Computer-assisted snowball search for meta-analysis research

The rapidly increasing number of publications in the clinical sciences presents both new opportunities and challenges for meta-analysis research. While this has allowed more robust evaluations of diagnoses and interventions, there are now more papers that the researcher must find, screen, and analyze. This is not to be underestimated: the PRISMA guideline for systematic literature review recommends a comprehensive database search involving forward (citation) and backward (reference) searches on primary data sources, ideally repeated to exhaustion. This process has traditionally been done largely by hand, limiting the scale and scope of meta-analysis research. However, recent growths in online databases and calls for open access have made scholarly databases more available to individual researchers, providing potential for the search process to be automated.

We report on the performance and philosophy of our tool *Snowballer*, a software for conducting automatic forward and backward (snowball) searches, developed in collaboration with meta-analysis researchers in child language development. *Snowballer* uses a downloadable snapshot of the Microsoft Academic database to find a paper's citations and references and then queries online databases including Scopus and Crossref to fetch information about the searched papers to help facilitate the screening process. In a validation experiment using the input and output data from a concurrent meta-analysis, *Snowballer* recovered 98% of the outputs within two iterations and found 35% more connections between the inputs and outputs. This demonstrates the potential for automated approaches to significantly reduce resource barriers to meta-analysis research without compromising a representative coverage of the target literature.