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ENGAGING INTROVERTS AND EXTROVERTS IN CLINICAL STATISTICAL PROGRAMMING TEAMS

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ABSTRACT

Clinical statistical programming depends on people who translate specifications, question assumptions, resolve data discrepancies, review outputs, communicate risk across study teams, and document decisions. Meetings centered on rapid verbal exchange may not give every participant an equally useful way to contribute. This review examines research on introversion and extraversion at work, meeting design, participation channels, psychological safety, employee voice, and group ideation. A focused, non-systematic search of scholarly publisher pages and PubMed-indexed records was conducted using terms related to these topics; selected sources were synthesized thematically. The reviewed evidence suggests that advance communication, agendas, written and spoken contribution channels, psychological safety, and structured idea generation may support participation. However, most evidence comes from general workplace or virtual meeting settings, and the full set of practices has not been evaluated in clinical statistical programming teams. Based on this synthesis, the paper presents eight meeting practices and an illustrative 45-minute specification-review agenda. The framework is intended for local adaptation; it is not a validated intervention and does not establish effects on programming quality or regulated deliverables.

Keywords: Introversion; Extraversion; Clinical Programming; Statistical programming; Team Communication; Inclusive Meetings; Psychological Safety; Employee voice; Workplace inclusion

1 INTRODUCTION

Clinical statistical programming is interdependent work. A programmer may identify an ambiguity in a derivation, a reviewer may notice a pattern in a listing, and a study lead may know that an interpretation depends on protocol intent. Meetings help teams surface and resolve these questions before they create rework or undocumented decisions. Their value depends partly on whether relevant information and concerns can enter the discussion in time to be considered.

Meetings that rely on spontaneous verbal participation can make rapid responses especially visible. A participant who prefers time to think, contributes in writing, or is less comfortable speaking in a large group may contribute differently. Introversion and extraversion are broad, continuous personality dimensions; they do not divide people into two fixed groups or predict behavior in every situation (Widiger and Crego 2019). Work role, familiarity, language, seniority, accessibility, meeting size, and psychological safety also shape participation. Facilitators should not infer competence or motivation from speaking frequency or require people to disclose a personality label.

This review connects research on personality at work and workplace meetings to a practical question: how can clinical statistical programming teams structure meetings so relevant input can be shared through more than one channel? It summarizes evidence, identifies its limits, and translates findings into a practical framework. The recommendations are intended for adaptation, not presented as a proven intervention.

2 REVIEW APPROACH

A focused narrative search was conducted on 31 October 2025 using targeted searches of scholarly publisher pages and PubMed-indexed records. Search concepts included introversion and extraversion at work, workplace inclusion, meeting effectiveness, written and verbal meeting participation, psychological safety, employee voice, and brainstorming or group ideation. Sources were selected for their relevance to one or more of these themes and for their ability to inform practical meeting design. This was a purposive narrative search, not a systematic or scoping review: it did not use exhaustive database searches, duplicate screening, formal study-quality ratings, or a screening flow diagram. The evidence discussed below therefore should not be interpreted as a complete inventory of all relevant research.

3 EVIDENCE RELEVANT TO MEETING PARTICIPATION

3.1 Personality is one influence among many

Workplace research on introversion uses varied definitions and measures. A systematic literature review by Herbert et al. (2023) describes strategies proposed to support introverted employees, while also noting limitations in the evidence base and a need for more research in real workplace settings. The broader personality-at-work literature likewise treats personality as one part of behavior in context, rather than as a complete explanation of how an individual will act in a particular situation (Ritz et al. 2023).

For meeting design, this means that a quiet participant should not automatically be treated as an introvert, disengaged, or lacking expertise. The same person may prefer advance preparation in one meeting and active verbal discussion in another. A fairer default is to offer multiple contribution routes and let participants choose what fits the task and their preferences.

3.2 Meeting design before, during, and after the meeting

Meeting research identifies practices that shape participation across the meeting lifecycle. Mroz et al. (2018) review evidence on activities before, during, and after meetings and emphasize the role of meeting design. In a large survey and follow-up measurement effort, Cutler et al. (2021) reported associations between meeting inclusion or effectiveness and factors including advance communication, agendas, post-meeting summaries, meeting size, and participant location. These are associations from general workplace and remote-meeting settings; they do not prove that any one practice will improve clinical programming outcomes.

Research on meeting participation also suggests that having a clear purpose and a process for considering contributions matters. An agenda can help participants prepare and keep discussion connected to the decision at hand. A written summary can preserve the rationale and next steps for people who contributed verbally, in writing, or after the meeting.

3.3 Psychological safety and speaking up

Psychological safety describes a shared belief that a team is safe for interpersonal risk-taking, such as asking a question or raising a concern (Edmondson 1999). Employee voice research also links inclusive leadership with employees' willingness to speak up, although results from a study of employees and supervisors in UK cargo companies cannot be assumed to transfer directly to clinical programming teams (Younas et al. 2023).

A facilitator can invite questions and dissent, but the response to those contributions also matters. If a concern is dismissed or treated as a challenge to authority, future participants may stay silent. Meeting practices should therefore pair explicit invitations with respectful follow-up and a clear record of how questions were resolved.

3.4 Written and spoken channels and group ideation

Virtual meeting research has examined chat and verbal participation as distinct channels. Kreamer et al. (2024) found that participation patterns varied with individual and status characteristics, including gender and job level. The study supports considering written chat as a participation route, but it does not establish that chat use is a proxy for introversion or that the same patterns apply to in-person clinical programming meetings.

Group ideation research offers another relevant, but bounded, finding. In brainstorming experiments, interactive groups produced fewer ideas than the same number of people working individually in some conditions; production blocking was one proposed explanation (Diehl and Stroebe 1987). This supports testing brief individual reflection before discussion when the goal is to collect possible explanations. It does not imply that discussion should be eliminated or that the finding automatically generalizes to specification review.

3.5 Relevance and evidence gap for clinical statistical programming

Clinical statistical programming meetings have specific purposes: interpreting specifications, assessing discrepancies, reviewing outputs, and assigning follow-up within controlled processes. The sources reviewed here offer useful principles for structuring participation, but they largely come from organizational psychology, general workplace meetings, or virtual collaboration. They do not validate a complete meeting protocol for regulated clinical statistical programming. The practical framework below is therefore an evidence-informed application of general findings, not an industry standard or demonstrated quality-control intervention.

4 EIGHT PRACTICES FOR TEAM LEADS AND FACILITATORS

The following practices translate the reviewed evidence into actions for clinical statistical programming meetings. They are intended to create several legitimate ways to contribute while keeping discussion focused on the work.

- **Send the purpose and materials in advance.** State the decision or output expected, share relevant specifications or examples, and identify questions participants should consider. For a derivation review, provide the variable definition, source references, known edge cases, and a clear question such as "Which records should be excluded, and why?" Advance communication and agendas are associated with meeting inclusion and effectiveness in general workplace research (Cutler et al. 2021).
- **Begin with silent thinking.** Give participants two to five minutes to write observations before open discussion. Individual idea generation followed by discussion may reduce production blocking during idea collection (Diehl and Stroebe 1987). Treat the timing as a practical suggestion, not a validated threshold.
- **Use structured invitations.** Ask a specific question and invite input in a predictable order, such as a round-robin or role-based sequence. Make passing acceptable and provide an opportunity to return to the question later. The purpose is to make contribution possible without turning participation into a test of personality.
- **Support spoken and written channels.** Allow participants to speak, add a note in chat, annotate a shared document, or submit a follow-up comment. Read written contributions into the discussion when useful, and ensure they receive consideration. Research on virtual meetings supports treating chat as a distinct channel, while its results should not be generalized to every meeting setting (Kreamer et al. 2024).
- **Separate idea generation from evaluation.** For brainstorming or root-cause analysis, collect possible explanations first and compare them against evidence second. Use a short individual write, a structured sharing round, and then criteria-based review. This can help the group consider more than the first ideas raised, while keeping final decisions evidence-based.
- **Invite questions and dissent explicitly.** Use neutral prompts such as "What assumption have we not checked?" or "What evidence would change this decision?" Respond with curiosity before rebuttal. A psychologically safe climate supports interpersonal risk-taking, but a prompt alone cannot create that climate (Edmondson 1999).
- **Recognize contributions by their value.** Credit preparation, careful review, documentation, and follow-through as well as live presentation. Do not equate frequent speaking with ownership or expertise. Attribute a contribution only with the person's agreement and in accordance with team norms.
- **Close with a written decision and next step.** Summarize the decision, rationale, unresolved questions, owner, and due date. Send the notes after the meeting and provide a defined channel for corrections. Meeting summaries and advance communication are among the factors associated with inclusion and effectiveness in remote meeting research (Cutler et al. 2021).

5 ILLUSTRATIVE 45-MINUTE SPECIFICATION-REVIEW PROTOCOL

The following protocol is an author-developed example for a small clinical programming team reviewing a derivation or output specification. Adjust it to the complexity of the decision and the group size. It has not been empirically evaluated and is not a substitute for required review, approval, or documentation procedures.

Table 1: Illustrative 45-minute team meeting agenda to support inclusive participation in clinical statistical programming teams

Time	Phase	Facilitator action
0-5 min	Frame the decision	Restate the objective, scope, and expected decision. Confirm roles and note any constraints.
5-10 min	Think independently	Participants record assumptions, edge cases, and questions. Offer paper, chat, or shared-document input.
10-22 min	Collect perspectives	Use a structured round. Invite one observation at a time; allow participants to pass and return later.
22-32 min	Test the options	Compare interpretations against the protocol, specification, source data, and applicable standards. Ask what evidence is still needed.
32-40 min	Resolve or assign	Record the agreed interpretation, or assign an owner to investigate unresolved items. Do not force a decision when evidence is incomplete.
40-45 min	Close the loop	Read back the decision, rationale, owners, due dates, and documentation location. Invite written corrections after the meeting.

6 APPLICATION TO A CLINICAL PROGRAMMING WORKFLOW

Consider a team reviewing a discrepancy between a programmed result and the expected result for a planned analysis. Before the meeting, the lead shares the relevant specification, source-variable definitions, and a minimal example. At the meeting, reviewers first record possible explanations independently. The lead then collects observations in a structured round, including written comments, before the group evaluates each explanation against source records and the documented derivation. If the discrepancy remains unresolved, the meeting ends with an assigned investigation rather than a rushed consensus. A written summary records the decision or open issue, evidence reviewed, action owner, and next checkpoint.

This is an illustrative scenario, not an observed case or a report of tested outcomes. Teams should follow their controlled procedures for specifications, code review, issue management, approvals, and documentation.

7 LIMITATIONS AND FUTURE RESEARCH

This review used a focused, non-systematic search and may have omitted relevant research. The evidence base combines personality, organizational, and virtual-meeting studies with different populations, designs, and measures. Findings from those settings cannot establish that the proposed practices improve clinical programming quality, compliance, or deliverable accuracy. The eight practices and 45-minute agenda have not been validated as an intervention.

Future research could evaluate the usability and acceptability of these practices in clinical statistical programming teams, using an appropriate ethics review, voluntary participation, and measures defined before data collection. Studies should distinguish process indicators such as whether decisions and owners are documented; from outcomes such as decision quality or rework. Introversion or extraversion should not be inferred from speaking frequency or used to rank individual performance.

8 CONCLUSION

Research on personality at work, meetings, employee voice, psychological safety, and virtual participation offers several principles relevant to clinical statistical programming teams: provide context in advance, structure discussion, allow more than one contribution channel, respond respectfully to questions, and record decisions. The evidence reviewed here supports these practices as reasonable design choices, not as a proven intervention in regulated programming work. The framework and illustrative agenda provide a starting point for local adaptation and future evaluation.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Disclosure of conflict of interest

The author declares no conflicts of interest regarding this manuscript.

Disclaimer

The views are the author's own; no proprietary or confidential employer information is included.

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