Informatics approaches to develop dynamic meta-analyses

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This Special Issue demonstrates that significant gains have accrued through meta-analytic approaches in evolutionary ecology (Nakagawa and Poulin 2012). However, we still lack informatics resources to facilitate their use in a standard way. Here, we point to the importance of the dynamic management of meta-analytic datasets, and by establishing a repository for meta-analytic data (www.evolutionary-meta-analysis.net), we propose a new framework to enhance the accumulation of scientific knowledge.

The scientific value of a meta-analysis is determined by the quality and completeness of underlying data, but at least three shortcomings should be considered at the level of data compilation. First, in keyword-based literature searches, it is remarkably easy to miss relevant studies. This is especially problematic if studies with weak effect are more likely to be missed, which violates assumptions about random sampling. This might happen, for example, when non-significant results are not included in the abstract of a paper. Second, any meta-analysis can offer only a summary of current knowledge. In rapidly developing disciplines such as evolutionary ecology, studies appearing after a meta-analysis are included in future synthetic research with a substantial time lag, if ever. Third, most effort is initially focused on calculating the overall effect, while understanding variation in effect sizes is often more interesting. Limited sample sizes often make it difficult to assess variation in effect sizes.

To address these challenges, we propose that meta-analysis databases should be maintained in freely accessible repositories and results dynamically updated as studies accumulate. The ability to access and add to these data continuously will help to recover missing studies, to incorporate new findings, to flexibly recalculate overall effect sizes upon each change, to focus on a subset of data, and to investigate the effects of moderator

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variables. On the website, we host two databases (Garamszegi et al. 2012; Rifkin et al. 2012) to demonstrate the advantages of this process.

References

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