Quantitative Objective Measuring Tool for Editor and Reviewer Rigour
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Objectives
The objective was to develop a tool, free from subjective bias, which could measure and profile editor-reviewer interactions when peer review is happening successfully or at least detect variations in approaches to reviewer selections or decision-making which could indicate changes in peer review rigour.

Hypothesis
Editors and reviewers should disagree. Reviewers with specific expertise may fail to identify critical flaws outside their research area which result in a manuscript being rejected. Editors have a greater understanding of their Journal’s scope and standards so that rigorous reviewers must be expected to make recommendations at variance with editor’s decisions. However, reviewers and editors opinions should generally agree because editors’ decisions are largely based on reviewers’ recommendations. Across all decisions they should tend to agree, with a few outliers of stronger disagreement. If frequency of disagreements are plotted this should result in an approximately bell-shaped (Normal) curve. In a study by McGlinchey et al (2019) a mathematical tool was used to demonstrate consistency in reviewer rigour in journals where editorial offices and editors independently selected reviewers. The authors decided to test if this tool could be used more widely.

Method
Editor decisions and reviewer recommendations were given numerical values where 1 = Accept; 2 = Minor Revision; 3 = Major Revision and 4 = Reject as described in detail in McGlinchey et al (2019). Differences between reviewer and editor opinions were then calculated at manuscript level to produce Reviewer Rigour scores with seven grades from -3 to +3. For example where a reviewer recommends Accept but an editor decides Reject then the Reviewer Rigour score would be calculated from 1 – 4 = -3. Score frequency was plotted to compare usual journal trends with Normal distributions to produce curves with a distinctive shape to ‘fingerprint’ editor and reviewer interactions where situations that standard peer review rigour might be expected to change or were concerns.

Scenario 1 – established reviewers
Fig 1 compares Reviewer Rigour for Journal A with established reviewers. The Normal and Journal Total curves are similar showing strong understanding and agreement between editors and reviewers. However, the greater number of negative scores in the Journal Total curve indicates that editors have a tendency to judge manuscripts more severely than reviewers. Journal A’s Impact Factor is currently increasing so this might be expected because with increasing standards, reviewers expectations may be lagging slightly behind editors’.

Scenario 2 – comparing editors
Journal A operates a process where different Editors handle manuscripts in different subject areas. It was noted that one editor’s Acceptance Rate was 61% while another’s was 37%. Subject areas were very different (rheology vs microbiology) so differences may be due to the difference in standards but raises a concern that manuscripts Rejected by the Guest Editor may have been suitable for transfer to a General Issue. For the Invited Call, there were more cases where Reviewer Rigour was +1 to +2 which occurs where reviewer/editor opinions are Reject/Major Revision or Major Revision/Accept. This indicates a bias towards acceptance with invited manuscripts. The difference may be due to the difference in scope between a Special Issue and a general issue. However, permanent editors need to consider whether accepted manuscripts are within a journal’s scope.

Scenario 3 – Open Calls vs Invited Manuscripts
Figure 3 compares a Special Issue with an Open Call for papers on Journal A with one where submissions were pre-screened and then invited. Figure 3 shows a peak which is lower than Journal Total in the Open Call near a Reviewer Rigour score of 0. The lower peak indicates less agreement between Guest Editor and reviewers. The higher level of -3 scores represent a greater number of instances were the reviewer recommended acceptance but the Guest Editor rejected the manuscript.

On one level, this is reassuring in that the higher Acceptance Rate (88%) is not caused by lower standards but raises a concern that manuscripts Rejected by the Guest Editor may have been suitable for transfer to a General Issue. For the Invited Call, there were more cases where Reviewer Rigour was +1 to +2 which occurs where reviewer/editor opinions are Reject/Major Revision or Major Revision/Accept. This indicates a bias towards acceptance with invited manuscripts. The difference may be due to the difference in scope between a Special Issue and a general issue. However, permanent editors need to consider whether accepted manuscripts are within a journal’s scope.

Conclusion
This strong agreement tool is shown to identify changes and differences in reviewer rigour. It highlights situations where the scope of Special Issues may cause weaker understanding between reviewers and editors (Scenario 3) as well as verifying rigour after major changes in practice (Scenario 4). It has potential to be a powerful Quality Assurance tool for the everyday managing editor with applicability to all editorial offices.

Limitations
The Reviewer Rigour score does not provide a direct measure of peer review rigour but rather compares editor and reviewer preferences and can provide a fingerprint for the variations that are to be expected between reviewer recommendation and editor decisions. The tool does not work at an individual manuscript level but across situations such as individual editor’s workflow, Special Issue submissions or changed journal practices.

Practical Implications
- Identify causes of variations in acceptance rates (e.g. Scenario 3)
- Fingerprint journal’s editor/reviewer agreement (e.g. Scenarios 1 and 4)
- Confirm the quality of editor decision-making (e.g. Scenario 2)
- Confirm the quality of reviewer selections (e.g. Scenario 4)

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