

Measurements must be interval, not ordinal

Eung-Kwon Pae, DDS, MSc, PhD

Someone once said that orthodontics is a 3 mm occupation. This comment was not meant to depreciate our clinical ability in the patient's mouth, but rather to indicate that an untrained person's visual cognitive threshold is around 3 mm. At the finishing stage of treatment, if a midline deviation is less than 3 mm, we can usually manage it; if more than that, we ought to sweat to fix it.

Although we brag about our clinical precision, we often base clinical decisions on ordinal perceptions, not measurements, especially during an interview with a new patient. After screening a potential patient, instinct usually tells us if this will be a difficult case or an easy one. How? Before measuring anything, we quickly compare the new case with our experience-archives and rank it into the position where it most likely fits. Direct measurements hardly influence that first decision made with clinical intuition. This may be why ob-

servations are ordinal.

Ordinal data are particularly useful for surveys because they help us make a decision easily and quickly. Checking along the scale in questionnaires, we can quickly deter-

or-din-al *adj.* expressing order or succession, specif. of a number in a series

mine where a particular case belongs—mild, average, or severe. But ordinal measurements present a few innate problems. First, the origin of measurements is not well defined, and your starting point is not always the same as mine. Second, the scale is not linear, and the difference between 1 and 3 on an ordinal scale may not be the same as the difference between 5 and 7, even though both are exactly 2. We all have an inconsistent rubber ruler in our minds!

In the short period of time since its birth, the PAR index appears to have become the gold standard for

evaluating malocclusion. While this may indicate a superiority of the PAR index over other indices, it is important for users to understand the fundamental problems this ordinal measurement carries. I am not insisting that we must intervalize all scaling indices, because there are many times continuous measurements do not really indicate what they mean. For example, a 1 mm difference in orthodontics is often ignored because it does not mean much clinically. When a change this small does become important, however, it might be better to convert it back to an ordinal scale to fully express its importance. Measurement, however, still must be interval, not ordinal. In other words, we cannot use the mean and standard deviation of measurements as if they were continuous due to the reasons illustrated above. Thus, when dealing with ordinal data as measurements, appropriate statistical methods must be implemented.

FREE access from your Desktop

European Journal of Orthodontics

Editor: Dr Fraser McDonald

One of the leading periodicals in its field, the *European Journal of Orthodontics* publishes scientific papers aimed at all orthodontists. The journal provides a forum for orthodontists in Europe where many developments are taking place, but also accepts papers from all parts of the world. Clinical papers cover all techniques as well as different approaches to treatment planning. Research papers are of direct relevance to the clinician and extend the scientific basis of orthodontics.

European Journal of Orthodontics

www.ejo.oupjournals.org

European Journal of Orthodontics Online enhances the print version in the following ways:

Faster Publication - full text of articles are available in advance of the printed issues so you can keep ahead of the field

Searchability - you can search through many issues for papers of interest and find them in just a few seconds

Medline 'hotlinks' - go straight from the references at the end of an article to its Medline abstract

Current Awareness Service - you can subscribe to the e-mail table of contents service to regularly receive the very latest contents in advance of publication

If your library has a print subscription (and has completed the registration form) you will find that you can go straight into *European Journal of Orthodontics Online* from your own desktop. If you have a personal subscription, online access is also included.

☐ Please enter my subscription as indicated below

Please note: £ Sterling applies in Europe, US\$ elsewhere

European Journal of Orthodontics, ISSN 0141-5387
Vol. 21, 1999, 6 issues

☐ Institutions: £164/\$286

☐ Individuals: £138/\$231

OR

☐ Please send me a free sample copy of *European Journal of Orthodontics*.

DELIVERY ADDRESS DETAILS

NAME

ADDRESS

POSTCODE/ZIP

COUNTRY

OXFORD UNIVERSITY PRESS

PAYMENT DETAILS

F9

☐ I enclose the correct remittance

(Please make cheques payable to Oxford University Press)

☐ Please charge my Access/Visa/American Express/Mastercard/JCB

CARD No

EXPIRY DATE

SIGNATURE

If credit card address differs from delivery address, please send details.

RETURN ADDRESS

Please return your order form to: Journals Marketing, Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, UK. Fax: +44 (0)1865 267835. Subscriptions can also be placed by telephone using any major credit card. Please call the Journals Subscription Department on +44 (0)1865 267907.

E-mail: jnl.orders@oup.co.uk

In the Americas, please return to: Journals Marketing, Oxford University Press, 2001 Evans Road, Cary, NC 27513, USA. Fax: 919 677 1714. Subscriptions can also be placed by telephone using any major credit card. Please call the Journals Customer Services on 1 800 852 7323 (USA and Canada only) or 919 677 0977 (outside of the USA and Canada). E-mail: jnlorders@oup-usa.org