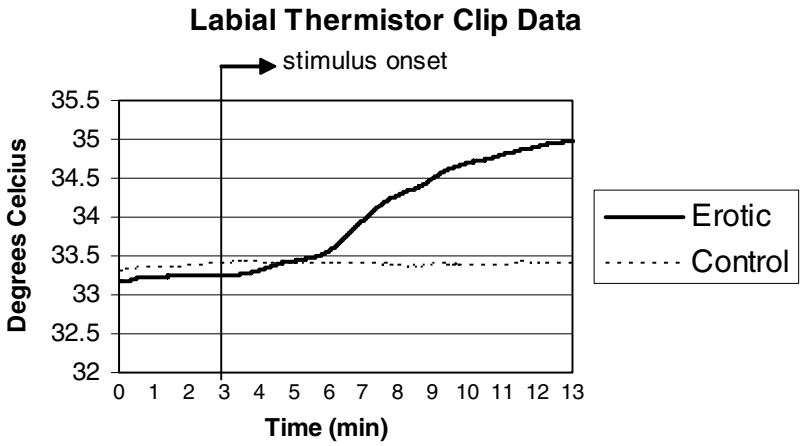

Fig. 1. Sample data of labial temperature from one healthy pre-menopausal woman with exposure to erotic and neutral control stimulus films. The control film consisted of a Canadian Film Board travelogue with no sexual content. The erotic film depicted two consenting adults engaged in a range of sexual activity along the following timeline from stimulus onset: 0:56 female nudity; 3:02 cunnilingus; 5:31 male nudity and fellatio; 7:16 vaginal penetration.

an absolute measurement unit (temperature) linked to a known physiological response (vasocongestion) making between-subjects comparisons possible; (2) it can be fastened to the labia with only a light tugging sensation, which is less invasive and painful for women suffering from dyspareunia; (3) it is extremely robust against movement artefact and other irregularities in the signal, resulting in comparatively simpler analyses; (4) existing evidence suggests that labial temperature may correspond better with subjective ratings of sexual response then either VBV or VPA; and, (5) lastly, the clip can easily be modified into a penile measurement device, allowing for comparisons between the sexes. As such, it is unclear to us why the labial thermistor clip has not been used more frequently, but we believe that it represents a promising alternative to VPA.

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