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Letter to the Editor, *International Journal of Obesity and Related Metabolic Disorders*

Physical versus psychosocial measures of influences on human obesity. Comment on Dhurandhar and others (2015).

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Eminent colleagues in research on energy balance and human obesity, including the two Editors of this journal, argue that research participants' reports of their own food intake and physical activity should be replaced by monitoring instruments that generate data automatically.¹ This proposal has two fundamental flaws. Each has been obvious for a long time. Neither of these criticisms is especially profound. Both basic deficiencies in research on human obesity can be overcome by objective verbal data developed in psychological science.

The first flaw is that the everyday actions that need to be measured are liable to be changed by awareness that they are being monitored. Participants in research on energy exchange between the body and the environment are likely to try to eat less and to exercise more if they think that they might be regarded as too heavy for their health. Furthermore, such efforts to adopt supposedly healthier practices are fully justifiable. Indeed, it would be unethical to try to persuade a participant to maintain habits which risk the disease and distress to which obesity can contribute. Attaching instruments to measure intake or movement may produce at least as much change as asking for a diary of weighed intakes or categories of physical activity.

Contrary to Dhurandhar and colleagues, the problem is not "self-"report. Awareness that an independent observer is making a record could change behaviour as much or even more.

Erroneous numbers for energy intake or expenditure can also come from intentional or unintentional omissions of intake or insertions of movement. Yet monitoring instruments can be abused, even when fixed to the body. People so minded can relax on a couch while knocking their wrist accelerometer in a walking rhythm!

For the same reason, participants' reports of readings on their bathroom scales should not be impugned relative to weights read in clinic or laboratory. Anticipation of the appointment for measurement is liable to change behaviour which is thought to affect weight. In addition, the intervals between appointments are generally too long

to track the step change in weight that results from a sustained alteration of energy intake or physical activity.

In short, all ethical observation is invalidated by reactivity. In addition, calculations of physicochemical values from records by wearable instruments and verbal reports share considerable inaccuracies. Poor sampling makes food composition databases and energy conversion factors highly approximate. Also, metabolic efficiencies and energy partitioning vary within and across individuals.

The second basic flaw is that physics and chemistry cannot capture the societally objective patterns in human ingestion and movement. Choices of foods and drinks, as well as exercising or resting, and keeping warm or cool, are all actions construed in words by a community. The identity of each habitual practice is specifiable only by a culture's consensus on descriptions of the observed activities, as shown by biosocial thought experiments in the 1930s² and more recently in human sciences.^{3,4} This principle has been recognised for physical activity.⁵ It has been implemented for a number of common habits of eating, drinking and exercise.^{6,7}

Only habits that recur at least once a week or so are likely to have substantial effects on weight. Recall of habitual occurrences can be highly accurate back over at least a week.^{7,8,9} Hence it is possible to estimate changes in the frequency of each habit in free-living individuals with sufficient accuracy to measure the effects on weight.⁷ Participants should never be asked, "How often do you ...?" Answering that question does not require any actual occasion to be recalled; there are many other ways of coming up with a number.¹⁰ Instead, the question should be "When did you last ...?", followed by "When was the last time before that?" The time between those two occurrences gives the exact current frequency.¹¹

In order to measure the effect of a habit on weight, that recurrent pattern of actions must vary in frequency independently of other habits' variations. This disconfounding has been attempted for energy intake between meals ('snacking')^{6,12} but not for other intake patterns.¹³ In addition, to show that the described behaviour influenced weight, rather than the other way round, the change in frequency of the habit must precede the start of the change in weight. Crucially, the asymptotic effect on weight of a change in frequency of a habit includes all compensation by later intake and/or expenditure.^{14,15}

In summary, effects of observation on behaviour imperil accuracy and validity no less for instrument readings than for verbal records. In any case, human actions can only be identified by communally agreed descriptions. Fundamental scientific evidence from life in the locality is needed in order to determine the amount of weight change caused by a persisting change in frequency of a recognised habit.

Once the effectiveness of a habit has been measured, approximate measures of that activity's usual material correlates are needed in order to specify supportive changes in the environment. These could include factors in the composition, labelling and marketing of foods, or in the provision of walkways, transport, room heating and so on, as well as dosage of a medication, design of a surgical procedure or intervention attuned to epigenetic background.¹⁶

Most importantly of all, the effects on weight of changes in socially identified habits translate directly into clinical or public messages for use within the same culture. Universal education in the options specified by such biosocial evidence may well be the only way to reduce the personal, social and economic costs of obesity and overweight.¹⁶

1. Dhurandhar NV, Schoeller D, Brown AW, Heymsfield SB, Thomas D, Sørensen TIA *et al.* Energy balance measurement: when something is not better than nothing. *Int J Obes* 2015; 39:1109-13.
2. Wittgenstein, L. *Philosophical investigations*. [Posthumous translation by G.E.M. Anscombe]. Oxford: Blackwell, 1953.
3. Romney AK, Weller SC, Batchelder WH. Culture as consensus: a theory of culture and informant accuracy. *Am Anthropol* 1986;88:313-38.
4. Maguire MJ, Dove GO. Speaking of events: event word learning and event representation. In *Understanding events: from perception to action*, 193-218 [Shipley TF & Sacks JM, eds.]. New York: Oxford University Press, 2008.
5. Westerterp KR. Pattern and intensity of physical activity. *Nature* 2001;410:539.
6. Booth DA, Blair AJ, Lewis VJ, Baek SH. Patterns of eating and movement that best maintain reduction in overweight. *Appetite* 2004;43:277-83.
7. Laguna-Camacho A. Patterns of eating and exercise that reduce weight. PhD Thesis 2013. etheses.bham.ac.uk/3963/
8. Smith AF, Jobe JB, Mingay DJ. Retrieval from memory of dietary information. *Appl Cogn Psychol* 1991;5:269-96.
9. Armstrong AM, MacDonald A, Booth IW, Platts RG, Knibb RC, Booth DA. Errors in memory for dietary intake and their reduction. *Appl Cogn Psychol*. 2000;14:183-91.
10. Sedlmeier P, Betsch T. [eds.] *Etc. Frequency processing and cognition*. New York: Oxford University Press, 2002.
11. Booth DA, Platts RG. Tool for assessing and reducing an individual's fat intake. *Appetite* 2000;34:107-8.
12. Coakley EH, Rimm EB, Colditz G, Kawachi I, Willett, W. Predictors of weight change in men: results from the Health Professionals Follow-up Study. *Int J Obes Relat Metab Disord* 1998;22:89-96.
13. French SA, Jeffery RW, Murray D. Is dieting good for you?: prevalence, duration and associated weight and behavior changes for specific weight loss strategies over four years in US adults. *Int J Obes Relat Metab Disord* 1999;23:320-7.
14. Booth DA. Mechanisms from models - actual effects from real life: the zero-calorie drink-break option. *Appetite* 1988;11 Supplement:94-102.

15. Dhurandhar EJ, Kaiser KA, Dawson JA, Alcorn AS, Keating KD, Allison DB. Predicting adult weight change in the real world: a systematic review and meta-analysis accounting for compensatory changes in energy intake or expenditure. *Int J Obes (Lond)*. 2015;39(8):1181-7. doi: 10.1038/ijo.2014.184.
16. Booth DA, Booth P. Targeting cultural changes supportive of the healthiest lifestyle patterns. A biosocial evidence-base for prevention of obesity. *Appetite* 2011;56(1):210-21.