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## Why Measure Behaviour?

Sam Winter

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## *Why Measure Behaviour?*

**SAM WINTER**, *Psychological Service, Cleveland*

**ABSTRACT** *The upsurge in the use of behavioural change techniques with children in education and residential settings has not always involved an equally strong commitment to behavioural measurement (by which is meant quantitative data collection relating to latency, duration or, most often, frequency of the target behaviour in question). This paper outlines several advantages, other than effectiveness evaluation, which accrue from behavioural measurement; in relation to (a) deciding whether to change behaviour, (b) deciding the type of intervention required, (c) assessment of caregiver skills and commitment, (d) therapeutic effects, (e) reinforcement, (f) analysis of critical variables and (g) analysis of caregiver attitudes and behaviour. Case examples are included throughout.*

The social learning approach to children with adjustment problems will be familiar to most readers. There is a growing appreciation that behavioural techniques, wisely used, are both effective and efficient ways of helping children with various problems of learning. The recent formation of the Association for Behavioural Approaches with Children testifies to this development in Great Britain.

Writers such as Bandura (1969), Gelfand & Hartmann (1975) and Sulzer-Azaroff & Mayer (1977) have all emphasised the important role played by behavioural measurement (quantitative data collection) in the process of applied behaviour analysis. They argue that measurements should be made of the frequency of the target behaviour (or occasionally its duration or latency) before, during and after the intervention programme in question. They maintain: (1) that adults should focus their attempts at change upon patterns of overt behaviour between children and those around them, but (2) that adults are often very poor observers of their own and children's behaviour, and (3) that they consequently fail to obtain the reliable and objective information they need as change agents. Despite this generally agreed good practice, however, none of us need look far for cases in which teachers, care staff, social workers and psychologists profess to use a behavioural approach and yet fail to measure target behaviours to which change techniques are being applied.

Much of this work remains 'invisible'; for obvious reasons it does not find its way

into the journals. Instead we have to look around us at the work of our colleagues. In the north-east of England we know of a special school and special unit which both actually enjoy a local reputation for employing a behavioural approach, and yet do not commonly engage in behavioural measurement. How many individual teachers in special and mainstream education, and how many social workers, profess the use of 'behaviour modification' techniques, and yet neglect measurement? We suspect the number is very large indeed. One reason may be that psychologists, advisers and trainers advocating the behavioural approach have themselves minimised the importance of measurement, despite the undeniable fact that it underpins the empirical method which has traditionally characterised the approach.

The importance of behavioural measurement in single case therapy effectiveness evaluation (especially in the absence of independent advocacy groups visiting schools, psychological services and social services departments on a daily basis) is widely accepted in the literature. It provides the child with protection against the possibility of being subjected to prolonged but ineffective change programmes. Texts such as Sulzer-Azaroff & Mayer (1977) investigate the question of accountability in some depth, and hence it will not be dwelt on in any greater detail here. Instead, in this article we will attempt to list a few other benefits of behavioural measurement, some of which are paid little attention in the existing literature. The order of presentation is as follows—

*Benefits of Pre-intervention Measurement*

- (1) Information on the need for behaviour change, and, where there is a need, which behaviour.
- (2) Information on the type of intervention required.
- (3) Information on caregiver skills and commitment, and existing environmental demands.
- (4) The therapeutic effect of baselining.

*Benefits of Within-intervention Measurement*

- (1) Reinforcement value.
- (2) Information on critical variables.
- (3) Information on caregiver attitudes and behaviour.

Attention throughout this paper will be focused upon the measurement of target behaviour *frequency* (rather than latency or duration) *by caregivers themselves* (rather than consultants or the child himself); this is because of the substantial predominance of this type of data collection in clinical work. Other important issues relating to measurement reliability, validity and obtrusiveness lie beyond the scope of this paper. For a fuller discussion see texts such as Sulzer-Azaroff & Mayer (1977) and Gelfand & Hartmann (1975). But 'caregivers' is meant those in direct daily contact with the child. Here the term is synonymous with 'caregivers' (Gelfand & Hartmann, 1975), 'mediators' (Tharp & Wetzel, 1969), 'contingency managers' (Sulzer-Azaroff & Mayer, 1977), 'change agents' (Bandura, 1969) and 'direct contact personnel' (Westmacott & Cameron, 1981). Parents, residential care workers, teachers and school auxiliaries are all caregivers.

By distinction, the term 'consultant' will be used to denote any person called in to give advice on child management and training. It is synonymous with 'behaviour analyst' (Sulzer-Azaroff & Mayer, 1977; Tharp & Wetzel, 1969) or 'therapist' (as used by McAuley & McAuley, 1977).

Psychologists and social workers act as consultants, although caregivers may occasionally adopt the role of consultant for others.

### (a) Pre-intervention Measurement (Baselining)

In most cases caregivers will co-operate in collecting data (at least for a week or two), *after* the target behaviour has been identified and *before* any discussion regarding change techniques. The major exceptions are cases in which the target behaviour: (a) constitutes a danger to the child or those who surround him or, (b) shows a frequency which all caregivers concerned agree upon (e.g. 'We are both absolutely sure he wets the bed each night. We change the sheets each morning'). Caregivers who are reluctant to baseline may be persuaded by the effectiveness evaluation argument or by reference to some of the other benefits listed below.

#### (1) *Information on the Need for Behaviour Change and, Where There is a Need, Which Behaviour*

The decision to institute behavioural change necessarily depends upon a large number of factors (including the age and developmental level of the child, the effects which the target behaviour has upon his life quality, and that of his peers and caregivers, etc.) and often demands careful consideration. Decision-making is rendered even more difficult where reliable frequency information is absent, as in cases where: (a) caregivers give poor or conflicting verbal reports, or (b) the frequency apparently fluctuates. In each case measurements can provide a basis for more informed choice when combined with other types of assessment data.

Similarly, in situations in which caregivers are concerned about a wide variety of problem behaviours, only one of which can realistically be dealt with at a time, behavioural measurement can once again provide a basis for informed joint decision-making, regarding the specific behaviour to be changed.

#### (2) *Information on the Type of Intervention Required*

Objective frequency data are often helpful in making decisions regarding the type of change techniques required.

Derek was a 4-year-old in a reception class. His aggressive behaviour caused concern to peers and adults alike. We decided to use DRO procedures as a component in an intervention package which also included modelling, time-out and self-control training. DRO (Differential Reinforcement of Other Behaviour) involved positive reinforcement at the end of each time interval during which problem behaviour (in this case, aggression) was absent. (For a fuller discussion of the technique see Sulzer-Azaroff & Mayer, 1977, Repp & Dietz, 1974 and Gelfand & Hartmann, 1975.)

Wherever this type of technique is used it is essential to select a time period which will ensure high levels of positive reinforcement for the child throughout the day. Baseline data collected by Derek's teacher over a period of one week revealed that violently aggressive behaviour (appropriately defined) ran at a daily frequency of 6.2 (with a range from 4 to 9). The clear implication was that on 'bad days' Derek was refraining from aggressive behaviour for periods averaging only 30 to 35 minutes. On the basis of this information, and allowing for random fluctuations within a day, a DRO interval of 10 minutes was chosen; that is, from the outset of the change programme Derek's teacher and peers praised him whenever he succeeded in refraining from aggressive behaviour for

the whole of a 10 minute period. For further details of this intervention see Winter (1980).

Baseline data can be used in a similar way where DRH and DRL techniques (Differential Reinforcement of High or Low frequency behaviour) are under consideration.

A rather different example concerns those cases in which the target behaviour apparently fluctuates with time. Behavioural measurement may reveal that the fluctuations are related to (for example) the teachers or tasks involved at school or the father's working hours at home. Information such as this may prove invaluable in decisions regarding intervention techniques themselves, as well as the caregivers by whom, and the settings within which, they should be implemented.

### *(3) Information on Caregivers Skills and Commitment, and Existing Environmental Demands*

Failure of a caregiver to collect data as agreed may be an indication of the absence of skills or of the commitment necessary for later implementation of change techniques. Further discussion may reveal the precise cause of failure. Alternatively, it may be due to genuine forgetfulness in which case some signalling device such as a kitchen timer or pre-recorded tape may be used as a reminder during the period of baseline, and during intervention itself.

Stephen was 4-years old and had been described as 'hyperactive'. Of all the problem behaviours he engaged in the most worrying to his teacher was that of non-attending behaviour during group sessions such as storytime, newstime, etc. The teacher was asked to collect baseline data for a week.

As specific moments during these sessions she was to observe Stephen's behaviour and write a tick on her hand if he was standing up, shuffling, walking around, interfering or talking with other children, staring elsewhere or making disruptive noises (all of which were considered to indicate non-attending behaviour). She was to write a cross if he was refraining from these behaviours (and thereby possibly attending to what was going on).

An immediate problem presented itself. The teacher found that she was too concerned with the content of these group sessions to remember to observe Stephen's behaviour using the 'interval' method described above. The solution was to provide a pre-recorded tape which played signals at one minute intervals. The teacher switched on the tape before each group session began and observed and recorded Stephen's behaviour quite successfully each time the taped signal reminded her to do so. Throughout the actual intervention, which involved DRO (as well as training and modelling sessions and extinction), it was necessary to continue to use the pre-recorded tape as a way of reminding the teacher to reinforce intervals of attentive behaviour.

Several possibilities exist where failure to collect baseline data seems to be due to a lack of commitment. The target behaviour which has been chosen may be low priority for the caregiver, despite the care previously taken when defining the problem behaviour. The solution to this particular situation is obvious.

More commonly the lack of commitment may stem from reservations about a 'symptom' approach (best dealt with through further discussion) from general pessimism about the possibilities for change (dealt with by further discussion and in increased consultant reinforcement of caregiver behaviour once intervention begins)

or from a desire (expressed or otherwise) to have the child removed rather than engage in *in situ* intervention. This last possibility (perhaps encountered more often in schools and largely the result of an abundance of special schools and units) may be the most difficult to deal with. Three possible solutions involve: (a) the enlistment of support from colleagues within the school, (b) the use of measurement and change techniques involving minimal caregiver effort (extreme forms of which are strategies which involve the child in self-reinforcement or involve reinforcement by other caregivers) and (c) choosing and training target behaviours which will result in the child quickly becoming more reinforcing to the caregiver (Hutchings & Jones, 1979).

#### (4) *The Therapeutic Effect of Baselineing*

A certain proportion of target behaviours appear to improve under baseline. Lindsley (in Duncan, 1969) reports a figure of 5% in his review of 2000 cases, whilst Tharp & Wetzel (1969) report 7% in a rather smaller sample of 83. A review of 36 of our own cases yielded a rather higher 14% (unpublished).

Sometimes this baseline effect is a result of the discussions which precede it. In particular the consultant will typically 'prepare' the caregivers for targeting and then baselineing a behaviour by telling them that the child's behaviour is a problem of learning, the solution to which lies in a teaching approach which they themselves will be required to adopt as the major participants of therapy. In certain cases all this is bound to change long-held attitudes and result in changes in caregiver behaviour *via-à-vis* the child.

Alternatively the acts of targeting (i.e. defining the child's 'problem' in observable behavioural terms) may make possible (and indeed result in) more consistent management by caregivers than has been possible hitherto. This in turn may lead to improvements under baselineing. Finally, there are cases in which the child observes or is told that the consultant is visiting the home or school in connection with his or her problems. This may lead to behavioural improvement by way of a sort of 'bogeyman' effect. Strictly, speaking, however, these are examples in which behavioural improvements are made visible by, rather than actually resulting from, baselineing. It is this second phenomenon to which we now turn.

Where the child is told or observes that his or her behaviour is under scrutiny he/she may exert a self-control that has hitherto been absent, with a consequent improvement in target behaviour. Unfortunately, the former pattern of behaviour may reappear when baselineing stops. One solution involves asking the caregivers to withdraw the offending record card or graph paper on one in every 5 days, then in every 4 and so on, until the baselineing has eventually been phased out, hopefully with no return of problem behaviour. Another solution may lie in transferring record keeping to the child itself.

#### (b) **Within Intervention Measurement**

The benefits which accrue from collecting quantitative data throughout the duration of an intervention programme are numerous.

##### (1) *Reinforcement Value*

Behavioural measurements provide a powerful source of reinforcement for the child,

for caregivers and for the consultant especially when improvements in target behaviour are shown visually (Gelfand & Hartmann, 1975). This is particularly important in two special cases.

- (a) Where behavioural change is expected to be (or actually turns out to be) gradual. Indeed changes of this sort may pass unnoticed altogether if measurements are not kept. In this connection it may be worth listing some of the conditions under which behavioural change may be expected to proceed gradually, if at all:
  - (i) Where one or more caregivers deviate from the agreed techniques, either through 'behavioural inertia' or 'sabotage'. All these possibilities are more likely to occur not only where a large number of caregivers are involved in the task of behavioural change (as in a residential school or a comprehensive) but also where important caregivers have not been co-opted into the programme (as where a grandmother has been left uninvolved in a programme which involves the use of pocket money as a reward).
  - (ii) Where the target behaviour is difficult to distinguish from non-target behaviour; has been poorly defined (i.e. 'naughty' or 'difficult' behaviour) or (as in Stephen's case earlier) itself consists of a particularly wide variety of constituent targets. All these are likely to reduce the consistency with which caregivers apply the programme.
  - (iii) Where the problem behaviour has been established for a particularly long time.
  - (iv) Where the intervention is planned for a limited setting (for example where withdrawn behaviour in home and school is being modified at school only).
- (b) Where caregivers perceive that response cost is high. By this is meant that they ask themselves 'Is what we are being asked to do worth it?', and conclude that it is not.

In answering the second question caregivers will weigh the physical effort and time involved or anticipated (in attending review meetings with the consultants as well as in implementing the behavioural techniques themselves) against the reinforcement received or expected (for themselves, their colleagues and superiors, the consultants and the child himself). Sometimes the physical effort and time expended in the early stages of intervention is very high indeed. For example an intervention package involving DRO, modelling, time-out and self-control training obviously involves quite a lot of effort during class hours as well as several hours discussion outside (Winter, 1980). Similarly reinforcement available to caregivers may be quite limited. They may fail to reinforce their own adherence to the programme because they feel uncomfortable using the techniques, are sceptical about their effectiveness or feel they are acting under duress. Superiors and colleagues may show scepticism about and even ridicule the techniques the caregivers are being asked to use. Most importantly the child himself may, through his or her continuing aversive presence in a classroom, punish a teacher for adhering to techniques which at best, 'only put off the day that the child goes to the unit'.

In a minority of cases the perceived response cost may be so high as to prevent behavioural techniques being used at all. For example, in a review of 36 of our own cases, 14% of the interventions terminated after unsuccessful attempts to negotiate a set of behavioural techniques acceptable to the caregiver(s). However, there are many methods by which apparently high response cost can be reduced. For example,

the consultant might ask them to consider less effortful and time-consuming behavioural techniques. He might arrange for discussions to take place within school hours or probe other adults who might reinforce programme implementation and, perhaps, encourage participation by caregivers in the whole business of designing a behavioural intervention—indeed, this is essentially what is meant by programme *negotiation*. Most importantly, behavioural measurements may be used as a source of reinforcement to the caregivers. Indeed, they may constitute the simplest method by which response-cost is reduced.

## (2) *Information on Critical Variables*

Throughout the duration of a programme a number of incidents take place, some of which may have an effect upon the target behaviour and may therefore be termed 'critical'. Their effect may pass unnoticed but for detailed behavioural measurements. Three examples may illustrate the point.

David was 5 years old and was the eldest son of an affluent working-class family. Despite being presented with well-prepared and wholesome food of all types he vomited in about four out of every 10 mealtimes at home, whatever the time of day. He had engaged in this behaviour for 2½ years despite being declared medically fit and, interestingly enough, ate perfectly normally at school. To relate the history of this case would be to digress; suffice it to say that the vomiting behaviour seemed to be maintained by attention, and by the individualised menu (consisting largely of puddings, sweets and crisps) in which it resulted. The chosen intervention, consisting of: (a) parental praise for problem-free eating, (b) time-out for baulking or vomiting behaviour and (c) an orthodox menu, resulted in a gradual and almost total elimination of vomiting behaviour after 120 days. It was then that a critical incident occurred. For some reason David began to vomit occasionally and the father, after very little consultation with his wife, decided to send David to bed after any instance of vomiting behaviour during the evening meal. After 11 days the data were inspected. It was quite clear that the sole outcome of the new strategy had been that David's vomiting behaviour had increased further and, even more striking, had increased only during the evening meal.

Indeed, evening vomiting had increased by a factor of six as compared with the 11 day period prior to this departure from the programme. Faced with such clear data the father had no choice but to stop sending his son to bed, and return to the agreed procedures, the result of which was the prompt reduction of evening vomiting back to initial frequency.

Peter was 4½ years old and had frequently soiled in his home over an 18 month period. Baseline yielded a rate of at least once every 2 days. The problem seemed to be maintained by the various forms of attention in which it resulted. Intervention consisted of positive reinforcement (involving praise, stickers, a chart and back-up activity rewards), over-correction (involving a requirement to wash out his own and other people's clothes for about half an hour in the bathroom) and prompting (involving a once nightly reminder to use the toilet). Soiling was immediately eliminated for 13 days only to return on days 14 and 15. There appeared to be several possible reasons for the return of the target behaviour. The most pertinent critical incidents seemed to be:

- (i) Parents had stopped prompting him to use the toilet.



- (ii) The father had moved south in search of work whilst the steel strike was on.
- (iii) Parents had told Peter that his good behaviour meant that the psychologist would no longer need to visit the home.

Over the next few weeks each factor was manipulated, and daily records were kept throughout. In this way it was discovered that the third item in the list of critical incidents was the controlling variable. The implications for the entire intervention programme were considerable and changes were made accordingly.

Behavioural measurement facilitates investigation of a number of other programme variables, such as the comparison of differences between different caregivers, settings and reinforcers or the evaluation of any of these three components over time. For example data may suggest (or confirm a suspicion) that behavioural change is taking place in only one class, at home rather than school, or for one parent only. Alternatively, it may show that what was once a reinforcer is no longer reinforcing.

In an effort to increase academic output and decrease disruptive behaviours in his class of 9–10-year-olds, a class teacher began to use a variant of the 'Good Behaviour Game', originally developed by Barrish, Saunders & Wolf (1969) in the USA and used in this country by, amongst others, Merrett & Wheldall (1978). The game involved dividing a class into teams, establishing clear criteria for behaviour, and a points system backed up by a menu of reinforcers. After an initial improvement in on-task behaviour a decline set in. One possible cause was that the teacher was no longer observing the teams frequently enough, with the consequence that he was awarding points on a poor ratio schedule that was extinguishing the newly established behaviour. Daily records confirmed this, and the teacher took steps to resolve the problem. However, the decline continued over the next fortnight. A possible remaining factor was that the reinforcer variety was not high, and that each reinforcer was losing its attractiveness. Final confirmation that this was happening came from close inspection of the records for one particular day on which four reinforcers were available to the children: (1) being allowed out first to lunch, (2) reading comics, (3) playing board games and (4) orange juice. The first three had been used on previous days. Orange juice was being used for the first time. The day began in heavy rain, and turned to brilliant sunshine at lunchtime. The points earnings of the class began at a very low level and suddenly rose in the afternoon.

Looking at the data, one gained a clear impression that the children were satiated upon three reinforcers, and orange juice only acquired incentive value with the improvement in the weather. Accordingly, the teacher increased the range and variability of reinforcers available daily. The result was a substantial and long-lasting improvement in target behaviours.

Even more startling investigations are possible. At one point inspection of the daily records shows that David's vomiting behaviour (earlier example) followed a cyclical pattern that was related to his mother's abnormally painful menstruation (see Fig. 1). It transpired that mother experienced great difficulty in reacting calmly to David's baulking behaviour at these points in her menstrual cycle. Consequently the parents and writer discussed ways in which this problem could be eliminated, for example through medication for the mother or alternatively through the father assuming responsibility for programme implementation during her menstrual period.

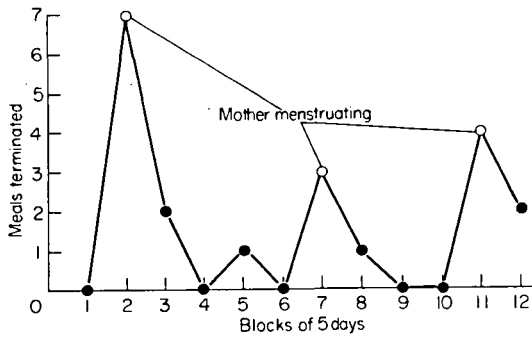


FIG. 1. The relationship between child's behaviour and mother's menstrual cycle.

### (3) Information on Caregiver Attitudes and Behaviour

Measurements occasionally conflict with opinions about the effectiveness of the behavioural programme which are expressed by caregivers. Contradictory evidence of this sort gives rise to a number of questions less likely to be posed when the consultant is dependent only upon the caregiver's subjective judgments. Clearly there are two possibilities, the first being that in which the caregivers judge the intervention a failure despite data which they themselves have collected which shows it to be a success. Amongst possible explanations for such a state of affairs are:

- (a) The target behaviour is not one considered by the caregivers to be of high priority. Although it has been successfully modified, they feel that the child is as serious a problem as before and consequently conclude that intervention has been a failure. The solution is straightforward; select another target behaviour.
- (b) The target behaviour has been poorly recorded. For example undesirable behaviour appears to have been eliminated simply because, although observed, it has been left unrecorded. This problem is essentially the same as that described earlier in the section entitled 'caregiver skills and commitment'. A number of solutions described there apply here also.

Lee A was 8 years old and engaged in a number of difficult behaviours when with his father (elderly and speech defective), who oscillated between over-indulgent and physically negative management methods. Two target behaviours were selected; demanding behaviour (e.g. 'I want money', 'I want to have those sweets') and refusal to comply with simple requests (e.g. 'No, I won't come in for my tea', 'No I won't sleep in my bed' etc.). Intervention consisted of DRO (1 hour periods—see example 1 earlier in this paper) using praise and home movie film parties as rewards, and time-out. Over several months the behavioural measurements which Mr A collected showed a dramatic reduction (by a factor of 6) in the two target behaviours.

Despite these results, Mr A maintained that Lee was only a little better behaved. It was only after a number of lengthy discussions, some rather heated, that Mr A admitted failing to record a substantial number of refusals and demands made by his son.

Significantly, he had failed to impose the time-out contingency for such

unrecorded misdemeanours, choosing instead to 'tell the boy off' threaten him with care (albeit quite empty) and smack him. As a result we had every reason to believe that the frequency of the target behaviours were, and would remain, as high as at baseline. Fortunately, Mr A finally chose to adhere to the recommended programme, after which point the reverse situation occurred; the data showed a temporary increase in target behaviour, despite verbal reports from Mr A that the boy's behaviour was slowly improving.

The second of the two possibilities is that in which the caregivers judge intervention to be a success despite their own data which suggest that it has failed up to that point. The most acceptable explanation seems to be that their criteria for what constitutes an instance of the target behaviour has changed as the programme has proceeded. By way of example, consider the case of a teacher who is attempting to increase interaction behaviour in a withdrawn child through the use of social reinforcement. It is possible that the teacher's judgment of what constitutes interactive behaviour will become more stringent as the behaviour itself becomes well-established in the child's repertoire. If this happens the result may be a behavioural record which shows precious little improvement, set against subjective judgments that gains have occurred.

An unfortunate consequence of this state of affairs is that the teacher may lapse into non-reinforcement of target behaviour at a time when it is still quite essential, the result being that any further improvements are discouraged. The simplest method of dealing with this problem may be to define the target behaviour more carefully, thereby reducing the need for interpretation.

### Conclusion

Those whose use behavioural change techniques without concurrent measurement do a disservice to themselves, their clients and the approach itself. It is a criticism of many therapies developed over recent years (for example counselling, play therapy, psychoanalytic approaches and drug therapy) that such scant regard has been paid to reliable and objective data collection. As a result large numbers of children and their caregivers have been drawn into interventions provided by expensive services and only later found wanting. Gelfand & Hartmann (1975) argue that the firm data base provided by the behavioural approach should reduce the faddism that has hitherto prevailed and may prove to be its most important and perhaps most enduring contribution to the helping professions. The implication for the responsibility of caregivers and consultants purportedly employing the behavioural approach is clear.

*Correspondence:* Sam Winter, Psychological Service, Burn Valley Centre, Elwick Road, Hartlepool, Cleveland TS26 9NP, England.

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