

Environmental Enrichment and Data Quality: Results of a Global Survey

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Introduction

It is widely accepted within the scientific community that ‘better welfare equals better science’, and it is also commonly acknowledged that environmental enrichment improves animal welfare. For example, recent versions of legislation, guidelines and codes of practice relating to laboratory animal use emphasise the importance of a stimulating environment to encourage appropriate natural behaviours [1-3], including group housing for social animals and environmental enrichment such as nesting material, refuges and chew blocks for rodents. However, there are still inconsistencies in the provision of enrichment. Reasons for this were recently reviewed in an article in the *Enrichment Record*, including the belief that experimental variability will increase, or a confound will be introduced, affecting data quality [4]. There are three main areas of concern relating to this: (i) whether the validity of the science within an individual project will be affected; (ii) whether the data will still be comparable with those obtained from studies conducted without enrichment; and (iii) whether greater variability will require more animals for significant results.

The article discussed the scientific, practical and ethical bases for each of these, suggesting action points to support the provision of enrichment (and encourage wider reporting of husbandry refinements) [4]. It also asked readers to participate in a survey, drawn up by the RSPCA (a UK scientific animal welfare organisation) and GR8 (a global education and training organisation), aiming to explore views and beliefs about the effects of enrichment on data quality. This ran for seven weeks, ending on 21 February 2014, and was promoted in the *Enrichment Record* article and via online forums such as Compmed, LAREF and laboratory animal science-related user groups on LinkedIn, including the Measuring Behavior group. The aim was to encourage a wide range of respondents, holding a variety of attitudes towards enrichment and beliefs about its effects on data quality [5].

Survey Results

A total of 343 people responded, including 112 researchers, 112 animal technologists, 85 veterinarians, 74 members of ethical and animal care and use committees and 9 regulators (the total number of responses was 473, as respondents could tick more than one role). Most (182 = 53 %) were from academic establishments or universities, 51 (15 %) worked in pharmaceutical establishments, 41 (12 %) in medical or veterinary research institutes, 26 (8 %) in government agencies and 25 (7 %) in Contract Research Organisations. The majority of respondents were located in north America (175 = 51 %) or Europe (128 = 37 %), with 20 (6 %) from Canada and small numbers of others located in most areas of the world apart from Oceania and sub-Saharan Africa. For full survey results, see [5].

When asked whether they regarded environmental enrichment as a basic necessity for animals, 336 people responded ‘yes’ and 5 answered ‘no’. This level of acceptance was also reflected in the responses to the question: ‘*In your view, is there adequate scientific evidence that animals benefit from enrichment?*’ Most respondents (275) agreed with the option ‘*Yes – I can accept the methodologies used to evaluate this and their conclusions*’, whereas 53 agreed with ‘*For some species, but not necessarily all*’. Over 95% of all 343 respondents thus agreed that there is scientific evidence that enrichment benefits at least some species, with 80 % of all respondents choosing the option that did not include a caveat relating to different species. Just 10 people (3 %) were not convinced.

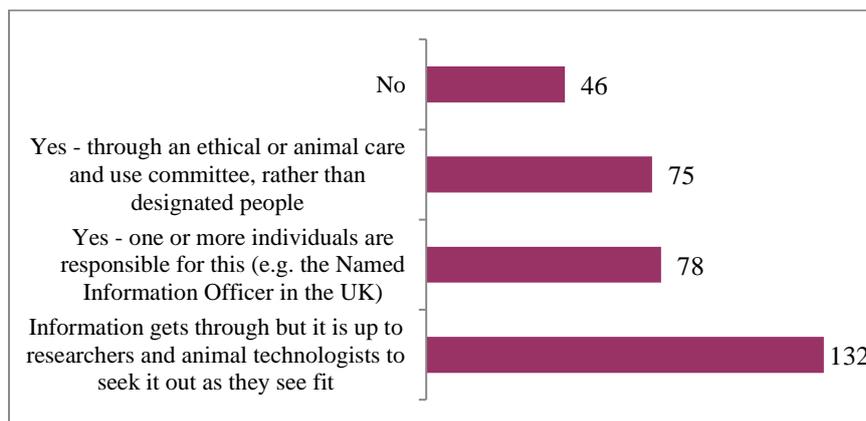
The results of the survey should therefore be interpreted as representing the views of people who, in general, regard enrichment as a basic necessity for animals and accept the scientific evidence that animals benefit

from its provision. Other responses indicated that the majority of respondents believe that enrichment has a positive effect on data quality, and work in an environment that is broadly supportive of providing enrichment for animals. They have a good level of awareness of the literature on the effects of enrichment, are prepared to encourage others to provide it, and recognise that it is relevant to the science and should be reported in publications.

However, the responses identified four issues of concern:

- Withholding environmental enrichment on the basis of untested assumptions about its impact on data quality (18 % of 243 respondents who felt the relevant question applied to them)
- A lack of motivation to challenge colleagues who do not provide enrichment, or a lack of support when raising the issue (15 % of 190 respondents to whom this applied)
- Perceptions that enrichment is irrelevant to materials and methods sections of publications (15 % of 135 people)
- Lack of a properly defined system (either via designated individual(s) or an ethical or animal care and use committee) for researching, retrieving and assessing new information on enrichment (see Figure 1)

Figure 1. Responses to the question: ‘Does your facility have a system for researching, retrieving and assessing new information on enrichment?’



All of the above issues arose even among people who were already engaging with welfare issues, motivated to provide enrichment and working in facilities that in general had a good ‘culture of care’, so they may well be more widespread among the wider population. The conclusions below are set out on that basis.

Discussion and Conclusions

Enrichment should be provided unless there is sound scientific or veterinary justification. This relates to concern (i) in the Introduction. It is essential to evaluate the impact of enrichment on data quality if there are any doubts about this, especially in the field of behavioural research where animal housing, husbandry and care can have significant effects on the parameters under investigation [6]. To give just two examples, enrichment has been reported to prevent cognitive impairment in rats with epilepsy [7] and enhance episodic-like memory persistence in an object recognition paradigm in mice [8]. From a translatability aspect, it could be argued that the validity of the results in studies such as these may be enhanced, as humans also live in an ‘enriched’ environment. In that case, any concerns about comparability with data obtained from studies without enrichment (concern (ii) in the Introduction) would not in themselves justify continuing to withhold enrichment, as the science would be improved.

Pilot studies can provide an informed basis for decision making about enrichment, by quantifying any potential effects and (if necessary) indicating necessary adjustments to experimental design, and data analysis, to accommodate any differences. In some cases this might involve an increase in animal numbers, which presents a conflict between reduction and refinement (issue (iii) in the Introduction). However, the consensus view is that reducing suffering to each individual – and improving welfare – should usually be the priority, even if more animals are used (just 5 % of survey respondents believed that reduction always came first). There will be further justification for increasing numbers if enrichment is found to improve the science as well as animal welfare.

People who are supportive of providing enrichment should increase their efforts to communicate about it and ‘set a good example’, both within their facilities and in their publications. Colleagues and journal editors should support them in this. Most respondents who encouraged colleagues to provide enrichment were successful, which is very positive, with a reported success:failure rate of around 3:1. However, it was disappointing to see that others were not motivated or did not feel they would be supported. This is largely a cultural issue that can be addressed within individual facilities, and it would be a good topic for an institutional ethical or animal care and use committee to discuss with staff.

Communication about animal housing, husbandry and care, including enrichment, within materials and methods sections of publications could also be improved. This is essential information to help disseminate and encourage good practice with respect to refinement, and to ensure all potential variables have been described so that the results can be adequately interpreted, compared with those from other facilities and replicated if necessary [9]. However, there are currently serious issues with inadequate levels of reporting in biomedical research papers [10-12] and a number of reporting guidelines have been drawn up to help to address this [e.g. 10,13]. Authors are beginning to use these, either in their entirety or adapted to individual studies, but reporting guidelines could still be used more widely – both at the protocol design stage and when preparing papers for publication [12]. It is noteworthy that Measuring Behavior has taken this responsibility seriously within its guidance for authors [14].

Every establishment should have a system for ensuring that new information on enrichment is researched, retrieved, assessed and implemented where appropriate, to facilitate better science and better welfare. Otherwise, publications and other communications on enrichment can easily be overlooked, for a number of reasons including lack of awareness of relevant journals, discussion fora and meetings that feature enrichment, or an establishment culture that does not recognise the value of regularly reviewing new information on refinement including enrichment. The role of ensuring an adequate flow of information can be undertaken by one or more designated individual(s), such as the Named Information Officer in the UK, or an institutional committee. NB ensuring that staff have access to species-specific information is also a legal requirement within the European Union [1] and recognised as good practice in other guidelines [2].

Helpful information and guidance relevant to all of the above can be found in *Guiding Principles for Behavioural Laboratory Animal Science*, which was supported and funded by the British Association for Psychopharmacology (BAP), British Neuroscience Association (BNA), the ESSWAP Foundation and the UK Laboratory Animal Science Association (LASA) [15].

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