

Is your graphic worth a thousand words? Considerations and approaches for visualising qualitative meaningful change in patient-reported outcome measures (PROMs)

Helen Kendal¹, Joel Sims¹, Julia Stein¹, Verity Smith¹, Brad Mason¹, Megan Mayhew¹, Katie Frampton¹, Holly Harris¹ and Adam Gater¹

¹Adelphi Values Patient-Centered Outcomes, Bollington, Cheshire, United Kingdom.

BACKGROUND AND AIMS

- > Exploration of **meaningful change (MC)** is critical for **interpretation of scores for patient-reported outcome measures (PROMs)** and determining the benefits of medical interventions on how patients feel and function.
- > Qualitative data (e.g., from interviews) can be valuable for informing definitions of MC and obtaining an in-depth understanding of **patient perspectives on MC**.¹
- > Visualisations can allow for clear and **impactful depiction** of qualitative data, helping audiences to better **contextualise qualitative responses**. Some guidance is available for visualising PROM data.²⁻³ However, there is **limited guidance** and precedence within the published literature for **visualising qualitative MC data**.
- > Here, we aim to **identify existing approaches and provide recommendations** to visualising qualitative MC data.

METHODOLOGY

- > A **targeted literature review** was conducted.
- > Key word searches (e.g., ‘**meaningful improvement**’, ‘**interview**’) were used to identify articles related to qualitative MC research for PROMs.
- > Records which referred to both **MC exploration of PROMs** and **qualitative research** methodologies (e.g., interviews, focus groups) were shortlisted for full-text review.

Targeted literature review: Results

- > N=26 articles were identified for full text review (Figure 1).
- > N=18/26 (69.2%) publications exploring qualitative MC did not include visualisations,^{1, 4-20} potentially indicative of a lack of published guidance regarding the value and best practices for visualisation of qual MC data.
- > N=8/26 (28.6%) publications including visualisations of qualitative MC were identified (Figure 2).²¹⁻²⁸
 - There was variation in data visualisations, with articles presenting summaries of data from both participant level scores and group averages.
 - Most articles (n=6/8, 75.0%), presented visualisation at PROM item-level, with fewer articles visualising scores on a domain/total-score level (n=2/8, 25.0%).

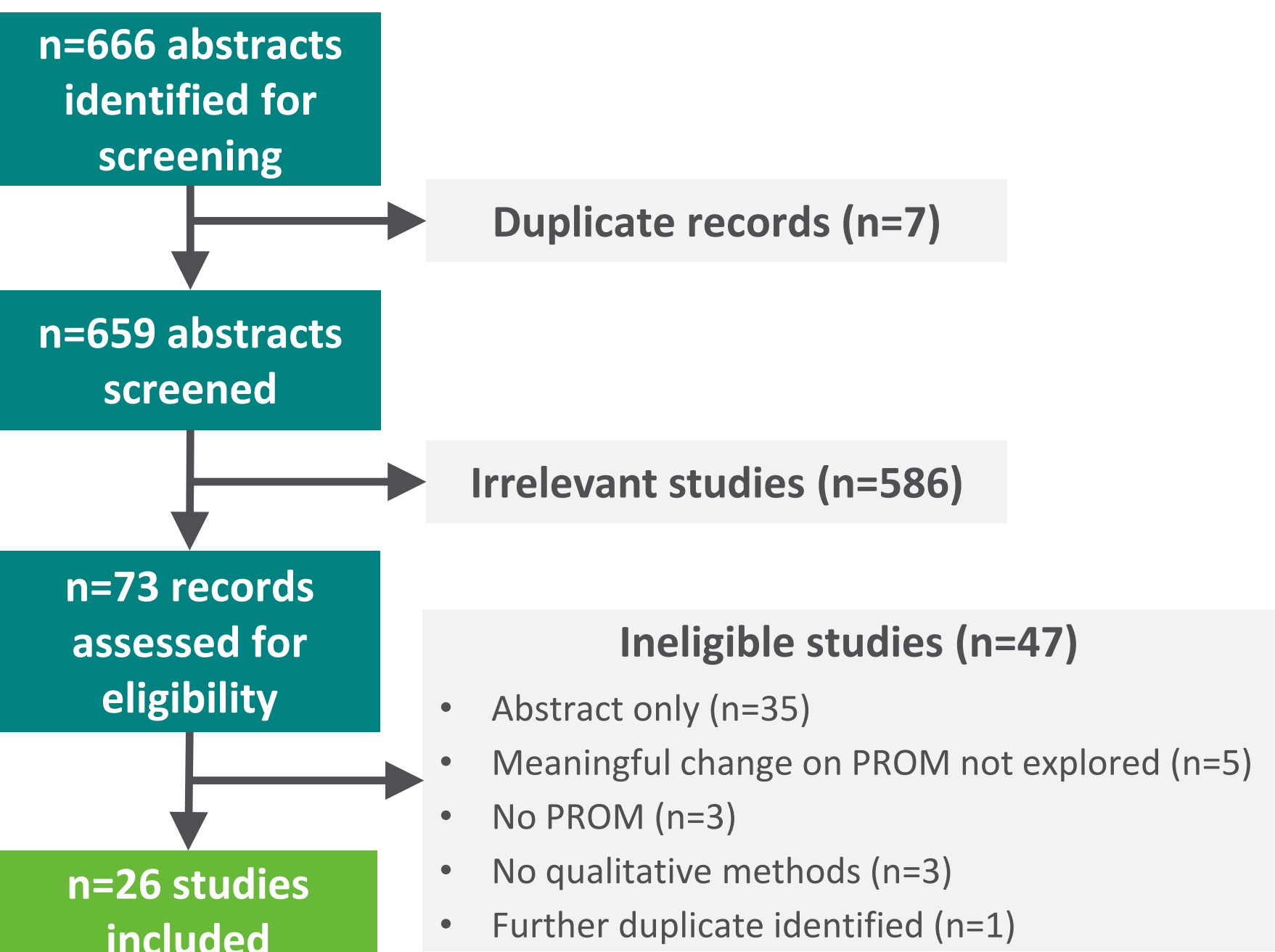


Figure 1. PRISMA-style diagram of studies selected for extraction of qualitative meaningful change visualisations

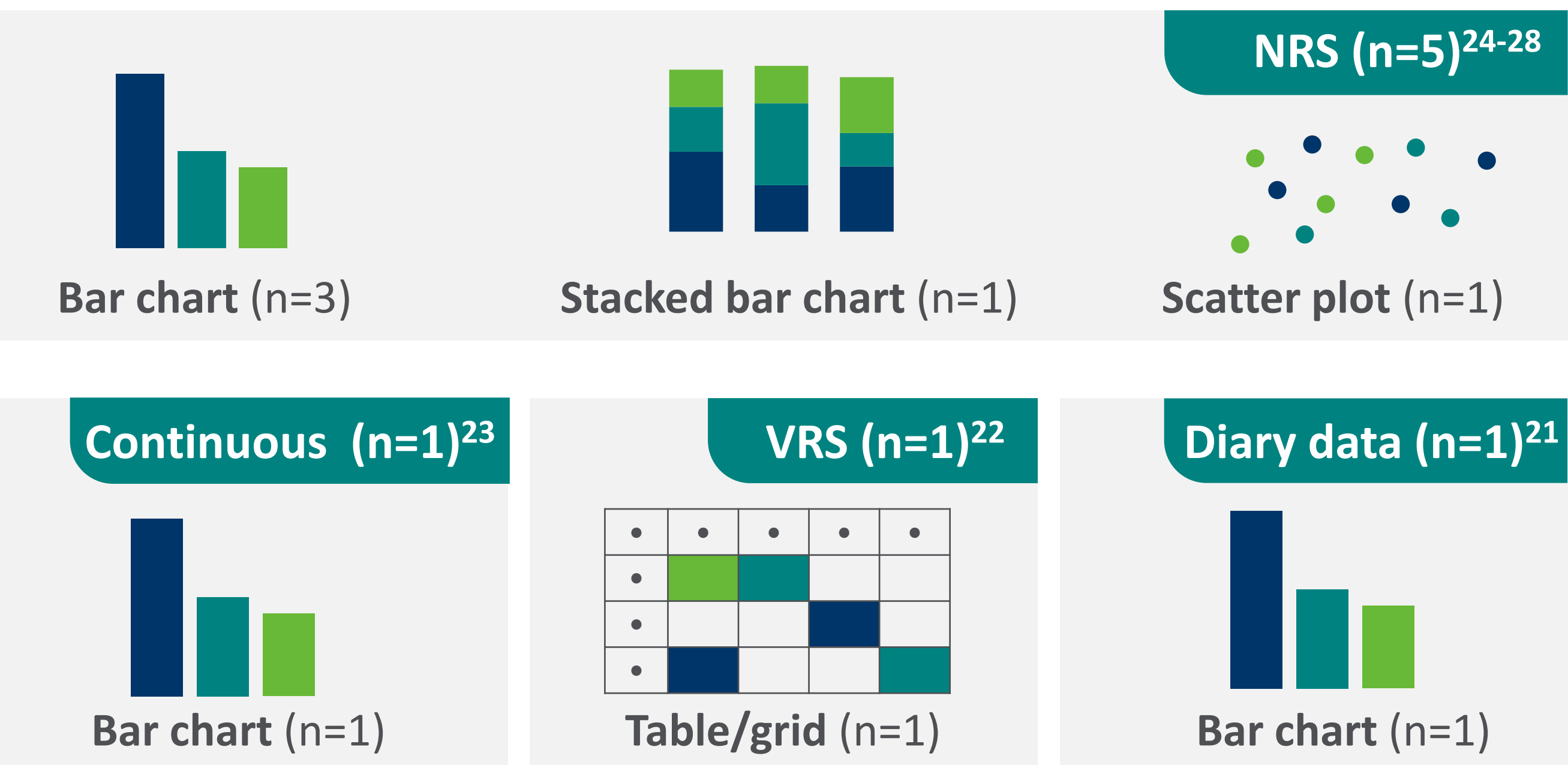


Figure 2. Existing visualisations for MC identified in reviewed literature
VRS = verbal response scale, NRS = numerical response scale

Considerations and recommendations for visualisations

ALIGNMENT WITH RESEARCH AIMS

- > Qualitative MC studies typically focus on **understanding MC at the individual participant level**. Therefore, informative visualisations should aim to avoid presenting data summarised at the group level only.
- > Qualitative MC studies often aim to **support and inform development of MC thresholds**.
 - Absolute **change in score considered meaningful** for each participant should be easily ascertained from the visual.
 - Assessment of individual variability is important to help determine if a **single meaningful change threshold would be appropriate across individuals**. Most importantly, is there a relationship between starting score and changes considered meaningful?
 - For multi-item measures, assessment of item-level variability is important to help determine if a **single meaningful change threshold would be appropriate across items**.

CHARACTERISTICS OF THE DATA

- > The **type of data** (ordinal vs continuous; item vs score-level) and **sample size** can inform the most suitable visual.
- **Lollipop charts** (A) can be used to present MC at an individual participant level in small sample sizes and where there are a small number of discrete response options.
- **Heat maps** (B) can be used in larger sample sizes to help visualise consistency of MC estimates across items and/or participants with respect to starting score.
- **Stacked bar charts** (C) can alternatively be used in larger sample sizes to visualise MC across items and/or participants.
- **Scatter plots** (D) can demonstrate trends for medium to large sample sizes and when dealing with continuous data where more individual variability in responses is anticipated.
- **Dot plots** (E) can be used with medium and large sample sizes to demonstrate MC across items.

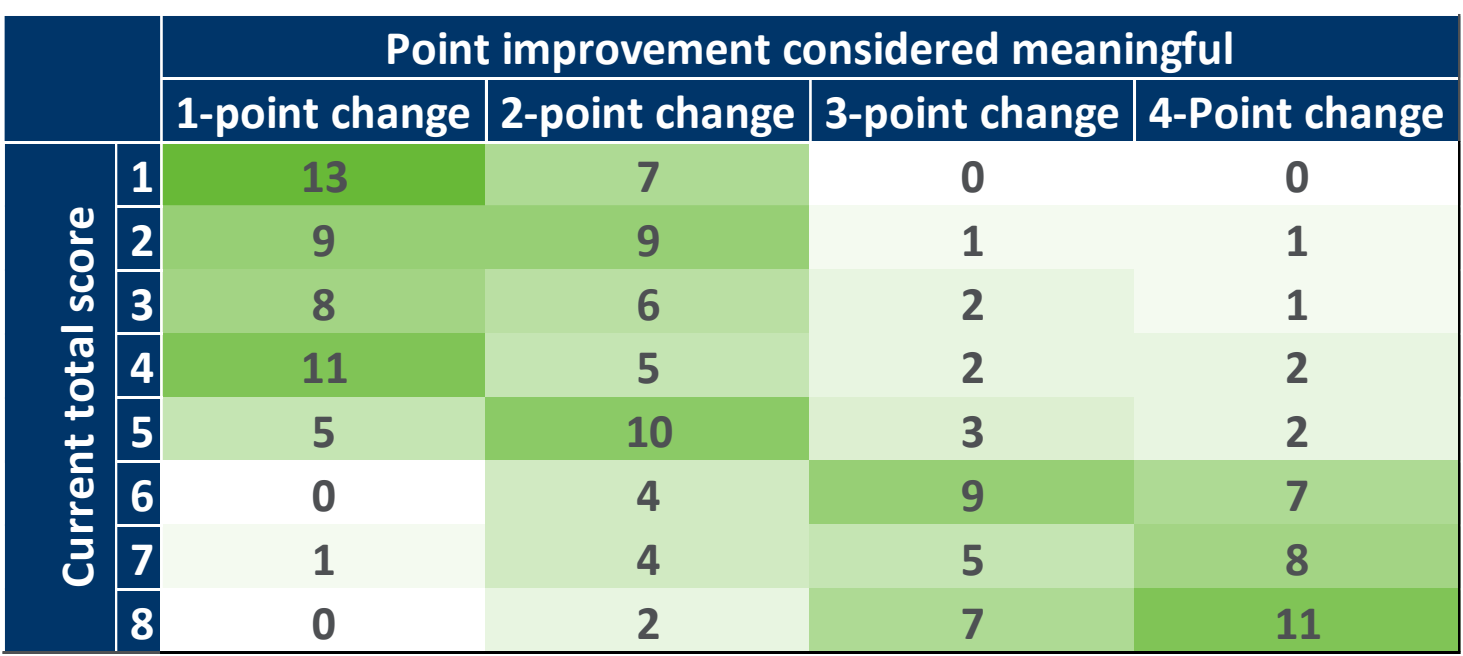


Figure B. Heat maps are ideal for assessing meaningful change in **ordinal data** with a **medium to large sample sizes**. Rows can either present different items, to assess consistency across items or (as in this example) participant starting score, to assess consistency across individuals. Numbers within cells refer to the number of participants reflected by the colour luminance, allowing for easy identification of trends. Here we see that point improvement considered meaningful is higher for participants with greater starting scores.

Ordinal data

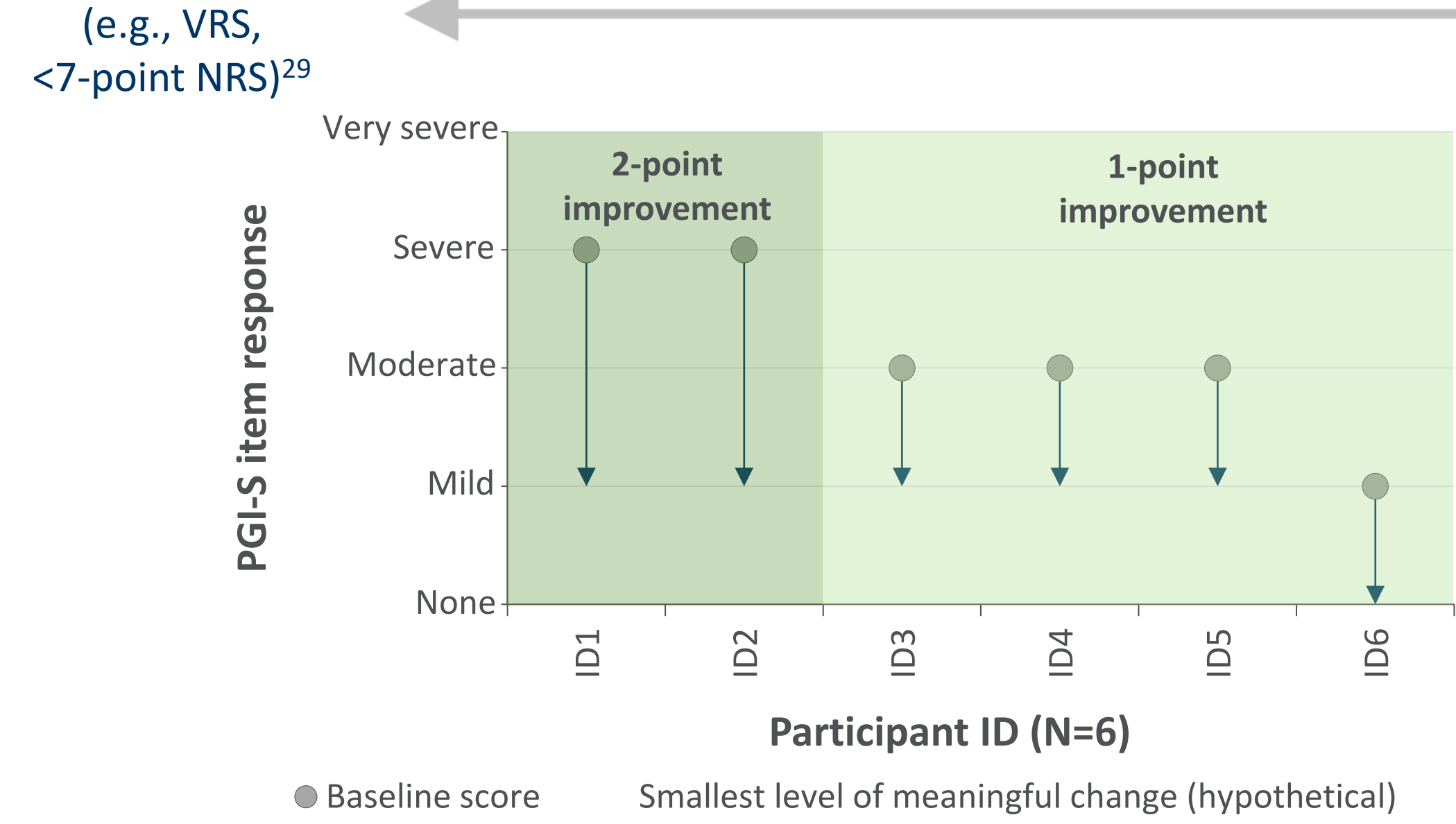


Figure A. Lollipop charts are ideal for assessing meaningful change of a **single score** (single item or total score) in **ordinal or continuous data** with a **large sample size**. Individual participant data is plotted as a unique pairs of points so we can identify **variability across participants**, including trends related to current score. Length of ‘lollipop’ depicts point improvement considered meaningful with current score.

Large sample size

(e.g., n>15)

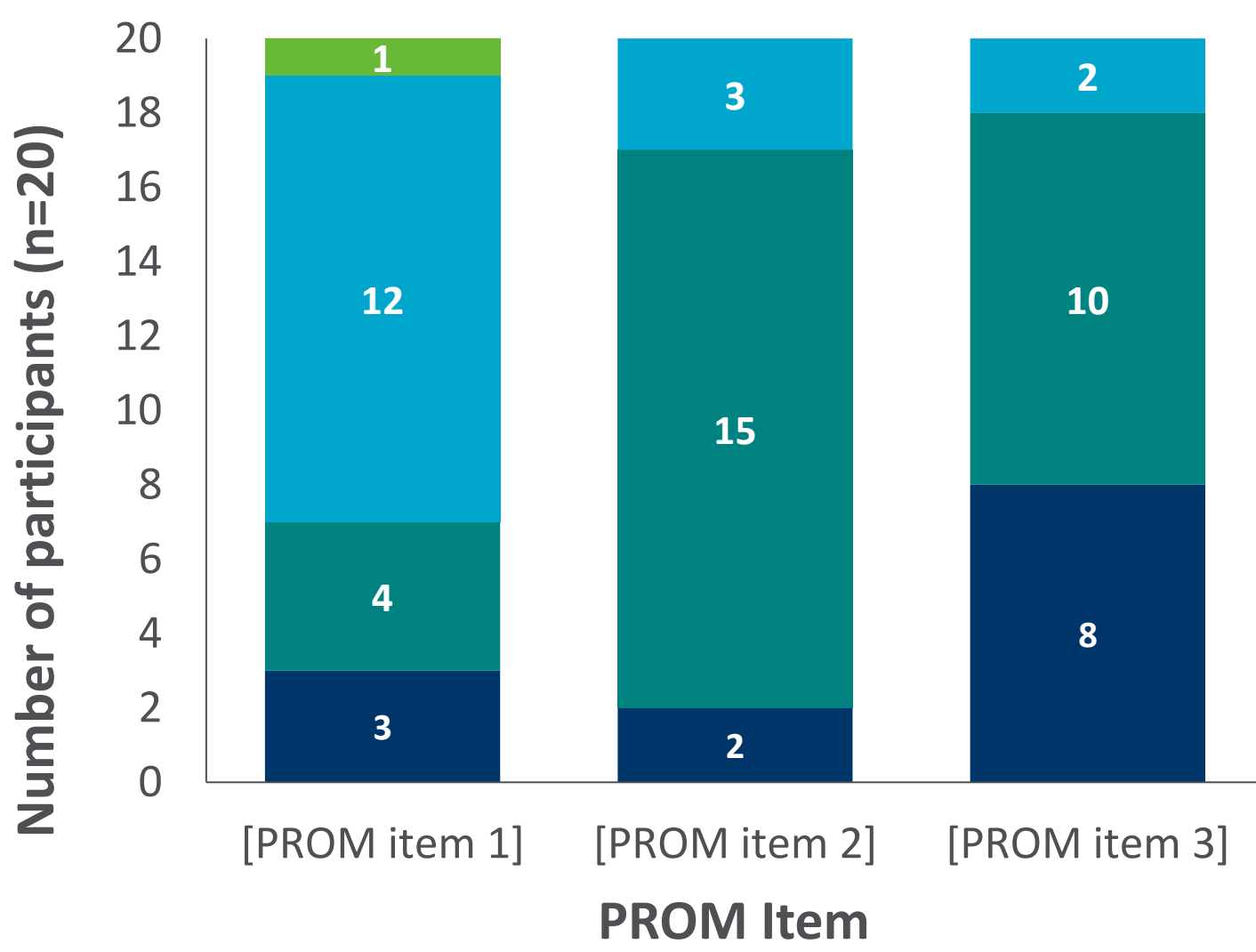


Figure C. Stacked bar charts are ideal for assessing meaningful change in **ordinal data** with **medium to large sample sizes**. Columns can either present different items (as in this example), to assess consistency across items or participant starting score, to assess consistency across individuals. Here we see that point improvement considered meaningful is mostly higher for Item 1.

Small sample size

(e.g., n≤15)

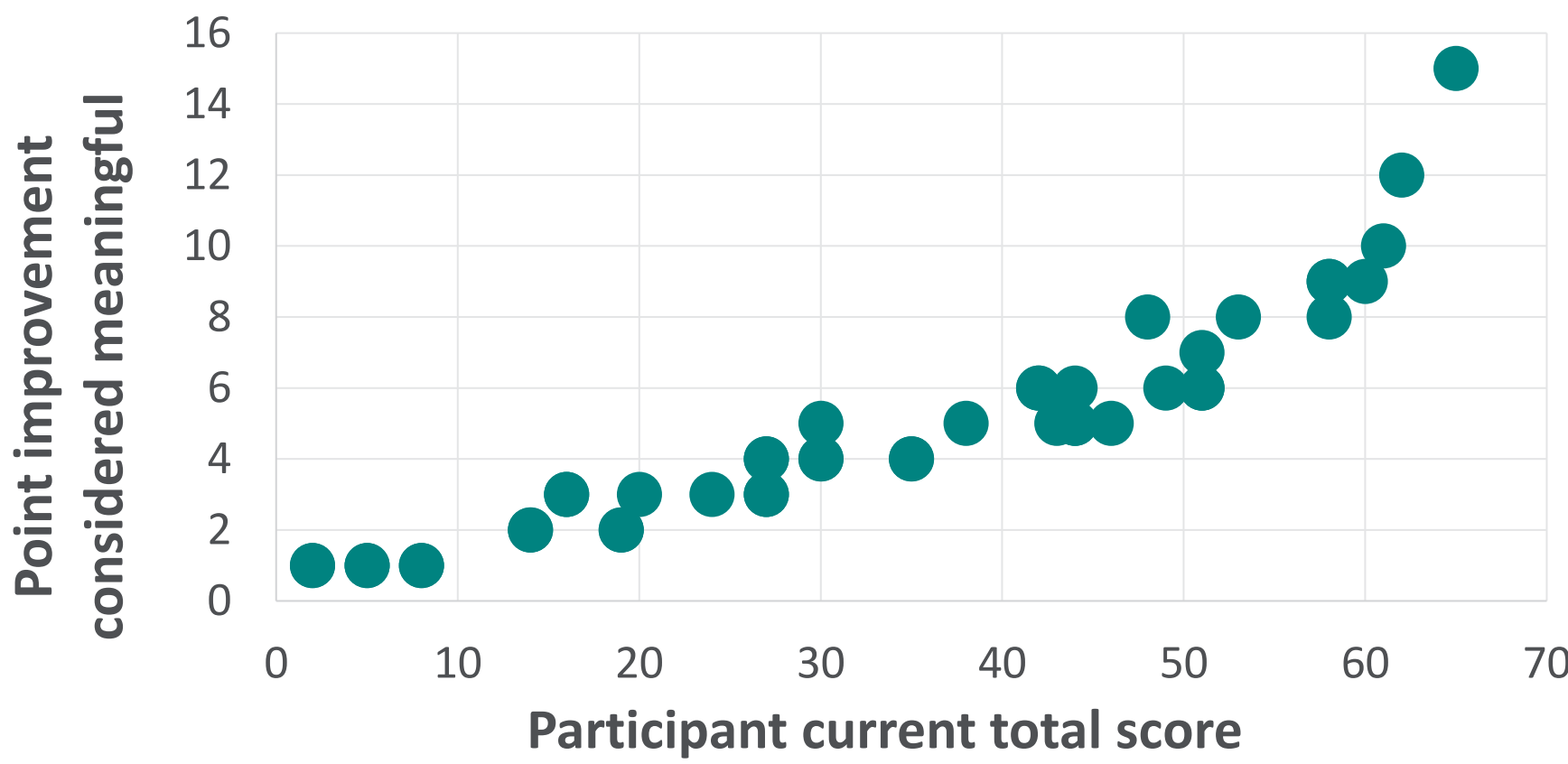


Figure D. Scatter plots are ideal for assessing meaningful change of a **single score** (single item or total score) in **continuous data** with a **large sample size**. Individual participant data is plotted as a unique point so we can identify **variability across participants**. Here, we see that point improvement considered meaningful is higher for participants with a larger starting score.

Continuous data

(e.g., 100-point NRS, total scores)²⁹

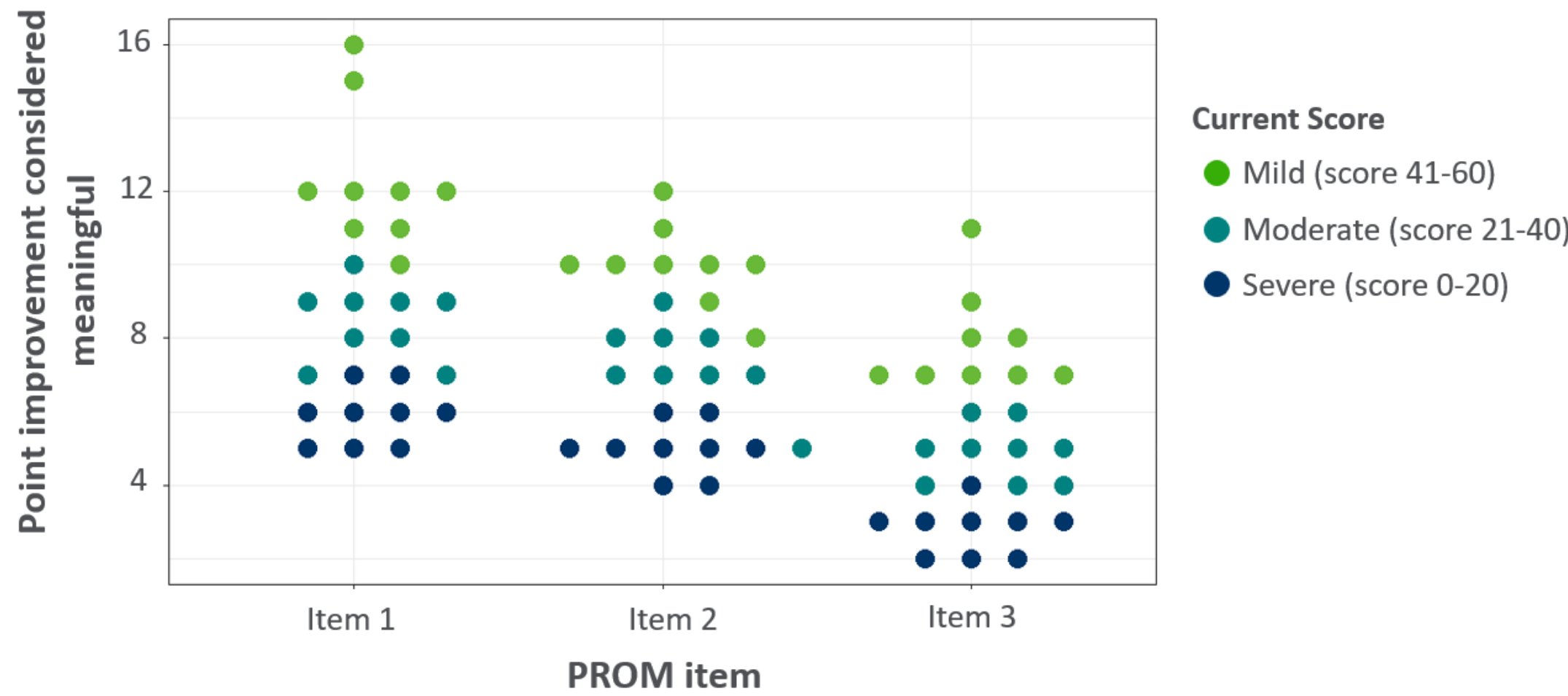


Figure E. Dot plots are ideal for assessing meaningful change **across items** in **continuous data** with a **medium to large sample size**. Individual participant data is plotted as a unique point so we can identify **variability across participants**. Colour has also been used to depict trends in MC with starting score. Here, the clear grouping of colours with milder (green) scores higher on they y-axis means that point improvement considered meaningful is higher for participants with a larger starting score.

Conclusions and further considerations

- > Visualisations allow for clear and impactful depiction of qualitative MC data, allowing the reader to better contextualise qualitative responses.
- > Despite this, only a few articles from the existing literature employed visualisations to supplement their qualitative findings, and all utilising very different methods, supporting the need for greater guidance for qualitative MC data visualisation.
- > Presented are several different options for visualisation, considering research aims and the characteristics of the data. Further considerations should be made to ensure that qualitative data is not being overquantified (i.e. by presenting group averages or trendlines) and general visualisation standards are being met.

References

