Identifying phrases for psychological safety on a workplace design team

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For Oscarito and Briannanana

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Abstract

Psychological safety, or the "shared belief that a team is safe for interpersonal risk-taking," (Edmondson, 1999, p. 354) is linked to effective team learning, creativity, innovation, and team performance. Despite the central relevance of these factors to design in engineering and other fields, there is limited understanding of psychological safety in these fields. For example, no work to date has empirically identified concrete things that people on professional design teams might say to enhance psychological safety on these teams.

Responding to this gap in understanding, I studied 21 meetings of a 27-member design team developing an app for a client. With this research, I sought to identify things people said which align with theoretical definitions of psychological safety. To achieve this goal, I triangulated between several ethnographic methods including observations, interviews, and a survey of a team in the software development industry throughout the course of a project. I used thematic analysis to code transcribed recordings from meetings and interviews to identify and categorize phrases for psychological safety on this design team.

Five main categories of phrases (themes) emerged from the data: phrases to support others on the team, ask for help or support, model accountability, display vulnerability, and add structure. These include 7 sub-categories and 28 groups of phrases that team members used in these meetings that may correlate with psychological safety, such as phrases for offering to help team members with their tasks, validating team members and their contributions, inviting feedback or pushback, and admitting a mistake. Within each of these themes, I document specific observed phrases for psychological safety that team members used.

This work suggests other implications for influencing psychological safety in conversation on design teams. Some of the components of psychological safety, for example, were supported by a wider range

of phrases than other components. Being able to take risks was supported by the widest variety of phrases, whereas being able to make a mistake or feeling like your unique skills are valued were supported by the smallest variety of phrases. This suggests that there may be an opportunity for design team members to incorporate phrases that link to these less supported aspects of psychological safety. This work also suggests that design teams may benefit simply from members avoiding conversational behaviors that may be detrimental to psychological safety, like those that belittle team members, interrupt others, or show a lack of follow-through on promised actions.

For practitioners, this research suggests categories of phrases and natural-language examples that individuals on engineering teams may already be saying to contribute to psychological safety on design teams while also identifying areas for growth, such as expanding conversational contributions that show that team members' skills are valued and that people can make mistakes without negative consequences. It also suggests things to avoid doing and saying. These findings can be used both by design team members looking to foster psychological safety from the ground up as well as for engineering managers and leaders aiming to enhance psychological safety on their teams more broadly.

Theoretically, this work begins to fill a gap in the literature on psychological safety and engineering by exploring what professionals actually do and say that may link to team psychological safety. This work uncovers areas for further research, such as identifying the relationship between identified phrases and psychological safety, studying how the absence of certain behaviors and phrases may impact psychological safety, exploring the potential impact of client interactions on psychological safety, and considering the potential impacts of psychological safety on design projects.

Keywords: Engineering design, team dynamics, psychological safety, design teams

Introduction

The most pressing topics for engineers today are complex, ill-structured problems like engineering's Grand Challenges, which include societal issues such as making solar energy economical, restoring and improving urban infrastructure, and providing access to clean water (R. K. Miller, 2017; National Academy of Engineering, 2017). These problems require that engineers collaborate with other engineers and professionals like business experts, urban planners, or environmental scientists; most of today's engineering and design problems require interdisciplinary collaboration (Fiore et al., 2018; Hindiyeh et al., 2023; Jonassen et al., 2006).

It is not, however, enough to simply assemble an interdisciplinary team. There is a growing body of literature that focuses on team effectiveness and performance in engineering (see Borrego et al., 2013; Hindiyeh et al. 2023; Takai & Esterman, 2017 for review articles). This and other literature on high-performing teams suggests that characteristics like team processes and interpersonal skills contribute to team performance (Cheruvelil et al., 2014; Takai & Esterman, 2017; Woolley et al., 2010). The processes and interactions that occur on these teams, or team dynamics, are important to understand because they directly impact team performance (Mathieu et al., 2008; Sheridan, 2018; Tonso, 2006), relate to other team characteristics like team creativity (Aggarwal & Woolley, 2019; Im et al., 2013), and influence individual factors for team members like sense of belonging (Meadows et al., 2015) and job satisfaction (Acuña et al., 2009).

One construct in team dynamics that has received increased attention in recent years is psychological safety. Psychological safety is the shared belief that a team is safe for interpersonal risk-taking (Edmondson, 1999, p. 354). The existing research in engineering and design suggests that psychological safety has the potential for positive impacts on design teams like better idea quality (Cole, Marhefka, et al., 2022), improved learning behaviors and knowledge creation (Cauwelier et al., 2016, 2019), and

higher job satisfaction (Lenberg & Feldt, 2018). Additional research in other fields suggests that it may also lead to enhanced team creativity and innovation (Andersson et al., 2020; Binyamin et al., 2018; Edmondson & Mogelof, 2005), which are critical in engineering and design.

Despite the established importance of psychological safety on teams and in the workplace, there has been limited empirical work on what might create psychological safety on teams. Edmondson and Bransby, in a recent review article, state that "the most glaring gap in the literature pertains to how to create psychological safety" (2023, p. 71). On engineering teams in particular, Cole et al. (2022) have suggested potential factors that may influence a team's psychological safety, such as communication, coordination, cooperation, composition, conflict, creativity, and cohesiveness. In this study, communication was the most frequently cited factor in a team's psychological safety. The importance of communication to the development of psychological safety has also been acknowledged more broadly, especially in the context of communication through conversation (Akan et al., 2020; Edmondson & Bransby, 2023). However, research has not identified what team members "can say and do in concrete terms" in conversation (Edmondson & Bransby, 2023, p. 72).

In this dissertation, I seek to address this gap by drawing on ethnographic methods, including observations, interviews, and a survey to understand what members on a design team are actually doing and saying that may contribute to the team's psychological safety. This research is conducted in the workplace with an industry partner. It contributes to the body of knowledge on psychological safety and design teams by suggesting conversational behaviors and specific phrases that design team members can incorporate that align with theoretical components of psychological safety.

Relevant literature

This work builds on research on engineering and design teams while drawing on constructs and theories from social psychology and organizational behavior. It also expands the research on psychological safety in the engineering workplace, where the topic has received limited attention.

Engineering and design teams

Educators and organizations have both recognized the importance of teamwork in engineering and design disciplines, and trends in engineering education and in engineering organizations have been towards increased teamwork (Borrego et al., 2013; Hindiyeh et al., 2023; Salas et al., 2015). Unsurprisingly, research on teams in engineering has increased with this focus on teamwork in engineering and design. For the purposes of this research, I refer to these teams as "design teams," where a design team is a group of people that work together to achieve a shared design goal. In this context, I use Simon's definition of design, where to design is to "devise courses of action aimed at changing existing situations into preferred ones" (1969, p. 55).

Teamwork in engineering and design is often developed through capstone senior design courses (Howe & Goldberg, 2019; Zhou & Pazos, 2014). However, teams in senior capstone design courses differ from teams in the workplace in that they are smaller and less interdisciplinary than the teams that engineers work on in industry (Goda et al., 2004). Further, the problems addressed in capstone design courses are often less complex and dynamic than those encountered in the workplace (Jonassen et al., 2006; Salinas & Sanders, 2022). These differences are important because they suggest that teamwork experiences in undergraduate engineering education are not entirely reflective of experiences of teamwork in the workplace (Jang, 2016; Jonassen et al., 2006). Research on design teams must therefore occur in both educational and organizational settings. By studying a workplace team, this work contributes to the body of research on engineering and design teams in industry.

Psychological safety

The construct of psychological safety is based on work related to organizational change by Schein and Bennis (Edmondson, 1999; Schein & Bennis, 1965). It was later considered by Kahn in research on engagement at work where psychological safety was linked to personal engagement at work (1990), and it was further popularized by Edmondson's (1999) seminal work. Psychological safety is a team-level construct that is defined as "the shared belief that the team is safe for interpersonal risk-taking" (Edmondson, 1999, p. 354). An individual working on a psychologically safe team feels comfortable sharing their opinions, being themselves, voicing a concern, or admitting a mistake without fear of reprehension from team members (Edmondson, 1999, 2019). Edmondson's original work on psychological safety involved a mixed methods field study to study team learning behavior; team psychological safety was introduced in this work and was found to impact team learning behavior, and through learning behavior, team performance. Edmondson characterized psychological safety as a group-level construct and developed and validated a 7-item Team Psychological Safety Scale, which is the most commonly used measure of psychological safety (Edmondson & Lei, 2014; Frazier et al., 2017). Edmondson specifically differentiates psychological safety differs from seemingly related team constructs like group cohesiveness and groupthink (Edmondson, 1999). Whereas group cohesiveness can reduce an individual's likelihood to share dissenting opinions, as in groupthink (Janis, 1982), psychological safety encourages voicing disagreement by creating a climate where team members feel safe taking interpersonal risks, like disagreeing with one another (Edmondson, 1999).

Psychological safety has since been studied extensively in the management and organizational behavior fields and has been linked to many beneficial outcomes including increased knowledge sharing (Siemsen et al., 2009) and learning behavior in organizations (Carmeli, 2007; Carmeli et al., 2009; Edmondson, 1999; Tucker et al., 2007), increased sense of belonging (Clark, 2020), enhanced creativity and innovation (Agarwal & Farndale, 2017), and improved decision quality and team performance

(Edmondson & Lei, 2014). It has mostly been studied in terms of its potential benefits, but recent work has begun to consider the potential limitations of psychological safety. Zhang and Wan (2021), for example, develop a framework for the benefits and downfalls of psychological safety; they suggest that when there is high variation among team member's perceptions of team psychological safety that there is the potential for dysfunctional team behaviors. This suggests that the strength and consistency of psychological safety on a team may be a boundary condition for any of the potentially benefits of psychological safety.

Psychological safety and engineering

Despite the extensive research on psychological safety in management and organizational behavior and the importance of related factors like creativity, innovation, and team performance to complex problem-solving in engineering, there has been limited work on psychological safety in engineering and design fields (Cole et al., 2020; S. Miller et al., 2019). Research in engineering has recently begun to consider psychological safety with much of the work focused on student design teams. Longitudinal work with student engineering teams has shown psychological safety to be a reliable measure for these teams (Cole, O'Connell, et al., 2022; S. Miller et al., 2019). Team psychological safety has been linked with team performance in capstone design (Takai & Bittorf, 2020), and was shown to have a very small positive predictive effect on effective teamwork (Wei & Ohland, 2021). Another team of researchers found psychological safety to be positively correlated with the quality of ideas generated by a team (Cole, O'Connell, et al., 2022). In the same research, Cole et al. explored factors like communication, coordination, and cooperation that might correlate with psychological safety on student design teams (2022), but their work does not suggest actions that individuals can take to positively impact those factors.

Work considering psychological safety in the engineering workplace is even more limited. This research has confirmed the link between psychological safety and team learning on engineering teams in the United States (Cauwelier et al., 2016), has shown that team psychological safety positively impacts knowledge creation in the engineering workplace (Cauwelier et al., 2019), and has found that psychological safety positively predicts team performance and job satisfaction on software engineering teams (Lenberg & Feldt, 2018). While these factors are important and relevant to engineering professionals, this work also lacks suggestions for building psychological safety in the workplace. The lack of research on how to build psychological safety is not exclusive to engineering and design disciplines; Edmondson & Bransby (2023) note that this is one of the biggest opportunities for future research on psychological safety, and this work begins to address this opportunity.

Conversation and psychological safety

An additional area for opportunity in psychological safety research has to do with the impact of communication, and especially conversation, on psychological safety (Edmondson & Bransby, 2023). The research considering psychological safety behaviors in conversation is limited (Akan et al., 2020; Edmondson & Bransby, 2023) despite researchers acknowledging the opportunity afforded by studying psychological safety through verbal communication (Newman et al., 2017). Edmondson & Bransby state "the microdynamics of conversations present an important understudied area in psychological safety research…we know less about what leaders and teammates can say and do in concrete terms" (2023, p. 72).

Psychological safety as a conceptual framework

Edmondson (1999) identified seven key components of psychological safety which are also a part of the Team Psychological Safety Scale. The descriptions below are adapted from the Team Psychological

Safety Scale. Items 1, 3, and 5 are reverse coded in the scale. For the purposes of this work, I have rephrased them to represent the positive characteristic, as indicated by the asterisk.

1. Mistake: If you make a mistake on this team, it is not held against you
2. Tough issues: Members of this team are able to bring up problems and tough issues
3. Different: People on this team do not reject others for being different*
4. Risk: It is safe to take a risk on this team
5. Help: It is not difficult to ask other members of this team for help*
6. Undermine: No one on this team would deliberately act in a way that undermines my efforts
7. Unique skills: Working with members of this team, my unique skills and talents are valued and utilized

This scale is the most commonly used measure of psychological safety (Edmondson & Bransby, 2023; Edmondson & Lei, 2014; Newman et al., 2017) and represents theoretical components of psychological safety. These components of psychological safety guided the data analysis phase of this work by informing the phrases, behaviors, and excerpts that were coded in the work and by guiding the themes that were subsequently identified.

Research methods

Research question

In this research, I seek to address gaps in the literature by identifying and categorizing phrases that individuals use that align with the theoretical components of team psychological safety. The primary research question I address with this work is: what do individuals say in the workplace that may promote team psychological safety on design teams?

Positionality and trustworthiness

Identifying one's positionality is important in research because it impacts a wide range of research decisions and assumptions, including the researcher's selected topic, epistemology, ontology, methodology, relationship to participants, and communication (Secules et al., 2021). Additionally, establishing trustworthiness in qualitative research is important for transparency and for others to assess the rigor of the work (Cope, 2014; Shenton, 2004). In this section, I outline my positionality and the strategies I employed to establish rigor and trustworthiness in this qualitative research.

Positionality

Due to the nature of qualitative research, my background plays a role in both conducting observations and interviews and interpreting the data in this study. I am formally trained in mechanical engineering, engineering management, and civil engineering with professional experience in mechanical and design engineering, but I have had very limited exposure to software engineering which is the focus of this work. I therefore bring an emic or insider view as someone who has been trained as an engineer and has worked on engineering teams. I also bring an etic or outsider view as someone who does not work at the partner organization and who is new to the organization's culture, clients, and sub-field of software engineering. I aimed to combine these insider and outsider lenses to be able to more quickly understand the engineering team processes that I was familiar with from past experiences while learning alongside participants about the team, the project, and the organization.

Given my background and training as an engineer, I may tend toward post-positivist paradigms where we expect a "real" reality or a definite "Truth", though I aim to combine pragmatist and constructivist approaches for this research where reality is locally constructed and influenced by our surroundings and environment. This allows me to attempt to understand individuals' realities, their interpretations of design team interactions, and their experience of working on the studied team.

Trustworthiness in qualitative research

There are four primary considerations for trustworthiness in qualitative research: credibility, transferability, dependability, and neutrality (Lincoln & Guba, 1985; Shenton, 2004). In this work, I incorporated methods to address each of these criteria, as summarized in Table 1.

Credibility

Credibility, or "truth value," is similar to internal validity in that it relates to "confidence in the 'truth' of the findings of a particular inquiry for the subjects with which and the context in which the inquiry was carried out" (Lincoln & Guba, 1985, p. 290). Approaches that contribute to credibility in this study include prolonged engagement, triangulation, peer debriefing, and member checks.

Prolonged engagement involves spending enough time in the field to understand the setting and the culture in the way that people in the environment do (Erlandson et al., 1993). In this research, I was involved with the partner organization from May 2022 through May 2023. Observations of the team that I worked with took place between October 2022 and February 2023, and additional follow-up with the participants continued through May 2023.

Triangulation can involve using different sources, methods, and analysts to draw conclusions (Denzin, 1978; Shenton, 2004). In this work, I use different sources by including observations of different types of meetings and interviewing multiple participants who held different roles on the team. I employed triangulation of methods by including data from observations, interviews, and a survey, and I incorporated analyst triangulation by working with a second coder during data analysis.

Peer debriefing "is the process of exposing oneself to a disinterested peer in a manner paralleling an analytic section and for the purpose of exploring aspects of the inquiry that might otherwise remain only implicitly within the inquirer's mind" (Lincoln & Guba, 1985, p. 308). I had regular peer debriefs with two

colleagues where we discussed progress and questions on this work and where I was able to get an outsider's perspective on my research.

The final method used to enhance credibility of this work was member checks, where findings are reviewed with participants to see if they make sense (Erlandson et al., 1993; Lincoln & Guba, 1985). The interviews with participants included some member checking where I probed on some initial findings. This technique is still in progress; I am compiling a shortened version of my findings to share with members of the team for review, feedback, and discussion following Birt et al.'s Synthesized Member Checking Process (2016).

Transferability

Transferability, or applicability, is similar to external validity in that it relates to "the extent to which the findings of a particular inquiry have applicability in other contexts or with other subjects" (Lincoln & Guba, 1985, p. 290). Approaches that contribute to applicability in this study include the use of direct quotes and thick description. Direct quotes require the incorporation of quotes from participants, which allow the reader to assess the data (Cope, 2014); these are included throughout the findings section. Thick description requires providing rich details regarding the research setting, participants, and themes (Creswell & Miller, 2000), which are included in following sections.

Table 1

Various strategies were incorporated to establish trustworthiness in this qualitative research

Qualitative Criteria	Definition (Lincoln & Guba, 1985, p.290)	Strategies incorporated	Analogous quantitative criteria
Credibility	Confidence in the "truth" of the findings of a particular inquiry for the subjects with which and the context in which the inquiry was carried out	Prolonged engagement Triangulation (of sources, methods, analysts) Peer debriefing Member checks	Internal validity
Transferability	The extent to which the findings of a particular inquiry have applicability in other contexts or with other subjects	Direct quotes Thick description	External validity
Dependability	Whether the findings of an inquiry would be repeated if the inquiry were replicated with the same (or similar) subjects in the same (or similar) context	Audit trail	Reliability
Confirmability	The degree to which the findings of an inquiry are determined by the subjects and conditions of the inquiry and note by the biases, motivations, interests, or perspectives of the inquirer	Triangulation (of sources, methods, analysts) Audit trail	Objectivity

Dependability

Dependability, or consistency, is similar to reliability and relates to "whether the findings of an inquiry would be repeated in the inquiry were replicated with the same (or similar) subjects in the same (or similar) context" (Lincoln & Guba, 1985, p. 290). Approaches that contribute to consistency or dependability in this study include a decision trail or an audit trail (Koch, 1994). This includes transparent documentation of data and decisions made through notes (Erlandson et al., 1993); the audit trail for this work focuses on methodological documentation and analytical documentation (Rodgers & Cowles, 1993) along with the raw data.

Confirmability

Finally, confirmability, or neutrality, is similar to objectivity and considers "the degree to which the findings of an inquiry are determined by the subjects and conditions of the inquiry and not by the biases, motivations, interests, or perspectives of the inquirer" (Lincoln & Guba, 1985, p. 290). Approaches that I used that contribute to confirmability in this study include an audit trail and triangulation (Guba & Lincoln, 1982; Lincoln & Guba, 1985; Tobin & Begley, 2004), as described above.

Sample & setting

All data was collected in collaboration with an industry partner: a mid-size software development and digital product company headquartered on the East Coast. My primary point of contact was the organization's director of research. I also worked with their chief diversity officer and vice president of human resources as needed, and I communicated with individual team members for meeting invitations and relevant information. This organization was selected for this research due to their organizational structure in which most work is completed on client-focused teams. This study was approved through the University of Virginia's Internal Review Board (UVA IRB-SBS #5466). Recruitment and consent materials can be found in the appendices. Participants had to opt in to this research, which may have

contributed to selection bias; it is possible that individuals with lower levels of psychological safety did not participate in this work. However, different individuals participated in different parts of this research, which partially mitigates this concern. Further, participants were required to opt in by signing a document through DocuSign, which presented a potential barrier for participation.

The team studied within the organization was selected due to availability and timing. I wanted to observe a team from start to finish, and this team was beginning their project at the same time that I was beginning my work. The project was initially planned to run from October 2022 through April 2023, but the client terminated the project early in February 2023. The team was developing an app for the client's retail employees to use to clock in and out, check shifts, view store goals, see personal pay information, among other tasks. For additional context, this team had a high psychological safety, with a team psychological safety score of 6.2 out of 7, based on a survey administered at the end of the project (n=16) using Edmondson's (1999) Team Psychological Safety Scale.

I classify this team as a product development team, which is a specific type of a design team. A product development team, or a new product development (NPD) team, is an interdisciplinary or cross-functional team with a shared goal of designing, creating, and testing a product and either bringing it to market or delivering it to a client (Ulrich & Eppinger, 2012). These teams are often interdisciplinary and fluid, with a core team and additional members joining and leaving as needed throughout the project (Bushe & Chu, 2011). The size of the team can vary from 3 or 4 people to thousands of people depending on the scope and scale of the project, and the project timelines similarly vary extensively depending on the project (Ulrich & Eppinger, 2012). Since the observed team was a fluid, interdisciplinary team tasked with developing and delivering an app to the client, they meet these definitions of a product development team.

Data collection

I collected data primarily through observations of a project team. I collected additional data through participant interviews and surveys, which contributed to credibility and confirmability through method triangulation (Denzin, 1978; Shenton, 2004).

Observations

I conducted direct observations of a single team from the start of their project in October 2022 to the project's completion in February 2023. There was a total of 27 team members throughout the project, and 17 of them agreed to having their contributions in meetings included in this research. Contributions from participants who did not provide consent were deleted from the transcripts. All observations were conducted via Zoom due to the dispersed geographic locations of myself and participants and the team's hybrid work schedule. Team members were located in various offices and worked on a hybrid schedule where employees were in the office on certain days each week and worked from home on other days each week.

Team meetings were audio-recorded for later transcription and coding. Video-recordings were not incorporated due to privacy concerns. Throughout the project, 21 meetings totaling 655 minutes (10 hours and 55 minutes) were observed. 11 of these meetings were fully virtual via Zoom, and 10 were hybrid, with some participants in a shared meeting room and others joining via Zoom; I did not observe any meetings that were fully in-person. These meetings were selected following a convenience sample approach due to the nature of the work; convenience sampling is frequently used when researchers have limited resources (Etikan et al., 2016). There were, for example, certain meetings that I was unable to attend due to prior commitments, and I was unable to observe meetings between the team and the client due to privacy and confidentiality concerns. Appendix A lists each details of each observed

meeting, such as the type of meeting, the date and time of the meeting, the length of the meeting, and the number of meeting participants.

There were 17 total participants in the observations. 35% of the participants were female (n=6) and 65% were male (n=11). Roles on the team included various levels of test engineers (n=4) and software engineers (n=6), senior product designers (n=2), an engineering director (n=1), a program director (n=1), a solution architect (n=1), a product architect (n=1), and a product researcher (n=1). Participant characteristics are summarized in Table 2, which includes participant's pseudonym, participation in each component of this research, department, gender, race, age, and work experience. Participants were given the option to select their own pseudonym (Allen & Wiles, 2016) or for me to randomly assign one, and their pseudonyms are used throughout this research. Some participants did not complete all parts of the study, so certain participant characteristics may be missing based on whether the individual participated in the phase of data collection when that information was gathered.

Observations of real meetings were used as the primary data source because they are helpful to understand "complex interactions in natural social settings" (Marshall et al., 2022, p. 155). Observations also allowed for the identification of things that team members actually said in the context of team meetings. The importance of qualitative research and observations is also recognized specifically in the context of psychological safety in the workplace. Edmonson & Bransby assert that qualitative research can "help understand the dynamics of fluid teams better" (2023, p. 72); they argue that "the original field research that generated this robust stream of literature [on psychological safety] owes its insights to observing and talking to people in natural work settings" and that "it may be that lack of access to such contexts is a loss to the field" (p. 72). Other reviews on psychological safety similarly emphasize opportunities for additional qualitative work on the topic (Newman et al., 2017).

Table 2

Participant characteristics including pseudonym, participation in each component of this research, role, gender, age, race, and work experience

Pseudonym	Observation	Survey	Interview	Department	Gender	Age	Race	Years in current position	Years work experience
Pete	x			Engineering	M	-	-	-	-
Cody	x	x	x	Engineering	M	40	White	0/Under 1	10+
SC	x			Engineering	F	-	-	-	-
Hotdog	x	x		Design	F	28	White	1	5 to 10
Panda	x			Engineering	M	-	-	-	-
Alison	x	x		Engineering	F	22	White	0/Under 1	0/Under 1
Nick	x			Design	M	-	-	-	-
Jeff	x	x	x	Engineering	M	39	White	3 to 5	3 to 5
Sam	x			Program management	F	-	-	-	-
Steven	x	x	x	Product management	M	42	White	1	10+
Daniel	x	x		Product management	M	43	White	0/Under 1	10+
Thomas	x	x		Engineering	M	38	Asian/Pacific Islander	1	10+
Winter	x	x		Product management	F	36	White & Asian/Pacific Islander	5 to 10	5 to 10
Zelda	x	x	x	Engineering	F	34	White	1	10+
Nathan	x	x	x	Engineering	M	32	White	1	5 to 10
John	x	x		Engineering	M	-	-	-	-
Bob	x	x	x	Research	M	32	Middle Eastern/North African	1	5 to 10
Alexa		x		Engineering	F	24	White	0/Under 1	2
Sofia		x		Product management	F	34	Black/African-American	1	10+
Matt		x	x	Program management	M	36	White	5 to 10	10+
Randy		x		Engineering	M	28	White	1	5 to 10

Interviews

I conducted semi-structured interviews with 7 team members in May of 2023. 12 participants indicated in the survey they would be willing to be contacted for a follow-up interview. I emailed all 12 of these individuals and 9 replied that they would be willing to participate in an interview. Two of these participants did not complete an interview due to scheduling conflicts. The interview protocol was piloted with 3 colleagues. See Appendix B for the complete interview protocol. Interviews varied in length from 34 minutes to 76 minutes with an average length of 50 minutes. One of the interview participants was female (14%) and the remaining 6 participants (86%) were male. One of the interview participants identified as Middle Eastern or North African (14%), and the remaining 6 participants identified as white (86%). The age of interview participants varied from 32 to 42 years with an average age of 36. Interview participants included 3 software engineers, 1 test engineer, 1 solution architect, 1 product researcher, and 1 project director. Additional information on participant characteristics can be found in Table 2.

Survey

I sent a survey out to the entire project team over email (27 total members over the course of the project) in February of 2023 once the project was terminated. 16 participants completed the survey. The survey included questions on psychological safety and demographics along with several other measures and open-ended questions. The survey was primarily used to collect demographic data and assess the team's psychological safety; other measures were exploratory due to the small sample size. The complete survey instrument and summary results can be found in Appendix C.

Data analysis

I coded the data with the help of a second analyst through thematic analysis (Braun & Clarke, 2006) using primarily inductive approaches, where the codes and themes were generated based on what

emerged from the data (Thomas, 2006). I selected thematic analysis because, compared to alternative qualitative methods, it allows for the coding of both observational and interview data (Terry et al., 2017).

Braun & Clarke outline 6 phases of thematic analysis: 1. Familiarizing yourself with your data; 2. Generating initial codes; 3. Searching for themes; 4. Reviewing themes; 5. Defining and naming themes; and 6. Producing the report (2006, p. 87). The primary source of data for this analysis was the team observations. Data from interviews and qualitative data from the survey were also incorporated; these were mainly used to validate or disconfirm findings from the observations.

Phase 1: Familiarizing yourself with your data

I began data analysis by listening to all of the meeting recordings, reading and updating the transcriptions from Otter.ai, re-reading the transcriptions, and noting initial ideas.

Phase 2: Generating initial codes

Once the transcripts were checked for accuracy, I loaded them into Dedoose (*Dedoose Version 9.0.106,* 2021), a software program for qualitative analysis. It is a straight-forward, low-cost program frequently used for collaborative coding in which users can highlight text and label it as a "code" and add "memos" that other users on the same project can then see.

Following typical qualitative research protocol, I brought on a collaborator to help generate codes and triangulate my findings. We applied an inductive, in vivo approach, where we used words directly from participants to generate our initial codes related to psychological safety (Saldaña, 2016). First, we each independently coded the same transcript, naming almost all the phrases and behaviors that could potentially relate to psychological safety. We then conducted a consensus building discussion to compare our interpretations and coding of the data (Saldaña, 2016). We took notes of the major

decision points (e.g., the “specific” code only applied when a person’s name was explicitly used) in an evolving document that ultimately informed our codebook.

We continued this process of consensus coding for two additional transcripts. I selected transcripts from different time points and different types of meetings to prompt more useful and comprehensive discussions on our interpretation and coding of the data. For each new transcript, we tried to minimize the number of new codes generated. We also made sure to make note of when we noticed new boundary conditions or potential overlap between codes. These discussions were highly generative, and we were able to gain clarity and specificity on initial codes.

The remaining transcripts were divided between the two coders. For all of the remaining transcripts, one coder first analyzed the data, then the other coder reviewed the coded transcript and made notes about any areas of disagreement. We discussed any disagreements until we reached consensus. Both coders independently took notes of questions and topics to discuss, and the codebook was updated throughout the analysis process based on these discussions. These notes along with notes from our consensus discussions contribute to the audit trail, which helps build dependability and confirmability of the findings. The codebook can be found in Appendix D.

Phase 3: Searching for themes

Once all of the data was coded, we began searching for initial themes, or “candidate themes” (Braun & Clarke, 2006). We began by creating a thematic map on Lucidspark and grouping codes together. We iterated on this process, and the two analysts discussed regularly until we achieved a set of candidate themes and sub-themes supported by the codes and relevant to the research question.

Phase 4: Reviewing themes

In this step, we refined our themes by merging, splitting, eliminating, and creating themes as needed based on the supporting data. There are two “levels” of reviewing themes. The first level requires

reviewing each coded excerpt that falls under each theme to determine whether there is a pattern. At the second level, the entire data set is considered to assess whether themes and interpretations represent the data.

Phase 5: Defining and naming themes

Once both analysts agreed that our data supported our themes and our themes represented the data, we defined and named the themes. This involves considering the relationship between themes and the overarching story of the data in addition to descriptions of each theme. Primarily inductive approaches were used to develop the themes; they were developed based on the data, though we as coders were likely influenced by our knowledge of the existing literature on psychological safety.

Phase 6: Producing the report

The main portion of analysis that occurs in phase 6 is the selection of excerpts that exemplify the themes and relate to the research question and grounding literature. The results of phase 6 are included in the Findings and discussion section below.

Findings and discussion

Five primary categories of phrases (themes) emerged from the data, along with 7 subcategories and 28 groups of things that individuals said in meetings that may promote psychological safety. For clarity, "categories" will refer to the top-level themes, "sub-categories" refer to secondary themes, and "groups" refer to tertiary themes; these are summarized in tables in each section. The findings suggest that some of the components of psychological safety were supported by a wider range of phrases (more categories and sub-categories) than other components. Being able to take risks was supported by the widest variety of phrases, whereas being able to make a mistake or feeling like your unique skills are valued were supported by the smallest variety of phrases. Thus, there may be an opportunity for design team members to incorporate phrases that link to these less supported aspects of psychological safety.

This work also suggests the importance of avoiding phrases that may undermine a team's psychological safety.

5 main types of phrases emerged

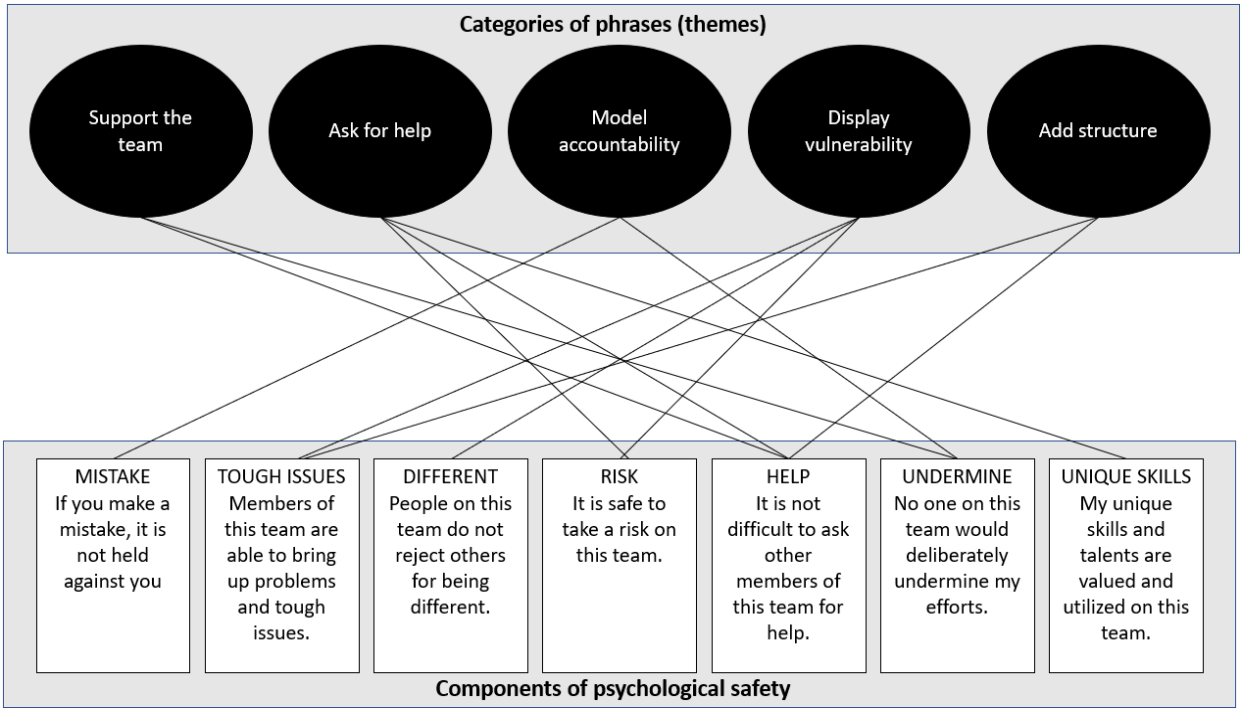
We identified 5 main categories of phrases relating to psychological safety that emerged from the data: phrases that 1. Support others on the team; 2. Ask for help; 3. Model accountability; 4. Display vulnerability; and 5. Add structure. Figure 1 shows how each of these categories of phrases connects to the components of psychological safety. Each of these categories, along with sub-categories and groups of phrases, are discussed with supporting quotations and example phrases. All of the quotations are taken directly from the participants, so there may be unfamiliar terms included. I have underlined the most important parts for clarity, and I retain other portions of the excerpt for context.

1. Support others on the team

Supporting others on the team is defined as expressing support for the team as a whole, for a sub-group of team members, or for an individual on the team. This includes sub-categories of phrases used to give feedback, to express team cohesion, to respond productively, and to be inclusive, and includes groups of phrases like volunteering your help or expertise, explaining the reasoning behind a decision, shielding the team from unrealistic expectations, delegating decision-making power to other team members, and being inclusive. This theme connects to aspects of psychological safety like ease of asking for help and the confidence that team members would not deliberately undermine one's efforts. Previous research also supports a connection between a supportive work context and psychological safety (Frazier et al., 2017; Wang & Hong, 2010).

Figure 1

Five main categories of phrases (themes) were identified that align with components of psychological safety



Offering help

One way that design team members supported others on the team was offering help. This proactively demonstrates that it is not difficult to ask other team members for help. For example, in one meeting, Bob shared:

> As for what else I'll be doing, I'm doing professional development today, because I'm very light on work. So if you have anything that I can help with, please come to me. Don't hesitate.

Other team members similarly offered their help when their workload was lighter. Alison, for example, said:

> I have like a relatively meeting free day today. So if anyone on the development side or test side wants to pair I'd be more than happy to do that. Just let me know.

This suggests that saying things to show your availability and openness to help team members may contribute to the team's psychological safety. Phrases to do this include "If you have anything that I can help with, please come to me" and "If anyone wants to pair, I'd be more than happy to."

Explaining why/providing context

Another way that team members supported others was by explaining the reasoning behind a decision or providing additional context on a task, decision, or request. This transparency supports other team members by helping them to better understand the situation and relevant factors that might influence their work. Take this exchange between Daniel and Hotdog, for example, where Hotdog provides her reasoning for excluding a particular feature from the app:

> *Daniel*: We feel confident that that is not necessary, correct?
>
> *Hotdog*: Yeah, the reasoning, so we had it at one point instead of your schedule, but like it's a January up at the top. The reasoning here is that you're looking at the current week and the next week. With the understanding that you probably know it's January without having to see it. Open to push back. But that was the reasoning there just because of the timeframe you were looking at, now to next week.

In another example, Sam provides the context for why she is asking about a specific task that the team is working on.

> All right. Cool. For kind of some why I'm asking we currently have it reported as we will be feature complete with schedule the end of sprint five. And I want to know if that doesn't sound accurate. So we can report that quickly to get it on CLIENT's radar.

Phrases to explain why or provide context include "the reasoning is…," "I'm asking because…," and "for some context…"

Protecting the team and delegating decision-making power

Other ways that participants supported the team included shielding the team from unrealistic expectations and delegating decision-making power to other team members. For example, Sam, who was the program director, shared how her goal was to "protect the team's time" and prevent them from "spending too much time on future ideation":

> My worry is since we are having to get to a place in January, that's far enough along that covers all the features like, I want to protect y'all's time to not spend too much time on the like future ideation.

Sam also explicitly states in another meeting that "my mission is to protect the team's time." In another example of protecting the team, Panda shares the need to "rein in their [the client's] expectations" regarding requested documents and the expected turnaround time.

Steven, who was the solution architect and was in a leadership role on the team, similarly shared in an interview how he would support the team by "making sure that the team was at times protected and defended, as well as just comfortable being able to voice their independent opinions."

Sam would also defer to others on the team. This is part of supporting the team, and it also connects to the aspect of psychological safety that an individual's unique skills and talents are valued and utilized; in deferring to other team members, Sam is demonstrating trust in their abilities.

> Yeah, I don't think they need the individual ones. I'll have to, I'll defer to y'all like on what's the easiest for today.

Sam does this again by expressing her confidence in Nick's plan for onboarding a new designer to the team when she says, "I deeply trust your like judgment on how to ramp up a designer on the team. But if you do need like extra eyes on it, feel free to send it over…whatever you're comfortable with."

Phrases to demonstrate that you will shield or protect the team are context-dependent, but may include terms or phrases like “protect,” “shield,” or “expectations.” Ways to defer to others include phrases like “I’ll defer to you on …” and “I deeply trust your judgment on …”

Support in interviews

Interview participants also discussed the importance of support to their psychological safety. When discussing the level of psychological safety on the team, Steven shared that he “felt like we always had support from our leadership.” On the other hand, Jeff shared that the manager he was working with on the project took a less supportive role than previous managers which detracted from his psychological safety on the team:

> I think one thing that came up in this project a little bit is that my, I was working with a new manager, who was way more passive than previous managers that I've had. And I perceived…I didn't feel like the protection, if that makes sense that a lot of the other managers have provided where like…Anyways, and so like, I felt like if something was really gonna go down, I've had managers in the past where they’d be like, I don't know a little more like mama bear towards the team. Yeah, and I don't feel that was the case in this project. So that might have played into some of my reactions or actions also, whereas like, I might have had a, some self-protection of that may not have been there in the past.

Groups of phrases discussed in this theme include offering your help to teammates, explaining why or providing context to the team, shielding or protecting the team, and delegating decision-making power. Table 3 summarizes these groups of phrases along with excerpts and sample phrases used by the participants for this category and sub-categories.

Table 3

Phrases to support the team included 3 sub-categories, 10 groups, and numerous sample phrases.

Category or sub-cat.	Group	Excerpt(s)	Sample phrases
Supporting others on the team	Offer help to team members when you have the capacity to do so	As for what else I'll be doing, I'm doing professional development today, because I'm very light on work. So if you have anything that I can help with, please come to me. Don't hesitate. (Bob) I have like a relatively meeting free day today. So if anyone on the development side or test side wants to pair I'd be more than happy to do that. Just let me know. (Alison)	If you have anything that I can help with, please come to me. If you want to pair up on work today, let me know.
	Provide additional context or information	Yeah, the reasoning, so we had it at one point instead of your schedule, but like it's a January up at the top. The reasoning here is that you're looking at the current week and the next week. (Hotdog) All right. Cool. For kind of some why I'm asking we currently have it reported as we will be feature complete with schedule the end of Sprint five. And I want to know if that doesn't sound accurate. So we can report that quickly to get it on CLIENT's radar. (Sam)	The reasoning for that is ____. I'm asking because ___. For some context, ____.
	Shield or protect the team	My worry is since we are having to get to a place in January, that's far enough along that covers all the features like, I want to protect y'all's time to not spend too much time on the like future ideation. (Sam) My mission is to protect the team's time. (Sam)	I want to protect your time. My mission is to protect the team's time.
	Delegate decision-making power	I'll have to, I'll defer to y'all like on what's the easiest for today. (Sam) I deeply trust your like judgment on how to ramp up a designer on the team. (Sam)	I'll defer to you on ____. I trust you to do ____.
Responding productively	Validating	That's a good question. Actually, I think we would probably still do it in order. But I can see what you mean. (Hotdog)	That's a good question. I see what you mean.
	Expressing appreciation	Thanks for asking the question. (Bob) I'm glad you brought it up. (Sam)	Thank you for ___. I'm glad you brought it up.
	Building	Okay, cool. What I like about that is it can give us a chance to catch up on like what we already know, like where we may have some questions we could get the business team beforehand. (Sam) But you know, like, yes, that makes sense. And like, these issues could arise rather than being like, no, that doesn't make any sense. (Nathan, interview)	What I like about that is ____. Yes, that makes sense, and ____.
Team cohesion	Expressing team cohesion	It's great, actually. I mean, I don't want to make it too vague. But on our side, I don't care who's in the meeting, because we work well together. (Hotdog)	We work well together.
	Sharing a common cause	Okay, so if that's helpful for our team, that's one discussion. And we can like, figure out how to make sure that you guys are getting what you need. But as far as like, what CLIENT requires...what we talked about yesterday was pushing them to make sure those API contracts in those in that documentation is exact. (Sam)	*Context dependent*
Being inclusive	Being inclusive	Real quick, I have one slightly embarrassing question NAME How do you pronounce your name? So to be sure I'm saying that right? (Nathan) I know it's a little harder, especially with remote. (Zelda) I worry a little bit about the color blindness like if it's if it's just relying on color. (Hotdog)	*Context dependent*

1.1. Respond productively

Responding productively is replying to team members in a way that demonstrates that their contributions are valued. It is a behavior that Edmondson discusses in *The Fearless Organization* (2019) as a way to help create psychological safety, and I believe that it can impact psychological safety by showing that if you speak up, you will be heard and respected. It connects to the psychological safety component that it is safe to take a risk on this team because making a contribution on the team can be perceived to be a risk (Burris, 2012), and responding productively demonstrates that a team member will not be punished for speaking up. Similarly, it relates to the aspect that it is okay to make mistakes; by responding productively to a team member who has admitted a mistake, it demonstrates that the mistake won't be held against them. This sub-theme includes behaviors like validating, expressing appreciation, and building on the contributions of others.

Validating others and expressing appreciation

Validating and expressing appreciation are similar and involve recognizing or affirming the validity or worth of a person, their feelings or opinions and showing gratitude or thanks to the person or team. This can be done in a number of ways, like how Bob and Hotdog express appreciation after a back-and-forth discussion:

> *Hotdog*: That's helpful just for my general knowledge.
>
> *Bob*: Well thanks for asking the question.

In this conversation, Hotdog brings up a client request that has not yet been addressed:

> *Hotdog*: That was, I just, this was CLIENT at the beginning of the week was like, can you put the designs like link the designs in Jira. We were going to try to figure out a way to do that. And I don't think we came back to something for that.

Sam: I'm glad you brought it up, because, I'm, does it feel appropriate?

Validating or expressing appreciation can also be done in more simple ways like acknowledging a good question:

> That's a good question. Actually, I think we would probably still do it in order. But I can see what you mean. It could be a little, like wonky looking. (Hotdog)

Another simple approach for validating or appreciation is acknowledging something exciting that a team member did. For example, SC completed an update that she had expected to be challenging. After showing the update to the team, Hotdog replied "that's amazing…I'm glad that it's there, it's cool" and Zelda shared that "it looks great."

Similarly, Thomas expresses appreciation for Panda for helping complete a deliverable:

> We got an iOS build out yesterday. Thanks for Panda for looking into it. That was, that was great.

Phrases that can be used to validate others include saying things like "That's a good question," "I see what you mean," or "that was great/awesome/helpful." Phrases to express appreciation include "thank you for…" and "I'm glad you brought it up."

Building

Another group of phrasea included under responding productively is building, or connecting to and adding to something that another team member said. In this quote, Sam connects to something Hotdog had suggested and builds on it:

> Okay, cool. What I like about that is it can give us a chance to catch up on like what we already know, like where we may have some questions we could get the business team beforehand. So I will put that as, set up a follow up, like design feature requirement session.

In this case, the team is discussing a feature, and Nathan affirms what Hotdog said and adds to it:

> *Hotdog:* I thought it was helpful if it was data that was relevant to them, like if their manager did schedule that, but I guess we can remove it.
>
> *Nathan*: It feels like it would be useful in a future version of the app, if it's like, you haven't taken your break, but it's scheduled, like reminding them to do that.

In an interview, Nathan also mentioned this idea of building when discussing an example of something that team members did to help him feel psychologically safe:

> Some of the early meetings we had talked about, like, doing "yes, and" and those kinds of things…it's just a good was a good intro to like, how the team was going to work over the course of the project. Like, don't shut me down. But you know, like, yes, that makes sense. And like, these issues could arise rather than being like, no, that doesn't make any sense. Like, what you're saying can't be done or whatever. Like, instead of shutting down, like, yes, but or yes, and like this can happen. So like, let's also talk about the downsides of that rather than like, saying no.

Phrases that can be used to build include "What I like about that is…" and "That makes sense, and…"

Groups of phrases discussed in this subtheme include validating team members, expressing appreciation, or building on team members' contributions. Table 3 summarizes these, along with excerpts and sample phrases used by the participants.

1.2. Express team cohesion

Expressing team cohesion involves sharing one's confidence in the team or showing team unity in some way. Showing team cohesion connects to psychological safety because it supports the notion that you can trust the team and that no one on the team would deliberately act in a way that undermines your effort. In some cases, team cohesion was expressed explicitly, like when Hotdog stated "It's great,

actually. I mean, I don't want to make it too vague. But on our side, I don't care who's in the meeting, because we work well together." There were instances where this happened in a more social setting, too, like when Nick greeted the team after returning from parental leave: "Yeah, it's good to be back. Looking forward to getting up to speed. I missed you guys" or when Zelda welcomed folks back at the start of the new year: "Welcome back, those of you who were on PTO. I know I missed a lot of people." Phrases like "we work well together" and "I missed you guys" can be used to express team cohesion.

In other cases team cohesion was shown through a sort of "us vs. them" mentality, which I'll refer to as "common cause." This occurred in situations where the internal team at the organization was presenting a united front toward the client, like in this discussion where the team is discussing a meeting to make a decision on a feature requirement:

> *Nathan:* I think for like this one I'm thinking that for this screen like we can just kind of make a decision on how like we had wanted to be able to scroll the top and the like horizontally and vertically here on the two different sections. And we either need to make some changes to like I think because I think it'd be a little bit easier if we make it so that that top bar doesn't scroll horizontally and like I don't think we need CLIENT's sign-off
>
> *Sam:* My mission is to protect the team's time so internal sounds good let's just scroll by like peek kind of like Google Calendar. (20230105_design_review)

This also arose during this discussion where the team is talking about what is helpful for the internal team versus what the client needs:

> Okay, so if that's helpful for our team, that's one discussion. And we can like, figure out how to make sure that you guys are getting what you need. But as far as like, what CLIENT requires, it's only the sequence diagram and we want to make sure we have a single source of truth for the API's. Their source of truth is the API documentation they have in their Confluence. The difficulty

is that's not always not always up to date. So what we talked about yesterday was pushing them to make sure those API contracts in those in that documentation is exact. (Sam)

The common cause mentality came up in interviews as well. Two participants mentioned how they felt like they built a high-level of psychological safety on this team due to the challenging nature of the client. Nathan mentioned the "trauma bond" that the team developed whereas Matt discussed how "when you're in the trenches with someone, you you inherently have a higher level of trust out of the gate." Phrases to show a common cause are context-dependent, but may include discussing a shared goal or presenting a united front to a client.

Groups of phrases discussed in this sub-category include expressing team cohesion and sharing a common cause. Table 3 summarizes these, along with excerpts and sample phrases used by the participants.

1.3. Be inclusive

A third sub-theme or sub-category under supporting others on the team relates to being inclusive, where team members specifically address individuals or groups that are often marginalized. This connects to the aspect of psychological safety that team members don't reject others for being different and demonstrates that team members are thinking of people that are different from themselves. There were several examples of team members doing this during meetings. In one meeting, Nathan demonstrated inclusion for an international team member when he asked about how to pronounce their name:

Real quick, I have one slightly embarrassing question NAME How do you pronounce your name? So to be sure I'm saying that right? (Nathan)

There were other exchanges where team members made an effort to be inclusive toward remote team members, like in the following excerpt where the team is discussing the best way to ask for feedback from the designers.

> *Hotdog*: And it really only takes a couple minutes for us to look at it and give a normal answer like this looks great. Just one thing. Then we won't waste time.
>
> *Zelda*: I know it's a little harder, especially with remote. Remote,
>
> *SC*: I was gonna say that
>
> *Zelda*: Definitely in person, those of us who are in person, like take that opportunity to do that.
>
> *Hotdog*: Yeah yeah yeah, but slack works, too. That's fine

Being inclusive with regards to accessibility

I worry a little bit about the color blindness like if it's if it's just relying on color. (Hotdog)

Yeah, it's fine. They're all able to be differentiated across all of the different types. And then the other accessibility concern is the if you have a white delineation between them, it's actually you don't it doesn't matter what color the next two. (Hotdog)

Groups of phrases discussed in this subtheme focus on being inclusive to people from often marginalized groups. These phrases are also highly context-dependent; there is no one-size-fits-all for this sub-category. Table 3 summarizes these, along with excerpts from participants that provide examples for how this may be done on a design team.

2. Ask for help or support

The second category of phrases, or theme, is phrases used to ask for help or support. This differs from supporting the team in that it involves a team member directly asking for help. This connects to the

psychological safety component that it is easy to ask others on the team for help. It connects to the aspect of risk, because it can be perceived as socially risky to ask for help; an individual may be concerned that asking for help demonstrates one's incompetency, for example (Bamberger, 2009; Edmondson, 1999). Finally, asking for help connects to the idea that one's skills and talents are valued and utilized on the team. By asking others for help, team members show that they value the skills of other team members. This theme includes conversational behaviors like making a specific request for help, asking for information, and asking a clarifying question.

Request something specific

One way that team members asked for help was by explicitly requesting an action from the team or an individual team member. In this case, for example, Nathan, who is a test engineer, specifically asks for help from teammates working on the front end. He also shares why he needs this help, which connects to the idea of explaining why.

> One thing I forgot, <u>if we could get some of the front end branches kind of merged and cleaned up I think that would be helpful</u> because I was trying to figure out where to put stuff. And I was getting a little confused. (Nathan)

Daniel similarly asks everyone for their help in updating tickets, which is the way the team tracked tasks.

> <u>I wanted to ask if anybody has tickets assigned to them. And if they could update the status</u> on the ticket, and just make sure that everything that's done is like, marked as such. And I also wanted to make sure that everybody can access it. (Daniel)

In this example, Alison directly asked "devs", or software engineers/developers for help reviewing two tickets:

> This is a side note, but if any devs could review 367 and 468 today, that would be amazing and lovely. (Alison)

Phrases to request something specific from team members include “I wanted to ask…” and “If NAME could…, that would be helpful.”

Ask for information

There were examples where team members specifically asked for information, which is similar to a direct request. In the following example, Bob asks for information related to an on-site meeting with the client that he was not at in case there was anything relevant for developing product research questions:

> One thing before I before I head out. Is there anything that came up after your guys's on site? That like is a question that you think I could answer that can just ask really quick, like a something that I can stick in there? Because I know like those questions come up sometimes in on sites. And it's not hard to like just add one more question to the bonus question. (Bob)

In another meeting, Sam asks the team for information related to down software that was preventing the team from making progress:

> Are there any existing threads about Kronos being down that I can reference when reporting this? (Sam)

Phrases used to ask for information are context-dependent; the excerpts above show ways that team members asked for information in their particular context.

Ask a clarifying question

Team members also asked a variety of clarification questions. Clarification questions sometimes related to clarifying requirements or specifications for the product, like in this example where hotdog is asking whether managers should be able to access the app when they are not in the store:

> Yes, I think, so, I just have some clarifying questions. So it is still geofenced though, right? Like, I'm a non hourly worker. I'm like a manager or something. I still need to be within the store? I overheard this, I don't know if I got the exact details. But is that correct? (Hotdog)

There were other clarification questions related to norms or standards within the team, like when Zelda is asking the designers about where to access the most recent designs:

> I wanted to ask a clarifying question so that the whole team is aligned on where do we look for the most up to date design? I know that we've talked about it before, but since the last time that I remember us talking about it, we've had some new people and, you know, it might just help us to just make sure, clear the air, we go to these spots, and it's this box in particular. Just in case, anybody had that as an outstanding (Zelda)

Phrases that can be used to ask a clarifying question include “I want to ask a clarifying question on …” and simply “I have some clarifying questions” followed by those questions. Groups of phrases discussed in this theme focus on making an explicit request, asking for additional information, and asking clarification questions. These, along with excerpts and phrases used by the participants, can be found in Table 4.

Table 4

Phrases to ask for help or support included 1 sub-category, 4 groups, and numerous sample phrases.

Category or sub-category	Group	Excerpt(s)	Sample phrases
Ask for help or support	Request something specific	I wanted to ask if anybody has tickets assigned to them. And if they could update the status on the ticket, and just make sure that everything that's done is like, marked as such. (Daniel) This is a side note, but if any devs could review 367 and 468 today, that would be amazing and lovely. (Alison)	I wanted to ask ____. If NAME could ____, that would be amazing/great/helpful.
	Ask for information	One thing before I before I head out. Is there anything that came up after your guys's on site? (Bob) Are there any existing threads about Kronos being down that I can reference when reporting this? (Sam)	*Context-dependent*
	Ask a clarifying question	I just have some clarifying questions. So it is still geofenced though, right? ...I overheard this, I don't know if I got the exact details. But is that correct? (Hotdog) I wanted to ask a clarifying question so that the whole team is aligned on where do we look for the most up to date design? (Zelda)	I have some clarifying questions. I wanted to ask a clarifying question on ____.
Request feedback	Welcome feedback, suggestions, or pushback	Feel free to leave comments…I would love some feedback there…I would love it anyone found themselves getting stuck. (Hotdog) I would love pushback here. (Sam) This is totally open for feedback. I'm just like spitballing here. (Sam) Let me know if I have them worded strangely, or if I should edit them somehow. (Daniel)	I would love feedback on ____. I would love pushback on this. This is totally open for feedback. Let me know if I should change ____.

2.1. Request feedback

Requesting feedback is another sub-category of phrases that may connect to psychological safety in this work. This is supported both by the data and the literature. Studies have found, for example, links between feedback and psychological safety (De Stobbeleir et al., 2020; Mura et al., 2016). Asking for feedback is a subtheme of asking for help because it is a specific type of request that occurred on the team. This aspect connects to the idea that it is safe to take a risk on the team. Further, feedback is a focal point of the partner organization. Cody, in his interview, mentioned feedback as a way to build psychological safety while sharing the emphasis on feedback: "You start that by saying 'Hey this is a safe space…give me your feedback, like, we want feedback about everything."

A willingness to ask for feedback suggests an expectation that team members will respond in a respectful and constructive way; there is some risk associated with asking for feedback, and it is unlikely that an individual would ask for feedback if they expected harmful responses. Team members asked for feedback in a number of different contexts. They asked for feedback on things specifically related to the app they were designing, as Hotdog does here:

> Feel free to leave comments, feel free to like, Slack us. And we will continue to share out some work. We can also share the clickable prototype, which is on its way to being finished. But I would love some feedback there…I would love if like anyone found themselves getting stuck or something getting glitchy to just let me know. (Hotdog)

They also asked for feedback on the format of meetings. In this case, they had been trying out different orders for the team's standup meetings, and Sam asks for feedback on their current approach:

> Side note would love folks' feedback on formatting if you're if you're liking the going by platform. Or if you have an opinion on flow, please, I'll start a thread in the main teams for some feedback here. (Sam)

In some cases, feedback was solicited regarding clarity of communication and “best practices”:

> Yes, as Sam said, starting to put some tasks in there, let me know if I have them worded strangely, or if I should edit them somehow, according to best practices. (Daniel)

Phrases that can be used to request or welcome feedback include “I would love feedback on…,” “I would love pushback on this,” “This is totally open for feedback,” and “Let me know if I should change…” These can be found in Table 4.

3. Model accountability

The third theme or category is modeling accountability. Modeling accountability means taking ownership for one’s decisions or actions and their consequences. This relates to aspects of psychological safety that it’s okay to make a mistake on the team and that no one on the team would deliberately undermine another team member. It is unlikely that an individual would take ownership for a mistake if they expected it to be held against them or if they thought others would undermine them as a result. This includes groups of phrases where an individual takes ownership or responsibility, admits to a mistake, and apologizes to someone.

Take ownership or responsibility

An example of someone taking ownership is when Jeff “takes the blame” for “causing confusion” with something he had suggested:

> For clarity, I'll take full blame for this. It was my idea to have user flows and API contracts that were outside of their documentation. And I think it's causing confusion. The only thing that's required by CLIENT is a sequence diagram, and I was trying to solve the problem of how does our front end know exactly what API's exist and what the contracts are?

There were also times when team members took ownership by admitting to mistakes. Daniel, for example, shares how he "screwed up" logging time for the project: "I screwed mine up and then I redid it. I don't know if you saw that." Hotdog also shares how she didn't make updates to a presentation that she owed the team: "The only thing is, I felt really bad about this. I didn't go back to finish the research presentation deck."

Phrases that can support taking ownership or responsibility include "I'll take full blame for this," "I messed up…," and "I didn't do…"

Apologize

An action that often went hand in hand with taking ownership was apologizing. In this example, Daniel realizes that he didn't have Cody on the list for standup. Daniel then apologizes, and takes action to fix the problem.

> *Cody*: I'm not on your list, Daniel. But if you want me to go. I've been in with John and Jeff.
>
> *Daniel*: I'm sorry. Yeah, go ahead Cody…Let me adjust my notes for that.

Phrases used to apologize included a very broad "I'm sorry" and apologizing for something specific like "I'm sorry I'm so behind on that."

Accountability in interviews

The importance of accountability was supported in interview data as well. Matt, for example, discussed how it is detrimental to psychological safety when someone on the team claims to support you but takes no action to back that up. This was in response to an open question about whether there was anything important that he wanted to share that we hadn't yet discussed.

> When you have someone who's just cheerleading and not backing the cheerleading up with action, it's just, it makes it so much worse. It almost negates the psychological safety at that

> point, because no one on the team feels like, you know, the folks above them have their best interests at heart.

Steven also shares the importance of accountability or actively following up on discussions where team members address issues or concerns. This was in response to a question about what psychological safety means to him:

> It's not just oh, yeah, Steven, thanks for the feedback, I'll go talk to our chief delivery officer, no problem. And then you hear nothing about it. Right. And that's, I think that is the absence of that safety. So I would say that it's not just what happens within that space of sharing, but also know that an expected result from that conversation… that those things are also followed through, it's not just enough to be heard and listen and say, yes, we've documented your concerns.

Groups of phrases that can be used to model accountability taking ownership and apologizing include "I'll take full blame for…," "I messed up…," "I didn't do…," and "I'm sorry about…". Specific phrases and relevant excerpts from participants can be found in Table 5.

Table 5

Phrases to model accountability included 2 groups and numerous sample phrases.

Category or sub-category	Group	Excerpt(s)	Sample phrases
Modeling accountability	Taking responsibility or ownership	For clarity, I'll take full blame for this. It was my idea to have user flows and API contracts that were outside of their documentation. And I think it's causing confusion. (Jeff) I screwed mine up and then I redid it. I don't know if you saw that. (Daniel) The only thing is, I felt really bad about this. I didn't go back to finish the research presentation deck. (Hotdog)	I'll take full blame for ____. I messed up ____. I didn't do ____.
	Apologizing	I'm sorry. Yeah, go ahead Cody…Let me adjust my notes for that. (Daniel) Yes, so hopefully figuring that out. Sorry about the delay on that. I don't know what's wrong. (Alison)	I'm sorry. I'm sorry about ____. Let me fix that. Sorry about ____.

4. Display vulnerability

The fourth category of phrases identified is phrases that display vulnerability, or open oneself up to the potential for emotional or psychological risk. This connects to many aspects of psychological safety including the feeling that it is safe to take a risk on the team, that team members do not deliberately undermine each other, and that team members can bring up problems or tough issues. In some cases, it also relates to the concept of not rejecting others for being different. Displaying vulnerability includes phrases that share one's opinion, express uncertainty or lack of knowledge on a topic, disclose personal information, use humor, express emotions, and ask tough questions. It also includes the two sub-themes of expressing disagreement and social interactions.

Share an opinion

Sharing an opinion is one way that participants modeled vulnerability. Especially if opinions are unsolicited, it takes a certain amount of interpersonal risk to contribute one's opinion. In this example, the team is discussing a specific feature of the app, and Nathan shares:

> It would feel really weird to be, to like show badges in the app that aren't on this website. Because if you go to that, like this is, this is kind of a source of truth for country mile stuff like points. So I'd assume that our app should show what's in this.

Hotdog similarly shares an opinion on a feature when the team is deciding on next steps:

> I think either way, I mean, I'd have to see it and just make sure but I think either way, it still feels right to show cards without the points. That's, I mean, we'll still have to show an error right for both of those?

And in the following example, Sam shares her opinion as a recommendation for handling an upcoming meeting with the client:

> What I recommend is let's not ask about this one directly, if they bring it up, we can clarify that we are under the impression it's approved.

Observed phrases that can be used to share an opinion include "I think…" and "What I recommend is…"

Express uncertainty or lack of knowledge

Another way that team members displayed vulnerability was by expressing uncertainty or sharing that they didn't know something related to a task or process. This connects to the aspect of psychological safety that no one would deliberately undermine others' efforts; if participants were worried about team members undermining them, they likely would not admit to not knowing things. Zelda, for example shares how she's still figuring things out and has been having a lot of back and forth with Nick, a designer on the team:

> So a lot of that is just me not knowing all the things yet. So not, it's not you for sure. It's definitely on me. Like just not knowing things. So yeah, totally open communication. Like Nick knows. I was like, hey Nick, another question for you. Like, five questions yesterday on design. So thank you guys so much. (Zelda)

In the next example, Daniel specifically asks if he's wrong about how he has been handling the creation of tasks and tickets:

> That's a different task. Right? So a different, it should be a different ticket. Am I, am I wrong about that? We've we've been separating these two things as separate. (Daniel)

Expressing uncertainty can also be as simple as saying "I don't know" or "I'm not sure" about a given task or topic, which multiple participants did throughout the observed meetings. Additional phrases that can be used to express uncertainty include asking "Am I wrong about that?" or sharing "I don't know all the things, yet."

Disclose personal information

Team members also showed vulnerability through self-disclosure. This can be risky because sharing personal information at work might be considered inappropriate for the workplace or can be deemed as "oversharing" (Klaus, 2012). This also connects to the aspect of psychological safety that the team doesn't reject others for being different. In this example, Alison shares personal information and background on a back injury that she's currently dealing with:

> Being horizontal for a couple days has been really helpful. Wonderful. Like icing my back. And my dad also has back problems. He's had a herniated disc for 20 years, which seems like the most miserable thing in the world. But it does mean that he's really helpful in giving advice for this. So yeah. (Alison)

In one meeting, some of the team members who live in the same area can hear an alarm going off in the background, and Zelda discloses:

> Yeah, I can hear it. I call it the oh, oh shit alarm, I used to live by a Navy base. And when you heard that alarm, you would say oh shit. Yeah. And it freaks me out because of my whole childhood living by the base (Zelda)

Self-disclosure is a personal and context-dependent type of phrase. The excerpts provide examples of self-disclosure in the observed meetings, but example phrases cannot be drawn from these excerpts.

Use humor

Using humor is another way that members of the team displayed vulnerability. Making jokes or incorporating humor can be risky because others may not find you funny or may judge you based on your sense of humor, among other reasons (Bitterly et al., 2017). In this example, Nick takes on Hotdog's normal role in a meeting because she's running late: "Alright, so like I said, Hotdog's running a little bit late. So I'm gonna be doing my best Hotdog impression."

Daniel joked about how much the team has aged between when Nick left on parental leave and when he returned: "We've all aged five years since you've been gone. So I have some grey areas." Jeff also mentioned in his interview that one way he tries to promote psychological safety on teams is by trying to "keep stuff pretty light generally, too. So like, self deprecation helps out a lot."

Similar to self-disclosure, humor is personal and context-dependent, and example phrases are therefore not provided for this category of phrase; the excerpts provide some examples of humor on the observed team.

Express emotions

Expressing emotions was another way that team members displayed vulnerability. On this team, members shared both positive emotions, like excitement, and negative emotions, like frustration. In a meeting where team members were introducing themselves, Zelda shared, “I'm a React Native engineer on this team, been here since day one with Panda and Walter. We have since grown to this big awesome team. Very excited to work with you all.”

Team members similarly seemed comfortable expressing negative emotions with one another. There were times when frustration came through, often as a result of client interactions, like in this example where Panda expresses frustration with a barrier on the client side:

> Yeah, that's really backlogged right now, I followed up with NAME twice last week, and they said they last I heard was Thursday, he said, that'd be ready Friday. And he was out of the office today or yesterday. So I don't think they've gotten their GitHub set up even. What asked him on last November 7, was, how's it going with the setup? And he said, by the end of the week, and then on the eighth, he said, Oh, yeah, maybe we'll have an end of the week. And then, yeah, he didn't didn't have any update by Friday. And then Monday, I tried to get a hold of him, but he was out of the office. So I mean, that's definitely a block. (Panda)

John also shares frustration when he expresses that he hasn’t made much progress because things have been “swirly,” meaning there’s been a lot of back and forth with the client without any decisions being made: “Last few days has just been really swirly, so yeah, not a whole lot has been done.”

This idea of sharing one’s feelings came up in the interviews as well. Nathan shared how the team would have “vent sessions” after especially frustrating client meetings where they would “just complain about what’s happening to each other” and “help build that kind of psychological safety.” They’d address “we all know there are issues like let’s take time to just vent and not fix the problems or anything, but like,

just complain about it with each other." Zelda also shared that she "cried during one or two retros. And it was okay…And everybody was like, Well, I'm sorry, but also like, yeah, it's okay to cry."

Phrases that can be used to express emotions include simply stating "I'm excited about…" or "I'm frustrated about…,"though frustration was sometimes expressed more through a complaint, like in th examples from John and Panda above.

Bring up tough issues or concerns

Finally, team members would model vulnerability through bringing up tough issues or concerns, which connects directly to the aspect of psychological safety that it is easy to bring up problems or tough issues. These were often issues or questions related to specific tasks or features. In one meeting, Thomas was questioning the approval process due to its implications for future work:

> Right, like, why like, this is going to come up for every feature, like why is that needed for getting approval on these technical diagrams? Because it's going to come up for not just for this, but like for every other feature coming down, like the sequence diagram, what the error UI looks like. (Thomas)

Nathan also asks a tough question regarding an upcoming task:

> Do we want to do that work? Like we're gonna have to have another ticket follow up to like rework that. So like, does it make sense to do that ticket the next sprint? Like if we know we're gonna have to revisit it again later. (Nathan)

Groups of phrases that can be used to display vulnerability include phrases that help share one's opinion, express uncertainty, disclose personal information, use humor, express one's emotions, or bring up tough issues or questions. Specific phrases and relevant excerpts from participants can be found in Table 6.

4.1. Express disagreement

Expressing disagreement is a subtheme of modeling vulnerability because it requires a higher level of risk; it therefore similarly connects to the risk component of psychological safety. Sharing one's opinion, for example, requires a certain amount of risk, but actively disagreeing with someone or offering a counter-opinion is riskier because it requires you to be in conflict with another team member (Burris, 2012). Expressing disagreement also connects to the aspect of psychological safety that it is easy to bring up tough issues or questions; a disagreement is often a tough issue.

Oftentimes, expressing disagreement arose as a result of a back-and-forth conversation on a specific feature or requirement of the product. In this example, Panda and Nathan are discussing how to show retail employees their working shifts and whether breaks should be included in the display. Panda shares his thoughts, then Nathan offers a different opinion:

> *Panda*: Oh, we do want to show it separately? Because because like like my thought was like the way the way we have it designed now we show two different ones, even if it happens to be like a quote unquote, single shift. But it just shows your times that you need to be like working like during the day
>
> *Nathan*: What I would want to know if I'm working in a store is like when I go to work. And when I leave work. Like I don't really care about the break, because I'm not probably not leaving work for that break, like your break room to eat. So when you actually start your day and end your day.

In the next excerpt, Hotdog, Nathan, and Panda are discussing whether the app would ever need to display 4 numbers when showing the daily percent of sales goal that the store has achieved. Panda disagrees with Nathan, and offers a situation where the store might get to 4 digits:

> *Hotdog*: Do you think that we would ever get to four?

Nathan: I don't think so but on like smaller screen sizes and stuff. We saw an example where it did. Even with three digits, it like turned into an ellipses.

Panda: If they're too small a goal it could I guess. If they made their made their goal too small. And I guess it could go really high.

This sub-theme of expressing disagreement also came up in the interviews. Jeff shared an example of an interaction he had with a teammate on a different team in the organization where they were able to disagree in a productive way:

> We have established rapport with one another, where people will say stuff, and we give people like, space to say them. So I went into that conversation already feeling comfortable expressing myself. But also in that particular conversation. This other developer, let's call him Ben, was, we had a similar idea. And we've worked together in the past. And so I knew that when Ben would say something, we already have a good working relationship. So I'd be like, No, that's, I don't agree with that. And he'd be like, oh, cool, and like vice versa.

Table 6

Phrases to display vulnerability included 2 sub-categories, 8 groups, and numerous sample phrases, though many of these examples are context-dependent.

Category or sub-category	Group	Excerpt(s)	Sample phrases
Display vulnerability	Share one's opinion	I think either way, it still feels right to show cards without the points. (Hotdog) What I recommend is let's not asked about this one directly, if they bring it up, we can clarify that we are under the impression it's approved. (Sam)	I think ____. What I recommend is ____.
	Express uncertainty or lack of knowledge	So a lot of that is just me not knowing all the things yet. (Zelda) That's a different task. Right? So a different, it should be a different ticket. Am I, am I wrong about that? (Daniel)	I don't know all the things, yet. Am I wrong about that? I don't know. I'm not sure.
	Disclose personal information	Being horizontal for a couple days has been really helpful. Wonderful. Like icing my back. And my dad also has back problems. He's had a herniated disc for 20 years, which seems like the most miserable thing in the world. But it does mean that he's really helpful in giving advice for this. So yeah. (Alison) Yeah, I can hear it. I call it the oh, oh shit alarm, I used to live by a Navy base. And when you heard that alarm, you would say oh shit. Yeah. And it freaks me out because of my whole childhood living by the base (Zelda)	*Personal & context-dependent*
	Use humor	Alright, so like I said, Hotdog's running a little bit late. So I'm gonna be doing my best Hotdog impression. (Nick) We've all aged five years since you've been gone. So I have some grey areas. (Daniel)	*Personal & context-dependent*
	Express emotions	I'm a React Native engineer on this team... Very excited to work with you all. (Zelda) Last few days has just been really swirly, so yeah, not a whole lot has been done. (John)	I'm very excited to ____.
	Bring up tough issues or questions	Right, like, why like, this is going to come up for every feature, like why is that needed for getting approval on these technical diagrams? Because it's going to come up for not just for this, but like for every other feature coming down, like the sequence diagram, what the error UI looks like. (Thomas) Do we want to do that work? Like we're gonna have to have another ticket follow up to like rework that. So like, does it make sense to do that ticket the next sprint? Like if we know we're gonna have to revisit it again later. (Nathan)	*Context-dependent*

Category or sub-category	Group	Excerpt(s)	Sample phrases
Express disagreement	Express disagreement	*Panda*: Oh, we do want to show it separately? Because because like like my thought was like the way the way we have it designed now we show two different ones, even if it happens to be like a quote unquote, single shift. But it just shows your times that you need to be like working like during the day *Nathan*: What I would want to know if I'm working in a store is like when I go to work. And when I leave work. Like I don't really care about the break, because I'm not probably not leaving work for that break, like your break room to eat. So when you actually start your day and end your day. --- *Hotdog*: Do you think that we would ever get to four? *Nathan*: I don't think so but on like smaller screen sizes and stuff. We saw an example where it did. Even with three digits, it like turned into an ellipses. *Panda*: If they're too small a goal it could I guess. If they made their made their goal too small. And I guess it could go really high.	*Context-dependent*
Social interactions	Recognize coworkers as people	*Zelda*: Jeff I really like that sweater. *Jeff*: Thank you very much, my mom knit it for me. *Zelda*: I love it. --- *Cody*: I'm sure people have commented on this before but Panda you have a really cute dog *Panda*: Oh, yea, thanks, better than my face right now, so *Zelda*: I do love that dog.	*Context-dependent*

It is challenging to identify specific phrases that can be used to express disagreement because it depends on the situation and what the disagreement is about. Relevant excerpts that show examples of disagreement from the observed meetings may illustrate how to disagree with a teammate and can be found in Table 6.

4.2. Social interactions

For many of the codes used, there were excerpts that were social rather than work-related. I grouped these in a separate "social" sub-category under the display vulnerability category. This category is supported by multiple interview participants, and it relates to aspects of it being safe to take a risk on the team and the team accepting others for being different. Existing work supports the connection between workplace friendship (defined as an informal interpersonal relationship at work) and psychological safety (Cao & Zhang, 2020).

The importance of non-work-related conversation and interactions to psychological safety was reinforced through many of the interviews. For example, when asked what might help create psychological safety on teams, Nathan replied:

> Yeah, the other thing we do is, it's a time to like just not do work, but like go play a game with each other or something like that…that is a nice way to like get to know your team members and like build inside jokes and stuff which can really help with some of that psychological safety.

Jeff also mentioned this time and the importance of spending time with teammates on non-work things:

> Just like I think being with each other in a non-working project. Setting or just situation is super important. Because then it's not like, oh, Brian, the giant jerk hates my coding. But rather like Oh, Brian, the guy that we like, crushed the cornhole tournament together, he wants to know

about this thing in my code. Like, that's huge, just doing stuff together, I think it's super important. So you have a context for the individual outside of a tense situation, if there happens to be one.

Similarly, Steven and Matt share the importance of recognizing that teammates are people.

> When we think about our project, we take seriously this idea that like, we are people first, right? And then there's roles that we're filling. So with that I think we do, we'll actually does a really nice job consistently of being able to say like, how do we connect as people so that we can do our jobs better?... (Steven)

> Just kind of the base human element aspect of leadership, where you, you get a couple of people and go out for lunch. You kind of form that connection with someone away from the work itself. And that, that, that goes a long way I found. (Matt)

In meeting observations, these non-work interactions often occurred at the beginning of meetings when the team was waiting for everyone to arrive. In one meeting, for example, the following exchange occurred:

> *Zelda*: Jeff I really like that sweater.
>
> *Jeff*: Thank you very much, my mom knit it for me.
>
> *Zelda*: I love it.

Another example of sharing social interactions or conversations included Cody, Panda, and Zelda talking about the photo of Panda's dog that popped up on his Zoom profile:

> *Cody*: I'm sure people have commented on this before but Panda you have a really cute dog
>
> *Panda*: Oh, yea, thanks, better than my face right now, so

Zelda: I do love that dog.

Similar to some of the other categories within display vulnerability, there are no obvious phrases that can be used to have social interactions with team members. These sorts of interactions are context-dependent. Examples of social interactions from the observed meetings are included in Table 6.

5. Add structure

Adding structure involves transparently organizing meetings or work. Adding structure may make it easier to bring up tough issues or ask for help by creating clear avenues for doing so. This includes groups of phrases like setting expectations and norms and establishing an agenda. This may be a straightforward way to help build psychological safety on teams through transparency by eliminating confusion around how to interact with other team members, which can inhibit individuals from speaking up.

Set expectations or norms

One way to add structure and clarity is to set expectations or establish norms. Take, for example, this exchange, where the product designer and engineers are discussing the best way to share feedback and questions with one another:

Zelda: Have we as a development team been bringing you guys in soon enough for you to get context on things before it's merged?

Hotdog: I would say no, there's a couple of things in the demo I hadn't seen before.

Zelda: So is there, should we be reaching out to you directly, also, Hotdog, just to make sure that you see everything as well?

Hotdog: I wouldn't mind being copied, our work is slowing a little bit…So I'm happy to spend more time with you or maybe like sit next to you, or if there's something. That would be awesome.

Nick: For in office stuff, like, if you want to throw something at me, yea actually throw, like, a piece of paper. Because yea, there's a lot of notifications that come through so they can get lost…but for me, don't worry about my flow. Just ask me.

Observed phrases that can help with setting clear expectations or team norms include asking "How should we be doing…?" or "What's the best practice for…?"

Establish meeting goals and agendas

Another example of adding structure include establishing clear meeting goals and agendas. Certain meetings, like standups, were very structured with the expectation that each team member would share what they worked on the previous day, their plan for the upcoming day, and whether they were running into any issues. These meetings also had a list for who would speak when grouped by platform, which helped ensure that everyone participated. The order for team members to contribute was often placed in the Zoom chat at the beginning of the meeting. These meetings also often included "post-standups" where the team would further discuss any issues. Agendas for the post-standup portion of the meeting was usually developed during the standup meeting, like in the following examples where team members ask items to be added to the post-standup agenda:

> I also want to post standup to confirm how we're feeling about actually sending out the build, any pipeline risks and path forward for smoke testing it. And another post standup request for me is for FEATURE tech design, closing the loop on one like if our error pieces are still in, two, if we're trying to talk about anything at the tech design call. (Sam)

> I will point out that Lucas did find a minor UI bug on the clock out sheet which we should probably post stand up on how to resolve that. (Zelda)
>
> So for post standup I mainly wanted to kind of touch base on the front end. So…did anyone have any post standup topic topics? (Daniel)

The team also set agendas in more open meetings, like in a design review meeting where Nick solicits agenda items at the beginning of the meeting by asking "Everyone, agenda items from the team. You guys have any agenda items? I know we started a thread here too."

Interview participants had mixed perspectives on whether this structure for participating in the meeting contributed to psychological safety on the teams. Some participants thought that the structure and agenda of standup meetings did contribute to psychological safety. Bob, for example, stated:

> Yes, I would say yeah, because it's kind of people are different. Some people will talk. And they will take the whole time to talk if other people will not talk unless they're called upon. So to say that everyone's going to share this, this and this kind of standardizes it so that you hear from everyone, and you don't, we don't, you don't only hear from the loudest, or the squeakiest wheel. I would say that encourages people to share. It also kind of gives like for myself, myself, I'm one of those people, I'm a quiet person. Like, unless you ask me, I'm not gonna give you my opinion. I don't know why it's just the way that I am. So the idea that Bob, it's your turn, was really nice for me, because I didn't feel like it was speaking out of place. And I also didn't feel like I was saying something that was low priority in a conversation that was about higher priority things. It kind of said, No, your input was welcomed here at this time.

Similarly, Steven shared that standups are:

> …very intentional, like round robin, everyone will get a chance and is expected to have some update…And so I think from that standpoint, I was very comfortable. And I think the team is very comfortable because it's a process, one that we expect, it's ingrained in how we work.

Other participants felt that this structure could impact psychological safety, but that standup meetings had such a strict purpose that it didn't really matter. Matt, for example, shared that standup "is less collaborative and more newsy…the standup for us is almost an agenda," so he didn't think that it really impacted how comfortable team members were in participating. Cody shared a similar sentiment that "people tend to just say what they did and what they're gonna do in stand up" because that is the purpose of those meetings.

Groups of phrases discussed that contribute to adding structure include those that set clear expectations or norms and those that establish clear goals or agendas for meetings. Excerpts and phrases used by the participants in this category can be found in Table 7.

5.1. Invite participation

Inviting participation is a sub-category under adding structure that involves intentionally bringing team members into the discussion. This relates to psychological safety in that it supports the inclusion of team members and may make it less likely for team members to feel that people on this team sometimes reject others for being different. Inviting participation also contributes to conversational turn-taking, which has been linked to psychological safety. Teams that have more even participation of individual team members tend to have higher psychological safety (Haan et al., 2021). See Appendix A for a summary on conversational turn-taking for each of the observed meetings. Observed types of phrases that contributed to inviting participation included passing conversation and extending meeting invites to the team.

Pass conversation

One way that inviting participation occurred in meetings was simply through passing conversation. For example, when referring to a small error on a screen, Zelda invites Alison to contribute her take on testing:

> It is in one of the videos, and you can see it if you're paying attention. But if you're not paying attention, it's only because I did the video in a smaller screen size than the one that was tested with. So just to point that out, Alison, if you want to give updates on testing for this one.

Team members hand off the conversation in other ways as well. They frequently just popcorned to the next person to chat by wrapping up their contribution and saying the next person's name, like Daniel and Jeff do in the following excerpts:

> And I'm focused on getting the requirements for HR benefits. And we have the refinement meeting today. So getting ready for that. And let's kick it over to the Thomas. (Daniel)

> Today, yeah, we have that meeting. And then I'll work continually on the app initialization flow. And a couple of meetings yesterday, and today. That's all. Passing to John. (Jeff)

At other times, team members specifically included another team member who hadn't yet contributed, like in this excerpt where Panda passes the conversation to Zelda:

> And yeah, so I'll just, as soon as this meeting is over, I'll start getting caught up with getting everything. But yea just happy to be back and hope everyone had a great, great holidays. I guess Yeah. Who else hasn't gone? Zelda, I guess. (Panda)

Zelda also mentioned doing something similar in her interview, where she describes looping in team members who haven't spoken up:

> Yeah, um, so my teacher experience always gets me to, to call on somebody who might not have spoken, even during stand up, because there are some people who might be working on a

> ticket, but you know, that they might have given their update, or they haven't, or whatever. And it's like, oh, I actually needed help with something. But they didn't say anything during the meeting.

Observed phrases that can be used to pass conversation include “Let’s kick it over to…,” “Passing to…,” and “NAME, do you want to give updates on …?”

Extend meeting invitations

Team members also invited participation by including others in upcoming meetings. Sometimes this invitation was extended to a specific person, and at other times it was open to any team members for whom it might be relevant. In the following excerpt, Steven does both by inviting Thomas and extending the invite to “anyone else that wants to join”. Radar, the company that they are talking about, is an organization that helps with location features and services.

> We have a call with Radar later this morning at 1130. And so that's going to be Zelda, Panda and I, Thomas if you want to join. Great. I also, you're more than welcome, I guess anyone else that wants to join too it's just going to be a discussion around what the Radar team can do with us and for us, and how do we position not only ORGANIZATION, but also CLIENT to make a decision on if we want to go with Radar. (Steven)

Phrases used to invite participation include “NAME, if you want to join…” and “Anyone else that wants to join is more than welcome.”

Groups of phrases discussed in this sub-category include those used to pass conversation and invite participation in meetings. These, along with excerpts and phrases used by the participants, can be found in Table 7.

Table 7

Phrases to add structure included 1 sub-category, 4 groups, and numerous sample phrases.

Category or sub-category	Group	Excerpt(s)	Sample phrases
Add structure	Set expectations and norms	*Zelda*: Have we as a development team been bringing you guys in soon enough for you to get context on things before it's merged? *Hotdog*: I would say no, there's a couple of things in the demo I hadn't seen before. *Zelda*: So is there, should we be reaching out to you directly, also, Hotdog, just to make sure that you see everything as well? *Hotdog*: I wouldn't mind being copied, our work is slowing a little bit…So I'm happy to spend more time with you or maybe like sit next to you, or if there's something. That would be awesome. *Nick*: For in office stuff, like, if you want to throw something at me, yea actually throw, like, a piece of paper. Because yea, there's a lot of notifications that come through so they can get lost…but for me, don't worry about my flow. Just ask me.	How should we be doing ____? What's the best practice for ____?
	Establish meeting goals and agendas	Everyone, agenda items from the team. You guys have any agenda items? I know we started a thread here too. (Nick) So for post standup I mainly wanted to kind of touch base on the front end. So…did anyone have any post standup topic topics? (Daniel)	Do you have any agenda items? Does anyone have any ____ topics?
Invite participation	Pass conversation	Alison, if you want to give updates on testing for this one? (Zelda) And let's kick it over to the Thomas. (Daniel) Passing to John. (Jeff)	NAME, do you want to give updates on ____? Let's kick it over to ____. Passing it to ____.
	Extend meeting invitations	We have a call with Radar later this morning at 1130. And so that's going to be Zelda, Panda and I, Thomas if you want to join. Great. I also, you're more than welcome, I guess anyone else that wants to join too it's just going to be a discussion around what the Radar team can do with us and for us. (Steven)	NAME, if you want to join. Anyone else that wants to join is more than welcome.

Some aspects of psychological safety are supported by a wider variety of observed phrases than others

Some of the components of psychological safety were supported by a wider range of phrases than other components. Being able to take risks was supported by the widest variety of phrases, whereas being able to make a mistake or feeling like your unique skills are valued were supported by the smallest variety of phrases. This suggests that there may be an opportunity for design team members to incorporate phrases that link to these less supported aspects of psychological safety. While the methods used do not allow for a true quantitative comparison, these trends can be identified by considering which categories and sub-categories of phrases aligned with each component of psychological safety, as shown in Table 8.

This suggests that design teams may want to extend what they are already doing well and continue to use a variety of phrases that contribute to the ability to take risks component of psychological safety. It also suggests that an area for growth may be to incorporate phrases that can further support other psychological safety components, especially the feeling that one's unique skills are valued and utilized and the sense that one can make a mistake without it being held against you.

Table 8

Some aspects of psychological safety were supported by a wider variety of phrases than others

	Risk	Different	Undermine	Help	Tough issues	Mistake	Unique skills
Category or sub-category of phrases	It is safe to take a risk on this team.	People on this team do not reject others for being different.	No one on this team would deliberately undermine my efforts.	It is not difficult to ask other members of this team for help.	Members of this team are able to bring up problems and tough issues.	If you make a mistake, it is not held against you.	My unique skills and talents are valued and utilized.
Supporting others on the team	-	-	x	x	-	-	-
Responding productively	x	-	-	-	-	x	-
Team cohesion	-	-	x	-	-	-	-
Being inclusive	-	x	-	-	-	-	-
Ask for help or support	x	-	-	x	-	-	x
Requesting feedback	x	-	-	-	-	-	-
Modeling accountability	-	-	x	-	-	x	-
Displaying vulnerability	x	x	x	-	x	-	-
Expressing disagreement	x	-	-	-	x	-	-
Social interactions	x	x	-	-	-	-	-
Adding structure	-	-	-	x	x	-	-
Inviting participation	-	x	-	-	-	-	x
TOTAL	6	4	4	3	3	2	2

Absence of phrases detrimental to psychological safety

One aspect of the observed meetings that is hard to assess but likely related to the team's psychological safety is the absence of phrases or conversational behaviors that may be detrimental to psychological safety. Interview participants mentioned some of the "toxic" behaviors that the client used and how they eroded the team's psychological safety, but these behaviors did not seem to come up in any of the internal meetings that I observed. Some of these conversational behaviors that may be detrimental to psychological safety that interview participants mentioned included being interrupted or talked over and being accused of not being prepared. Two participants, Steven and Zelda shared the same story where one of client team members "mentioned to us, you guys are totally unprepared for this meeting" (Zelda). While this was not the focus of this work, there are potential implications for team psychological safety based on the absence of these behaviors.

Limitations

This work was limited to data collection with a single team, in part due to constraints on timing and availability of teams to observe at the time of my data collection phase. I was limited in the meetings that I was able to attend, both due to confidentiality concerns and conflicts with my schedule. There is, for example, a gap of almost one month between meeting observations (December 7, 2022 to January 3, 2023) when the standup meetings that I often joined were changed to include the client; I was unable to join those because I did not have permission to attend client-facing meetings. I also did not have access to all of the team's documents and communications outside of the meetings that I attended. This potentially limits the credibility and transferability of this work. Due to the qualitative nature of this study, the phrases and their categories have not been shown to cause psychological safety; instead, this research describes phrases and their functions used by a team that are aligned with the theoretical components of psychological safety.

This work may be limited in its application to fully in-person meetings; since this work was conducted with hybrid and virtual teams, it is possible that different phrases or categories of phrases may be used in-person. There also may have been selection bias in sampling of participants; since participants opted into the research, it is possible that individuals who experienced lower levels of psychological safety did not participate in this work, which could limit these findings.

Additionally, while the phrases identified in this work can be a helpful starting point to building psychological safety on teams, they must be used in a genuine way to be effective. One challenge in analyzing transcripts of spoken behavior in written format is that tone of voice and other nuances are lost (Parameswaran et al., 2020). Expressing appreciation or apologizing to a team member, for example, is only effective if it is authentic; doing it in a sarcastic or disingenuous way may have the opposite effect (Rockwell, 2006). Therefore, while this work does suggest phrases that may correspond with psychological safety, simply using these phrases in conversation is not enough; their usage must be authentic.

Finally, since this work was the first step to identify phrases in conversation that team members use that may align with psychological safety, the potential impacts of various personal characteristics, such as seniority, leadership status, gender, and race, among others, were not incorporated; this may be an interesting area for future work.

Future work uncovered

This research uncovered several opportunities for future work that can build upon the findings presented in this dissertation, including expanding data collection, studying the absence of detrimental phrases, evaluating the link between the identified phrases and team psychological safety, considering client influence on psychological safety, and exploring the impacts of psychological safety on design projects. Each of these areas are discussed below.

Expand data collection

Working with additional teams within the organization can strengthen this line of work. There may also be additional opportunities for data collection from a single team, such as incorporating data from sources like the team's Slack channel and other digital documents and archives. I did not have permission to access this data through the organization for this study, but may get access to it as our collaboration builds. It may also be possible to attend a broader range of meetings for other teams, since much of this work was focused on standup meetings and design review meetings.

There may also be an opportunity to incorporate more robust longitudinal measures in the future. The company collects data from their employees through an annual organizational engagement survey and through a bi-weekly team survey. It may be possible to add the team psychological safety scale or other relevant measures into these surveys in order to collect quantitative measures over time.

There is the potential to continue this collaboration and use the findings from this research as preliminary data for an NSF Grant Opportunities for Academic Liaison with Industry (GOALI) proposal alongside an NSF Engineering Design and Systems Engineering (EDSE) proposal to continue to explore psychological safety in the engineering workplace.

Evaluate the link between these phrases and psychological safety

The phrases and behaviors identified in this work are thought to promote psychological safety on the team due to their alignment with theoretical components of psychological safety. However, this research did not study a correlational or causational relationship between these phrases and the team's psychological safety. Future research could examine this relationship quantitatively to determine whether these phrases and categories of phrases actually contribute to a team's psychological safety.

Study the absence of detrimental contributions

Conducting research that looks for behaviors and phrases that might be detrimental to psychological safety may be another interesting and fruitful opportunity. Several examples of "anti-psychologically safe" behaviors came up in the interviews, such as interrupting others, talking over one another, working based on fear from higher ups, and belittling team members. Considering what behaviors and types of phrases may have a negative impact on psychological safety and then looking for their absence or presence in design team interactions could therefore add a new perspective to this research.

Consider client influence on psychological safety

An interesting finding that emerged from the data was the potential impact that a client can have on a team's psychological safety and potential implications for design teams doing agency work. The client on this project was challenging for the team members to work with. Multiple participants spoke to the difficulty of the project and the challenges of working with the client. Jeff said that this was "the most difficult project I've ever been on." Cody stated "It was a very difficult and stressful project with the client though with a lot of contention." The client was "difficult" (Hotdog & Alison), "hard to read" (Hotdog), and "combative and dismissive" (Matt), and there was a "lack of trust" (Zelda) or they "never got to an established level of trust" (Steven).

In interviews, I asked whether and how client interactions might impact the team's psychological safety. Participants shared that there were carryover effects from working with the client, where team members would adopt some of the "toxic" behaviors like interrupting others and talking over people on the team. Zelda and Matt both provided examples of this:

> And then sometimes, like some of the ORGANIZATION people would pick up some of their [AN: Client] isms and, and start to be a little negative, but it's like crap, I've just been working with them for like the past five hours. And now I'm in a meeting which is ORGANIZATION people. And

> instead of letting go of all that toxicity, it kind of brought it into this meeting. So we would always like try to recognize it and then you know, hey, I'm sorry, I spoke over you. (Zelda)
>
> We would get off a CLIENT call. And there would be a heightened level of certain negative emotions, condescension, aggression, just slightly higher, it wasn't over. But there was definitely there, you know, you get off of two hours of calls with these CLIENT teams who were just just maddening to work with and jump into a team call. And it was still it lingered…it absolutely 100% in- infected everything internally. (Matt)

Survey participants also mentioned the difference in their experience on the internal organization team versus their experience with the client team. This suggests that researchers may want to explore the potential external influences on a team's psychological safety, such as client interactions. It may also be worth considering whether two measures of psychological safety may be required on client-facing teams: one for the internal team and one for the broader team that includes the client.

Explore impacts of psychological safety on design projects

While it was challenging to assess potential impacts of psychological safety on the design process and the team's project, this topic is relevant to engineers and organizations. I included a question in the interview protocol asking participants "Do you think psychological safety impacted the project? If so, how?," and then opened it up more broadly for how psychological safety might impact projects in general. Overall, participants considered it to be an important aspect. The most consistent response was that a lack of psychological safety between their internal team and the client team on this particular project increased the amount of time that the project took. It "caused a lot of lot more check ins, a lot more just like reporting, a lot of just like upward visibility and engagement from their leadership and our leadership" (Steven) and with higher psychological safety they "could have delivered faster" (Steven) or could have "addressed issues faster" (Nathan). Matt mentioned that higher psychological safety "makes

the project more efficient." Studying the potential impacts of psychological safety on design projects, especially their timeline, is an opportunity for future research.

Conclusion

This research contributes to our knowledge of what design team members actually say that may support team psychological safety, suggests areas for future work to build upon my findings, and has broader implications for engineering and design professionals working on teams.

Contribution to knowledge

In this research, I set out to identify things that individuals on a design team actually say that may correspond with psychological safety on a design team, addressing a noted gap in the literature (Edmondson & Bransby, 2023). I identified five main categories of phrases for psychological safety: phrases to support the team, ask for help, model accountability, display vulnerability, and add structure. Each of these categories includes more specific types of phrases for each of these items, along with natural-language examples of things a team member actually said within each of these categories. For researchers, this work describes a process that can be used for future coding and analysis of phrases for psychological safety, which can further expand this area of work.

Additional implications include that some of the components of psychological safety were supported by a wider range of phrases than other components. Being able to take risks was supported by the widest variety of phrases, whereas being able to make a mistake or feeling like your unique skills are valued were supported by the smallest variety of phrases. This suggests that there may be an opportunity for design team members to incorporate phrases that link to these less supported aspects of psychological safety. This work also suggests that the absence of phrases that undermine psychological safety may

also be important. This research expanded work on psychological safety and conversation in the engineering and design workplace.

Research uncovered

Future research suggested by this work include looking at the absence or presence of phrases that may hurt psychological safety, testing the relationship between the identified phrases and themes and team psychological safety, exploring the impacts of client or external interactions on team psychological safety, and investigating impacts of psychological safety on the design process and designed products.

Broader impacts

For practitioners, this research suggests categories of phrases and natural-language examples that individuals on engineering teams may already be saying to contribute to psychological safety on design teams while also identifying areas for growth, such as expanding conversational contributions that show that team members' skills are valued and that people can make mistakes without negative consequences. It also suggests things to avoid doing and saying. These findings can be used both by design team members looking to foster psychological safety from the ground up, as well as for engineering managers and leaders aiming to enhance psychological safety on their teams more broadly.

This research may help design teams to build psychological safety and thus lead to increased creativity, innovation, and learning behavior on these teams. It may suggest potential interventions focused on some of these phrases to enhance psychological safety on design teams. Finally, it may contribute to more effective teams that can better address the complex issues facing engineers today and into the future.

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Appendix A: Meeting Observations

Observations recruitment

IRB-SBS #5466

Jenn Campbell

Introduction Script

Hi all. I'm Jenn Campbell, and I am a PhD Candidate in Civil Engineering at the University of Virginia. I study engineering and design teams, and I will be conducting research on teams at ORGANIZATION this fall through the beginning of 2023. I am interested in learning more about team dynamics in the workplace, especially sense of belonging and inclusion, and how these team dynamics are related to the engineering and design processes and products. I am excited to be working with ORGANIZATION since so much of your work is done on teams.

With your consent, I will be observing the [INSERT PROJECT NAME] team as a fly on the wall, and I will be taking notes and recording the audio of regular team meetings and working sessions, both in-person and virtually over Zoom. I will share with you all consent forms that further outline details of the study. There are several items that I would like to draw your attention to:

- Your decision to participate will have no effect on your employment status or services, and ORGANIZATION will not know who agreed to participate.

- I have signed an NDA with ORGANIZATION, and the information and interactions from these meetings will be kept confidential.

- Any data that I use will be deidentified, meaning your name, the organization's name and industry, and details on the project will be removed.

I will give you several minutes to read through the consent form, and I am here if you have any questions.

Observations consent

Consent for observations was collected through DocuSign after IRB approval of this study.

Informed Consent Agreement: Observations

Please read this consent agreement carefully before you decide to participate in the study.

Purpose of the research study: The purpose of the study is to learn more about team dynamics, like sense of belonging and inclusion, in the workplace and how they are experienced by individual team members. Additionally, we hope to learn about how team dynamics relate to the engineering and design processes, and designed products.

What you will do in the study: You will be observed during regular team meetings and working sessions, both in-person and virtually, and audio of these meetings will be recorded. The researcher will take notes during these meetings in addition to the audio recordings, and the researcher's presence during these meetings will be known.

Time required: The study will not require any additional time or effort on your part. The study will take place during normal working hours during team meetings and working sessions. The researcher will observe multiple meetings and working sessions; the exact length of each session will be the length of your team meeting. Observations will occur throughout the duration of your team's project, and total observation time will be around 12-24 hours.

Risks: There are no anticipated risks in this study beyond potential discomfort in being observed. Data from individual participants will not be shared with ORGANIZATION, and all of the data collected will be kept confidential.

Benefits: There are no direct benefits to you for participating in this research study. The study may help us understand how team dynamics like sense of belonging and inclusion develop and are experienced in the workplace and how team dynamics are related to the design process and products.

Confidentiality: The data collected in this study will be handled confidentially. Your decision whether to participate in this study will be kept confidential, and ORGANIZATION will not know who has agreed to participate in this research. Only the researcher will have access to the raw data. The researcher's notes and audio-recordings from the study will be stored in password-protected cloud accounts or hard drives. The results of this research may appear in publications, but individual participants will be deidentified. You will select a private code name that only you and the researcher will know, and your name will be replaced with this code name in the researcher's notes and in transcriptions of the audio recordings. When the study is completed and data have been analyzed, this list will be destroyed. Your name will not be used in any report. Audio recordings will be transcribed after all of the data is collected; the original files with your voice will be destroyed after all recordings are transcribed.

Voluntary participation: Your participation in the study is completely voluntary. Your decision to participate will have no effect on your employment or services, and ORGANIZATION will not know who has agreed to participate in this research.

Right to withdraw from the study: You have the right to withdraw from the study at any time without penalty. Any notes on your participation and the transcriptions of your audio recordings will be destroyed should you decide to withdraw from the study. Your contributions to the original audio recordings will not be deleted.

How to withdraw from the study: If you want to withdraw from the study, please let the researcher know whether there are certain observations you would like to withdraw from, or whether you would like to withdraw from the entire study. There is no penalty for withdrawing, and withdrawing will not affect your experience as an employee at ORGANIZATION. Withdrawing will not affect your employment or services. If you would like to withdraw after your materials have been submitted, please contact Jenn

Campbell, jc3nh@virginia.edu. If you choose to withdraw from the study, all of your data except the original audio recordings will be destroyed.

Payment: You will receive no payment for participating in the study.

Using data beyond this study: The data you provide in this study will be retained in a secure manner by the researcher for 5 years and then destroyed.

If you have questions about the study, contact:

Jenn Campbell
Department of Engineering Systems and Environment

Olsson Hall, 151 Engineer's Way
University of Virginia, Charlottesville, VA 22904
Telephone: (203) 994-2229
Email address: jc3nh@virginia.edu

Leidy Klotz
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University of Virginia, Charlottesville, VA 22904
Telephone: (434) 982-5389
Email address: lk6me@virginia.edu

To obtain more information about the study, ask questions about the research procedures, express concerns about your participation, or report illness, injury or other problems, please contact:

Tonya R. Moon, Ph.D.
Chair, Institutional Review Board for the Social and Behavioral Sciences
One Morton Dr Suite 400
University of Virginia, P.O. Box 800392
Charlottesville, VA 22908-0392
Telephone: (434) 924-5999
Email: irbsbshelp@virginia.edu
Website: https://research.virginia.edu/irb-sbs
Website for Research Participants: https://research.virginia.edu/research-participants

UVA IRB-SBS #5466

Electronic Signature Agreement:
I agree to provide an electronic signature to document my consent.

Print Name: _____ Date: _____

Signature: _____

Agreement:
I agree to participate in the research study described above.

Print Name: _____ Date: _____

Signature: _____

Selected code name: _____ (You are welcome to leave this blank and let the researcher know your selected code name at a later date.)

You may print a copy of this form for your records.

Meeting observations

In this appendix, I describe the different types of meetings that I observed and provide information on each meeting that I observed.

Meeting types

Norming meeting: The purpose of a norming (or renorming) meeting is for the team to come to an understanding on how team members will interact and what the team's goals are. A renorming (or "retro") meeting is an opportunity to revisit previously agreed-upon "rules" based on the current needs of the team. These meetings occurred regularly every other week. I was unable to attend these meetings due to scheduling conflicts.

Other meeting: A meeting that is not a norming meeting, a standup meeting, or a review meeting is considered "other meeting." The purpose of an "other" meeting is specific to that particular meeting. These occur as needed.

Review meeting: The purpose of a review meeting is for team members to provide information or feedback or ask questions on a specific topic. Some review meetings, like the design review meeting, occur weekly, whereas others occur as needed.

Standup meeting: The purpose of a standup meeting is for each team member to share what they worked on yesterday, what they're working on today, and what, if anything, is blocking their work. These usually occur daily. These meetings often include "post-standups" to discuss blockers or issues in greater detail with impacted team members; these post-standups are optional and team members not affected by the blocker do not need to stay on.

The following table, Table 9, lists details of each meeting I observed, including the date, type of meeting, time of meeting, length of meeting, and meeting participants. Meeting start time is based on the meeting start as indicated on the meeting invitation as opposed to the actual start time. The number of meeting participants is a range if participants joined the meeting late or left early. When "Other" is listed in the Conversational turn-taking column, it refers to an individual who did not opt in to the study.

Table 9

Details of observed meetings, including the date, type of meeting, meeting start time, length of recording, and number of participants

Date	Meeting type	Meeting start time (ET)	Length of recording (minutes:seconds)	# of participants	Notes	Conversational turn-taking
10/31/22	Review - Interview protocol review	2:30pm	29:59	4		Bob: 46% Hotdog: 34% Nick: 13% Sam: 7%
11/3/22	Other - Interview debrief	4:45pm	28:29	5-6		Bob: 68% Sam: 15% Hotdog: 9% Nathan: 3% Thomas: 3% Nick: 2%
11/4/22	Standup	10:00am	21:48	14-15		Sam: 23% Jeff: 16% Daniel: 10% Panda: 9% Steven: 8% Zelda: 8% Other: 6% Alison: 5% Winter: 5% John: 5% Thomas: 5% Other: 2%
11/7/22	Standup	10:00am	17:48	13-14		Jeff: 9% John: 8% Hotdog: 7% Zelda: 7% Panda: 7% Daniel: 5% Bob: 5% Thomas: 5% Alison: 5% Sam: 4% Other: 3% Other: 3%
11/8/22	Standup	10:00am	22:11	16		Sam: 23% Panda: 20%

Date	Meeting type	Meeting start time (ET)	Length of recording (minutes:seconds)	# of participants	Notes	Conversational turn-taking
						Steven: 11% Bob: 5% Daniel: 5% John: 5% Thomas: 5% Alison: 5% Other: 4% Zelda: 3% Hotdog: 3% Winter: 3% Nick: 2% Jeff: 2% Nathan: 1% Other: 1%
11/15/22	Standup	10:00am	24:09	8	Includes post-standup	Panda: 44% Daniel: 26% Winter: 9% Hotdog: 7% Nathan: 7% Nick: 5% Bob: 1% Other 1%
11/17/22	Standup	10:00am	56:03	12	Very hard to understand the recording because many people were in-person in a single room. Only used this recording up to 20:08.	Not calculated, too hard to tell who is speaking when
11/18/22	Other - Research debrief	11:30am	23:14	12		Bob: 94% Other: 6% (the “other” in this

Date	Meeting type	Meeting start time (ET)	Length of recording (minutes:seconds)	# of participants	Notes	Conversational turn-taking
						meeting are recordings from interviews with client employees)
12/2/22	Other - Design planning	3:00	55:42	4-5	I joined 5 minutes late at 3:05	Sam: 62% Hotdog: 32% Nick: 5% Daniel: 1% Thomas: <1%
12/6/22	Standup	9:30am	28:35	8		Zelda: 34% Daniel: 21% Thomas: 16% Panda: 14% Alison: 8% Steven: 6% Other: 2% Hotdog: 1%
12/7/22	Review – Design review	11:00am	44:41	7-11	I had to hop off early for another meeting	Hotdog: 35% Panda: 24% Sam: 17% Nathan: 12% Zelda: 6% Nick: 5% Daniel: 2%
1/3/23	Standup	9:30am	30:00	12-14	Includes post-standup	Sam: 27% Thomas: 17% Daniel: 10% John: 9% Nathan: 8% Zelda: 8% Panda: 6% Alison: 5% Hotdog: 3% Other: 2% Other: 2% Other: 2% Pete: 1% Other: 1%

Date	Meeting type	Meeting start time (ET)	Length of recording (minutes:seconds)	# of participants	Notes	Conversational turn-taking
1/5/23	Standup	9:30am	33:17	11-15	Includes post-standup	Sam: 48% Thomas: 8% Other: 8% Daniel: 7% Panda: 7% Pete: 6% Zelda: 5% Jeff: 4% John: 2% Hotdog: 2% Nathan: 1% Other: 1% Other: <1%
1/5/23	Review – Design review	10:30am	28:03	9-10		Sam: 46% Hotdog: 32% Nathan: 7% John: 6% Other: 2% Pete: 2% Other: 1% Other: <1% Zelda: <1% Daniel: <1%
1/11/23	Standup	9:30am	36:47	14-16	Includes post-standup	Daniel: 16% Sam: 15% Panda: 15% Zelda: 14% Nathan: 13% Jeff: 7% Cody: 5% Alison: 4% Other: 3% John: 2% Other: 2% Hotdog: 1% Other: 1% Thomas: 1% SC: 1% Other: 1% Other: 1%

Date	Meeting type	Meeting start time (ET)	Length of recording (minutes:seconds)	# of participants	Notes	Conversational turn-taking
1/11/23	Review – Design review	11:00am	29:43	13		Hotdog: 38% Daniel: 28% Sam: 17% Panda: 9% Nathan: 6% Zelda: 1% Other: <1% Winter: <1%
1/27/23	Standup	9:30am	37:03	18	Includes post-standup	Sam: 27% Jeff: 21% Daniel: 13% Thomas: 11% John: 5% Zelda: 4% Nathan: 3% Other: 3% Panda: 3% Hotdog: 3% Pete: 3% Other: 2% SC: 1% Other: 1% Other: 1%
1/31/23	Standup	9:30am	10:57	13-14		Daniel: 29% Zelda: 15% Jeff: 12% Panda: 11% Cody: 10% John: 9% SC: 6% Thomas: 3% Other: 3% Other: 2% Other: 1%
2/3/23	Standup	9:30am	21:34	20	Includes post-standup	Daniel: 17% Zelda: 17% Other: 10% Sam: 9% SC: 8% Hotdog: 6% Jeff: 6%

Date	Meeting type	Meeting start time (ET)	Length of recording (minutes:seconds)	# of participants	Notes	Conversational turn-taking
						Nathan: 6% Panda: 5% Cody: 5% Other: 3% Thomas: 3% Nick: 2% Other: 2%
2/6/23	Standup	9:30am	27:34	21	Includes post-standup	Other: 18% Daniel: 11% SC: 10% Panda: 9% John: 8% Zelda: 7% Thomas: 7% Jeff: 7% Other: 6% Sam: 6% Other: 3% Hotdog: 3% Cody: 1% Nick: 1% Other: 1% Alison: 1% Nathan: <1% Pete: <1% Other: <1% Other: <1%
2/9/23	Review – Design review	2:00pm	47:51	12-15		Hotdog: 44% Zelda: 19% Nick: 9% SC: 8% Cody: 6% Pete: 4% Alison: 2% Daniel: 1% Panda: 1% Nathan: 1% Other: 1% Other: <1% Other: <1% Other: <1% Other: <1%

Date	Meeting type	Meeting start time (ET)	Length of recording (minutes:seconds)	# of participants	Notes	Conversational turn-taking
						Sam: <1% Other: <1%

Appendix B: Interview Protocol

Interview Recruitment Email

IRB-SBS #5466

Jenn Campbell

Interview Recruitment Email

Hi NAME,

Thank you for participating in my research on team dynamics in the workplace through observations of the CLIENT team and completing the survey last month. I am reaching out because you indicated that you would be interested in potentially participating in a follow-up interview. I would love to chat with you one-on-one to learn more about your experiences on the CLIENT Team. Some information on the interview is below, and additional information can be found in the attached study info sheet. This study has been approved through University of Virginia's IRB, and the protocol number for reference is IRB-SBS #5466.

Interview information

The interview will take 30-60 minutes and will be conducted over Zoom. Audio and video of the interview will be recorded through Zoom and saved locally on my computer. Interviews will take place between May 4 and May 19, 2023. I will ask for your verbal consent at the beginning of our scheduled interview time.

As with the previous parts of this study, there are a few items that I would like to draw your attention to:

- Your decision to participate is voluntary and will have no effect on your employment status or services. ORGANIZATION will not know who agreed to participate.

- Any information that I use will be deidentified, meaning your name and identifying characteristics of you and the organization will be removed.

Next steps

If you are willing to participate in an interview, please reply to this email. If you have a preferred date (prior to May 12th) and/or time for the interview, please include that as well. I am usually available from 9:00am-5:00pm and from 7:30pm-9:30pm Eastern Time on weekdays, and I can make other times work to best fit your schedule.

Thanks again for your help!

Jenn

Interview Study Information Sheet

Study Information Sheet IRB-SBS #5466 Team Dynamics in the Workplace

Please read this study information sheet carefully before you decide to participate in the study.

Purpose of the research study: The purpose of the study is to learn more about team dynamics, like sense of belonging and inclusion, in the workplace and how they are experienced by individual team members. Additionally, we hope to learn about how team dynamics relate to the engineering and design processes, and designed products.

What you will do in the study: You will participate in a one-on-one interview over Zoom, and the audio and video of these interviews will be recorded through Zoom and saved locally on the researcher's computer. The researcher will also take notes during the interview. You can skip any question that makes you feel uncomfortable, and you can stop the interview at any time.

Time required: The study will require about 1 hour of your time.

Risks: There are no anticipated risks in this study beyond potential discomfort during the interview. Data from individual participants will not be shared with ORGANIZATION.

Benefits: There are no direct benefits to you for participating in this research study. The study may help us understand how team dynamics like psychological safety and inclusion develop and are experienced in the workplace and how team dynamics are related to the design process and products.

Confidentiality: The data collected in this study will be handled confidentially. Your decision whether to participate in this study will be kept confidential, and ORGANIZATION will not know who has agreed to participate in this research. Only the researcher will have access to the raw data. The researcher's notes and audio- and video-recordings from the study will be stored in password-protected cloud accounts or hard drives. The results of this research may appear in publications, but individual participants will be deidentified. You will select a private code name that only you and the researcher will know, and your name will be replaced with this code name in the researcher's notes and in transcriptions of the audio recordings. When the study is completed and data have been analyzed, this list will be destroyed. Your name will not be used in any report. The audio and video recordings will be transcribed after all of the data is collected; the original file will be destroyed after the recording is transcribed and analyzed.

Voluntary participation: Your participation in the study is completely voluntary. Your decision to participate will have no effect on your employment or services, and ORGANIZATION will not know who has agreed to participate in this research.

Right to withdraw from the study: You have the right to withdraw from the study at any time without penalty. The recording of your interview will be destroyed should you decide to withdraw.

How to withdraw from the study: If you want to withdraw from the study during the interview, tell the interviewer to stop the interview. There is no penalty for withdrawing, and withdrawing will not affect your experience as an employee at ORGANIZATION. Withdrawing will not affect your employment or

services. If you would like to withdraw after your materials have been submitted, please contact Jenn Campbell, jc3nh@virginia.edu. If you choose to withdraw from the study, all of your data from will be destroyed.

Payment: You will receive no payment for participating in the study.

Using data beyond this study: The data you provide in this study will be retained in a secure manner by the researcher for 5 years and then destroyed.

If you have questions about the study, contact:

Jenn Campbell
Department of Engineering Systems and Environment

Olsson Hall, 151 Engineer's Way
University of Virginia, Charlottesville, VA 22904
Telephone: (203) 994-2229
Email address: jc3nh@virginia.edu

Leidy Klotz
Department of Engineering Systems and Environment

Olsson Hall, 151 Engineer's Way
University of Virginia, Charlottesville, VA 22904
Telephone: (434) 982-5389
Email address: lk6me@virginia.edu

To obtain more information about the study, ask questions about the research procedures, express concerns about your participation, or report illness, injury or other problems, please contact:

Tonya R. Moon, Ph.D.
Chair, Institutional Review Board for the Social and Behavioral Sciences
One Morton Dr Suite 400
University of Virginia, P.O. Box 800392
Charlottesville, VA 22908-0392
Telephone: (434) 924-5999
Email: irbsbshelp@virginia.edu
Website: https://research.virginia.edu/irb-sbs
Website for Research Participants: https://research.virginia.edu/research-participants

UVA IRB-SBS # 5466

You may keep this copy for your records.

Interview Protocol

UVA IRB-SBS #5466

- *Thank you so much*
- *How is your week going*
- Game plan
    - Read a script with some info on the study
    - Ask for your consent to be interviewed and recorded
    - Around 8 questions, but I may ask some follow-up questions based on your responses
    - May take up to an hour

Introduction and consent

Thank you so much for taking the time to join me today. As you know, I am a Ph.D. candidate studying civil engineering at the University of Virginia. I am conducting a study on team dynamics in the workplace and how these team dynamics are related to the engineering and design processes and products.

I would like to ask you some questions about team dynamics at ORGANIZATION, particularly with regard to your time on the CLIENT Team. This interview may take up to 60 minutes of your time in one sitting today over Zoom. I would like to record the audio and video of this interview so that I can accurately capture your words. Feel free to ask any questions at any stage during the interview. And I may make notes so that we can return to a topic later in the interview. You can skip any question, and we can stop this interview at any time.

Do you have any questions about the study?

Do you agree to be interviewed and recorded?

Great, thank you so much! Let's get started. We'll start with some broader questions, then move on to some more specific ones.

Interview questions (semi-structured)

1) Can you tell me about a time at work where you felt comfortable being yourself, bringing up tough issues and concerns, or taking a risk?
    a) Can you provide an example of something team members did or say to help you feel that way?
    b) Was this at ORGANIZATION or elsewhere?
2) Can you tell me a little bit about your experience on the CLIENT team? First, role and responsibilities.
    a) Had you worked with any of these team members before?
    b) To what extent did you feel comfortable being yourself, bringing up tough issues and concerns, or taking a risk?
    c) How did this experience compare to your other work/team experiences?
3) I observed several different types of meetings with you all. I'm curious how the stand-up meetings compare to other meetings with regards to how comfortable you felt speaking up, voicing concerns, etc.?
    a) Did that impact the way you interacted with people over the day?

   b) Did it seem like different types of meetings impacted psychological safety differently? Were there some meetings that contributed to it and others where it was more a demonstration of the level of psych safety?
4) Often over time, teams get closer and team members feel more comfortable with each other and addressing potential issues or mistakes - did you see that with the CLIENT Team?
   a) Why do you think that is?
5) Do you think the client impacted your team's psychological safety? If so, how?
6) Do you think psychological safety impacted the CLIENT project?
   a) Probe on process and product
   b) In your experience (outside of this project), how do you think psychological safety impacts the process and products that you have worked on?
7) "What does psychological safety mean to you?"
   a) What do you do to help create psych safety?
   b) How can you tell that a team is psychologically safe?
   c) What do people do or say to make you feel psychologically safe?
   d) Is psychological safety important to you? Why?
8) Given your work experiences, if you had to design an intervention or activity to help increase psychological safety on teams, what would you do?
9) Is there anything important regarding your experiences of psychological safety and teamwork either on the CLIENT team or in the workplace more broadly that we haven't discussed?

Conclusion

Thank you so much for taking the time to participate in this study. I appreciated learning more about _____.

Appendix C: Survey Information

Survey recruitment email

IRB-SBS #5466

Jenn Campbell

Survey Recruitment Email

Hi all,

Thank you all for letting me observe meetings throughout the course of the [INSERT PROJECT NAME]. As I wrap up my research with your team, I'm hoping to collect some final individual data such as your role on the team, measures of psychological safety and belonging, perceived diversity, project outcomes, and demographics. The survey will take roughly 10 minutes.

The survey will close on [INSERT DATE]. If you are willing to participate in the survey, please click the link below. The first page of the survey will provide additional information on this part of the study (which is also attached for reference), and will require your consent via a signature box. If you decide you do NOT want to take the survey, you can exit on the first page, and you can stop the survey at any time.

There are a few items that I would like to draw your attention to:

- Your decision to participate is voluntary and will have no effect on your employment status or services. ORGANIZATION will not know who agreed to participate.

- Any information that I use will be deidentified, meaning your name and identifying characteristics of you and the organization will be removed.

Thanks again for your help!

Jenn

Survey instrument

JCampbell Dissertation Team Survey Deidentified

Start of Block: Informed consent

consent **Protocol 5466: Team dynamics in the workplace**

Informed Consent Agreement: Please read this consent agreement carefully before you decide to participate in this portion of the study.

Purpose of the research study: The purpose of the study is to learn more about team dynamics, like sense of belonging and inclusion, in the workplace and how they are experienced by individual team members. Additionally, we hope to learn about how team dynamics relate to the engineering and design processes, and designed products.

What you will do in the study: You will be asked to complete a survey. The survey will include questions about your experience working on a team at ORGANIZATION, as well as demographic questions. You can stop the survey at any time. You may withdraw your participation at any time.

Time required: This survey will require about 10 minutes of your time in a single session.

Risks: There are no anticipated risks in this study beyond potentially feeling fatigue. Data from individual participants will not be shared with ORGANIZATION, and all of the data collected will be kept confidential.

Benefits: There are no direct benefits to you for participating in this research study. The study may help us understand how team dynamics like sense of belonging and inclusion develop and are experienced in the workplace and how team dynamics are related to the design process and products.

Confidentiality: The data collected in this study will be handled confidentially. Your decision whether to participate in this study will be kept confidential, and ORGANIZATION will not know who has agreed to participate in this research. Only the researcher will have access to the raw data. The results of this research may appear in publications, but individual participants will not be identified. Once the data collection is completed, your name will be replaced with a code name. The list connecting your name to this code name to this code will be kept in a locked file. When the study is completed and the data have been analyzed, this list will be destroyed. Your name will not be used in any report.

Voluntary participation: Your participation in the study is completely voluntary. Your decision to participate will have no effect on your employment or services, and ORGANIZATION will not know who has agreed to participate in this research.

Right to withdraw from the study: You have the right to withdraw from the study at any time without penalty. Your survey data will be deleted should you decide to withdraw from the study.

How to withdraw from the study: If you want to withdraw from the study, please exit the survey. There is no penalty for withdrawing, and withdrawing will not affect your experience as an employee at ORGANIZATION. Withdrawing will not affect your employment or services. If you would like to withdraw after your materials have been submitted, please contact Jenn Campbell, jc3nh@virginia.edu. If you choose to withdraw from the survey portion of the study, your individual data will be destroyed.

Payment: You will receive no payment for participating in the study.

Using data beyond this study: The data you provide in this study will be retained in a secure manner by the researcher for 5 years and then destroyed.

If you have questions about the study, contact:
Jenn Campbell
Department of Engineering Systems and Environment
Olsson Hall, 151 Engineer's Way
University of Virginia, Charlottesville, VA 22904
Telephone: (203) 994-2229
Email address: jc3nh@virginia.edu

Leidy Klotz
Department of Engineering Systems and Environment
Olsson Hall, 151 Engineer's Way
University of Virginia, Charlottesville, VA 22904
Telephone: (434) 982-5389
Email address: lk6me@virginia.edu

To obtain more information about the study, ask questions about the research procedures, express concerns about your participation, or report illness, injury or other problems, please contact:
Tonya R. Moon, Ph.D.
Chair, Institutional Review Board for the Social and Behavioral Sciences
One Morton Dr Suite 500
University of Virginia, P.O. Box 800392
Charlottesville, VA 22908-0392
Telephone: (434) 924-5999

Email: irbsbshelp@virginia.edu
Website: https://research.virginia.edu/irb-sbs Website for Research Participants: https://research.virginia.edu/research-participants
UVA IRB-SBS #5466

consent.sign I agree to participate in the research study described above.

Q135 If you do not wish to participate, you may exit the survey now.

End of Block: Informed consent

Start of Block: ID

name What is your name (first & last)?

_____

team_role What is/was your role on the CLIENT team?

_____

Page Break

date.start On what date did you START working on the CLIENT team?

_____

date.stop On what date did you STOP working on the CLIENT team? (If you are still working on the team, please select April 1, 2023.)

_____

Page Break

team.exp Please tell me a bit about your experience working with the CLIENT team.

_____

End of Block: ID

Start of Block: Psychological Safety Scale, Edmondson, 1999


safe How much do you agree with the following statements in describing your team?
"Your team" refers to the internal ORGANIZATION CLIENT team.

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
If you make a mistake on this team, it is often held against you. (11)	○	○	○	○	○	○	○
Members of this team are able to bring up problems and tough issues. (12)	○	○	○	○	○	○	○
People on this team sometimes reject others for being different. (13)	○	○	○	○	○	○	○
It is safe to take a risk on this team. (14)	○	○	○	○	○	○	○
It is difficult to ask other members of this team for help. (15)	○	○	○	○	○	○	○
No one on this team would deliberately act in a way that undermines my efforts. (16)	○	○	○	○	○	○	○

Working with members of this team, my unique skills and talents are valued and utilized. (17)	○	○	○	○	○	○	○

End of Block: Psychological Safety Scale, Edmondson, 1999

Start of Block: Perceived diversity, Harrison et al. MODIFIED SCALE

intro.perc.div
Please think about how similar members of your team are for the following questions. Don't overthink it – your first gut reaction is probably best.

Page Break

div.edu How similar are the members of your team with regard to their educational background?

- ○ Very different (1)
- ○ Different (2)
- ○ Somewhat different (3)
- ○ Somewhat similar (4)
- ○ Similar (5)
- ○ Very similar (6)

Page Break

div.race How similar are the members of your team with regard to their race?

- Very different (1)
- Different (2)
- Somewhat different (3)
- Somewhat similar (4)
- Similar (5)
- Very similar (6)

Page Break

div.value How similar are the members of your team with regard to their personal values?

- Very different (1)
- Different (2)
- Somewhat different (3)
- Somewhat similar (4)
- Similar (5)
- Very similar (6)

Page Break

div.priority How similar are the members of your team with regard to their priorities?

- Very different (1)
- Different (2)
- Somewhat different (3)
- Somewhat similar (4)
- Similar (5)
- Very similar (6)

Page Break

Q91 How similar are the members of your team with regard to their personalities?

- Very different (1)
- Different (2)
- Somewhat different (3)
- Somewhat similar (4)
- Similar (5)
- Very similar (6)

Page Break

Q92 How similar are the members of your team with regard to their commitment to the project?

- Very different (1)
- Different (2)
- Somewhat different (3)
- Somewhat similar (4)
- Similar (5)
- Very similar (6)

Page Break

Q93 How similar are the members of your team with regard to their project goals?

- Very different (1)
- Different (2)
- Somewhat different (3)
- Somewhat similar (4)
- Similar (5)
- Very similar (6)

End of Block: Perceived diversity, Harrison et al. MODIFIED SCALE

Start of Block: Sense of belonging

sob_1 Please use the scales below to rate how much you agree with the following questions. "On the CLIENT team, I feel..."

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
Accepted (1)	○	○	○	○	○	○	○
Appreciated (2)	○	○	○	○	○	○	○
Like I fit in (3)	○	○	○	○	○	○	○
Content (4)	○	○	○	○	○	○	○
Respected (8)	○	○	○	○	○	○	○
Connected (9)	○	○	○	○	○	○	○
Comfortable (10)	○	○	○	○	○	○	○
Valued (11)	○	○	○	○	○	○	○
At ease (12)	○	○	○	○	○	○	○

Page Break

sob_2_rev Please use the scales below to rate how much you agree with the following questions.

"On the CLIENT team, I feel..."

	Strongly disagree (7)	Disagree (6)	Somewhat disagree (5)	Neither agree nor disagree (4)	Somewhat agree (3)	Agree (2)	Strongly agree (1)
Tense (1)	○	○	○	○	○	○	○
Like I don't belong (2)	○	○	○	○	○	○	○
Like an outsider (3)	○	○	○	○	○	○	○
Neglected (4)	○	○	○	○	○	○	○
Excluded (5)	○	○	○	○	○	○	○
Nervous (6)	○	○	○	○	○	○	○
Invisible (7)	○	○	○	○	○	○	○
Inadequate (8)	○	○	○	○	○	○	○
Disregarded (9)	○	○	○	○	○	○	○
Insignificant (10)	○	○	○	○	○	○	○
Anxious (11)	○	○	○	○	○	○	○

End of Block: Sense of belonging

Start of Block: Outcomes

Q121 To what extent do you agree with the following statement?

The team met the project goals.

- ○ Strongly disagree (6)
- ○ Somewhat disagree (7)
- ○ Neither agree nor disagree (8)
- ○ Somewhat agree (9)
- ○ Strongly agree (10)

Page Break

Q126 How satisfied are you with the process for this project?

- ○ Extremely dissatisfied (11)
- ○ Somewhat dissatisfied (12)
- ○ Neither satisfied nor dissatisfied (13)
- ○ Somewhat satisfied (14)
- ○ Extremely satisfied (15)

Q127 How satisfied are you with the end result?

- Extremely dissatisfied (11)
- Somewhat dissatisfied (12)
- Neither satisfied nor dissatisfied (13)
- Somewhat satisfied (14)
- Extremely satisfied (15)

Page Break

Q122 How satisfied do you think the client is with the process for this project?

- Extremely dissatisfied (11)
- Somewhat dissatisfied (12)
- Neither satisfied nor dissatisfied (13)
- Somewhat satisfied (14)
- Extremely satisfied (15)

Q123 How satisfied do you think the client is with the end result?

- Extremely dissatisfied (11)
- Somewhat dissatisfied (12)
- Neither satisfied nor dissatisfied (13)
- Somewhat satisfied (14)
- Extremely satisfied (15)

Page Break

Q124 How satisfied do you think ORGANIZTION is with the process for this project??

- Extremely dissatisfied (11)
- Somewhat dissatisfied (12)
- Neither satisfied nor dissatisfied (13)
- Somewhat satisfied (14)
- Extremely satisfied (15)

Q125 How satisfied do you think ORGANIZATION is with the end result?

- Extremely dissatisfied (11)
- Somewhat dissatisfied (12)
- Neither satisfied nor dissatisfied (13)
- Somewhat satisfied (14)
- Extremely satisfied (15)

End of Block: Outcomes

Start of Block: Demographics

Q107 Which ORGANIZATION location are you based in? (Note: this was a multiple choice question, but I removed locations to deidentify the survey)

- Other (4)

role.exp How long have you worked in your present role/position?

▼ 0 / Under 1 year (0) ... 10+ years (5)

X→

WT.exp How long have you worked at ORGANIZATION?

▼ 0 / Under 1 year (0) ... 10+ years (5)

X→

work.exp How many years of full-time work experience do you have?

▼ 0 / Under 1 year (0) ... 10+ years (5)

Page Break

fam.ppl How much do you agree with the following statement:

"I knew my teammates well **before** the CLIENT project."

- ○ Strongly disagree (1)
- ○ Disagree (2)
- ○ Somewhat disagree (3)
- ○ Somewhat agree (4)
- ○ Agree (5)
- ○ Strongly Agree (6)

Page Break

gender Thank you! We'll now ask a brief set of demographic questions.
What is your gender?

- ○ Man (0)
- ○ Woman (1)
- ○ Non-binary (2)
- ○ Prefer not to say (3)

race What is your race or ethnicity? Please select all that apply.

- ☐ Black / African-American (1)
- ☐ White / Caucasian (2)
- ☐ Asian / Pacific Islander (3)
- ☐ Latinx/ Hispanic (4)
- ☐ Native American / Alaskan Native (5)
- ☐ Middle Eastern / North African (6)
- ☐ Other (7) _____

Display This Question:

If What is your race or ethnicity? Please select all that apply. != Latinx/ Hispanic

Q120 Are you of Hispanic or Latinx origin?

- ○ Yes (1)
- ○ No (2)

age What is your age?

_____

income Before taxes, what is your household's annual income?

▼ Greater than $300,000/ year (16) ... Less than $20,000 per year (1)

Page Break

degree What is the highest educational attainment (level of school) that you have completed?

- ○ I have a Graduate Degree or Professional Degree (MA / MBA / MS / PhD / JD / MD) (7)
- ○ Some graduate school training, but no degree (6)
- ○ I have a Bachelor's Degree (BA / BS) (5)
- ○ I have an Associates Degree (AA / AS) (4)
- ○ Some college experience, but no degree (3)
- ○ I have a High School Diploma or GED equivalent (2)
- ○ Some high school experience, but no diploma (1)

single.par Did you grow up in a single-parent household?

- ○ Yes (1)
- ○ No (0)
- ○ Other (2) _____

mo.ed What is the highest level of education that your MOTHER (or primary guardian) completed?

- ○ Graduate Degree or Professional Degree (MA / MBA / MS / PhD / JD / MD) (7)
- ○ Some graduate school training, but no degree (6)
- ○ Bachelor's Degree (BA / BS) (5)
- ○ Associate's Degree (AA / AS) (4)
- ○ Some college experience, but no degree (3)
- ○ High School Diploma or GED equivalent (2)
- ○ Some high school experience, but no diploma (1)
- ○ Prefer not to say (0)
- ○ I'm not sure (99)

fa.ed What is the highest level of education that your FATHER (or secondary guardian) completed?

- ○ Graduate Degree or Professional Degree (MA / MBA / MS / PhD / JD / MD) (7)
- ○ Some graduate school training, but no degree (6)
- ○ Bachelor's Degree (BA / BS) (5)
- ○ Associate's Degree (AA / AS) (4)
- ○ Some college experience, but no degree (3)
- ○ High School Diploma or GED equivalent (2)
- ○ Some high school experience, but no diploma (1)
- ○ Prefer not to say (0)
- ○ I'm not sure (0)

Page Break

ladder Think of this ladder as representing where people stand in the United States (you may have to wait for the image to load).

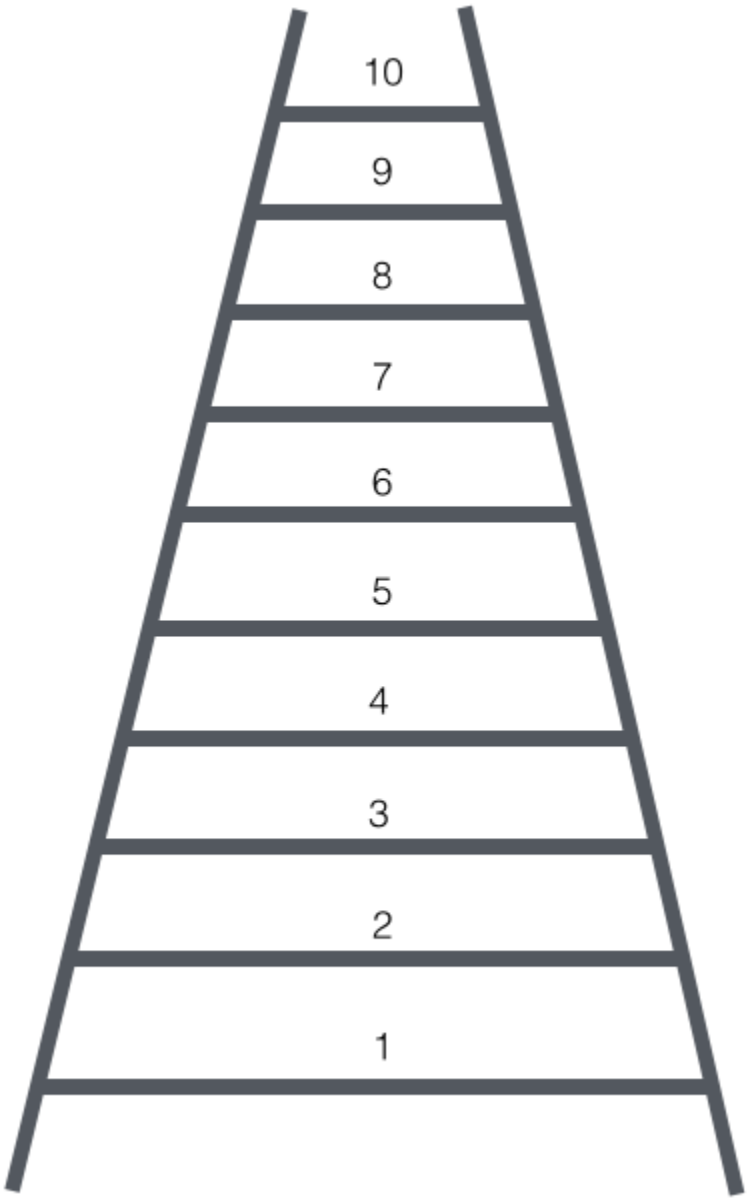
At the top of the ladder are those who are the best off: Those who have the most money, most education, and the most respected jobs.

At the bottom are the people who are the worst off: Those who have the least money, least (or no) education, and least prestigious jobs in the United States.

The higher you are on this ladder, the closer you are to the top. The lower you are, the closer you are to the people at the bottom.

Where would you place yourself on this ladder? Please click the rung where you think you stand at this time in your life, relative to other people in the United States.

	Off (1)	On (2)
1 (4)		
2 (5)		
3 (6)		
4 (7)		
5 (8)		
6 (9)		
7 (10)		
8 (11)		
9 (12)		
Region #10 (13)		



Those who are the **best off:**
People with the **most** money, most education,
and most respected and prestigious jobs in the Unit

Those who are the **worst off**:
People with the ***least*** money, least/no education,
and least respected and prestigious jobs in the Unit

End of Block: Demographics

Start of Block: Attention and things

X→

attn.fail You are almost finished. Please select "Strongly agree" on the scale below.

- ○ Strongly disagree (1)
- ○ Strongly agree (0)
- ○ Disagree (1)
- ○ Neither agree nor disagree (1)
- ○ Slightly agree (1)
- ○ Agree (1)
- ○ Strongly Disagree (1)

End of Block: Attention and things

Start of Block: End

Page Break

interview Thank you for participating in this study!

Can we reach out to you for a possible follow-up interview? It would help us better understand your experience on the CLIENT team.

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Thank you for participating in this study! Can we reach out to you for a possible follow-up inter... = Yes

Q129 What is your email address to reach out about an interview?

_____

Page Break

other This is the end of the survey.

Is there anything else you would like to share?

_____

_____

_____

_____

_____

End of Block: End

Summary results

Psychological safety

Psychological safety was measured using Edmondson's (1999) Team Psychological Safety Scale. This is a 7-point Likert scale, where 1 = strongly disagree and 7 = strongly agree. Participants were asked "How much to you agree with the following statements in describing your team? 'Your team' refers to the internal ORGANIZATION CLIENT team." Three of the items are reverse coded, which was accounted for in the analysis. The score is calculated by taking the average of each individual's answers to the seven items, then averaging all of the individual scores (Edmondson, 1999). The team's psychological safety had a mean of 6.2 with a standard deviation of 0.5.

Perceived diversity

Perceived diversity was measured using Harrison et al.'s (2002) questions, which are in the format of "How similar are the members of your team with regard to their ____?" Possible answers are on a 6-point Likert scale from 1= very different to 6= very similar. Each of the topics is listed below along with the mean and standard deviation for each question.

Perceived diversity aspect	Mean	Standard deviation
Educational background	3	1.4
Race	3.3	1.3
Personal values	4.2	1.1

Priorities	4.5	0.7
Personalities	2.5	1
Commitment to the project	5.1	1.2
Project goals	4.9	1.5

Sense of belonging

Sense of belonging was measured using the scale from Good et al. (2012). Participants were asked "Please use the scales below to rate how much you agree with the following questions: 'On the CLIENT team, I feel…'" Participants responded on a 7-point Likert scale where 1 = strongly disagree and 7 = strongly agree. This measure includes a set of positively framed sentiments (accepted, appreciated, like I fit in, content, respected, connected, comfortable, valued, at ease) and a set of negatively framed sentiments (tense, like I don't belong, like an outside, neglected, excluded, nervous, invisible, inadequate, disregarded, insignificant, anxious). The negatively framed sentiments are reverse coded, then all of the scores are averaged to get an individual's score. The mean individual score for participants was 5.7 with a standard deviation of 0.6.

Satisfaction with process and outcomes

In an attempt to gauge individual, client, and organizational satisfaction with the process and end result for the project, I included several questions asking about perceived satisfaction. Participants were asked "To what extent do you agree with the following statement," and responses were on a 5-point Likert scale where 1 = strongly disagree and 5 = strongly agree or 1 = extremely dissatisfied and 5 = extremely satisfied. Each question along with the mean and standard deviation are listed below.

Question	Mean	Standard deviation
The team met the project goals	2.9	1.4
How satisfied are you with the process for this project?	2.6	1.3
How satisfied are you with the end result?	2.3	1.2
How satisfied do you think the client is with the process for this project?	1.7	1.4
How satisfied do you think the client is with the end result?	2.4	1.5
How satisfied do you think the organization is with the process for this project?	2.4	1.2
How satisfied do you think the organization is with the end result?	1.9	1.0

Appendix D: Codebook

Code	Definition	Example(s)
apology	Saying sorry or apologizing for something	Sorry I was late. I don't want to be a blocker for y'all. So like I like the real time. I missed the one yesterday. Apologies for that.
appreciate_broad	Shows appreciation, gratitude, thanks, or recognition for the team broadly	So good work everyone there
appreciate_specific	Shows appreciation, gratitude, thanks, or recognition for a team member specifically by name	Shout out to Hotdog for joining a call with CLIENT to share some of the insights from the on site.
building	Building on or adding to something someone else has said	Jeff: ...I did drop a line about that one endpoint being geofenced or not to NAME. And then it came up in the design call. And they're like, alright, so Sam there's some uncertainty on their end of like what is and is not geofenced, just a heads up. Daniel: There's also some uncertainty on the business side, which we're hoping to get some finalization on as soon as possible.
clarification question	A question or statement asking for clarification on a topic, task, process, etc.	Can we talk about it real quick, so it's just that sales goal they may or may not use it, is that what the thing was? Clock in they'll always use it?
counter information	Offering information that is different or in contrast to another opinion or information	on the geofence, like the, should we post-stand up on that because we're doing geofence in this sprint, right? Zelda 07:04 Yes, we are. Jeff 07:05 We just don't know yet. I guess is kind of the point. *[AN: this is the counter*

		information part, just provided the earlier part for context]
counter opinion	Offering an opinion that is different or in contrast to another opinion or information	Panda 15:43 Okay, so it's a matter of if it'll show up on the homescreen or not basically, like the Menu button. Sam 15:50 Well, I think it would still need to be there on the home screen, *[AN: This is the counter opinion part]*
delegate	Assigning a task or responsibility to a team member.	Could you summarize what they just talked about there and reply to that thread with NAME? So is that maybe a NAME and Hotdog thing, can y'all get together on that? Panda, if you wanto to look at them in more depth and let us know which feels more achievable...I'll defer to you if it feels like that could take all day.
excited	Expressing excitement or enthusiasm	That's really exciting, I love how it comes in. Woohoo! That sounds awesome.

explain why	Explaining why or sharing context	Yeah, the reasoning, so we had it at one point instead of your schedule, but like it's a January up at the top. The reasoning here is that you're looking at the current week and the next week. (Hotdog) All right. Cool. For kind of some why I'm asking we currently have it reported as we will be feature complete with schedule the end of Sprint five. And I want to know if that doesn't sound accurate. So we can report that quickly to get it on CLIENT's radar. (Sam)
feedback	Asking for feedback or input from the team or mentioning feedback received	Yes, as Sam said, starting to put some tasks in there, let me know if I have them worded strangely, or if I should edit them somehow, according to best practices. So want to make sure I'm using the proper terms. Yeah. Open to feedback if that feels confusing. It's just we just thought it looked cool. So Panda and I talked a little this morning and I just want to get input from the team, or Sam.
frustration	Expressing frustration	Yeah, that's really backlogged right now, I followed up with (NAME) twice last week, and they said they last I heard was Thursday, he said, that'd be ready Friday. And he was out of the office today or yesterday. So I don't think they've gotten their GitHub set up even. What asked him on last November 7, was, how's it going with the setup? And he said, by the end of the week, and then on the eighth, he said, Oh, yeah, maybe we'll have an end of the week. And then, yeah, he didn't didn't have any update by Friday. And then Monday, I tried to get a hold of him, but he was out of the office. So I mean, that's definitely a block. (Panda)
I don't know	Saying "I don't know" or expressing uncertainty at a specific, likely task-based level	Yeah, not sure. Nathan and Zelda were I know were workign on it. So I don't know what all's left on schedule to do.

im confused	Acknowledging confusion or lack of understanding	So yeah, when nathan and I were in there, we didn't realize that they had expectations about document for Chronos. Specifically, I'm still a little bit confused on exactly what it is. Yea. Could I could I actually ask sort of a tangential question? Is that are timecards screen in scope? That's something that I've been a little fuzzy on.
improve	Mentioning improvement or something that suggests a growth mindset	So start with the CLIENT one. I think we did improve a lot with the Okta side. So we're happy about that.
inclusive	Being inclusive of marginalized group	I worry a little bit about the color blindness like if it's if it's just relying on color Real quick, I have one slightly embarrassing question, NAME, how do you pronounce your name? So to be sure I'm saying it right?
invitation_meeting_open	General open invitation to a meeting or event; no one invited specifically by name	We have a call with radar later this morning at 1130. And so that's going to be Zelda Panda and I, Thomas if you want to join. Great. I also, you're more than one I guess anyone else that wants to join too it's just going to be a discussion around what the radar team can do with us and for us, and how do we position not only ORGANIZATION, but also CLIENT to make a decision on if we want to go with radar
invitation_meeting_specific	Specific invitation (by name) to join a future meeting or event	Bob right now you're not on the wireframe review. It is at 515. There's no pressure. But would you like me to just add you as optional to that one?
inviting participation_open	Open invitation to participate verbally in the current meeting	I think we can open that up to the team. Anything that we want to know from people?
inviting participation_specific	Specific invitation (by name) to participate verbally in the current meeting	Yeah, I think that'd be a starting point. Hotdog, How do you feel about that?
joke	Making a joke	We've all aged five years since you've been gone. So I have some grey areas. I was trying to make a really bad chick day pun.

missed you guys	Expressing happiness to be back at work, having missed teammates, etc.	Welcome back, those of you who were on PTO. I know I missed a lot of people. It's amazing what will happen when you take a month off, right? Yeah, it's good to be back. Looking forward to getting up to speed. I missed you guys. But yeah, just happy to be back and hope everyone had a great, great holidays.
mistake	Sharing or admitting a mistake or error.	I joined the wrong meeting somehow. Sorry. I screwed mine up and then I redid it. I don't know if you saw that. I don't want to be a blocker for y'all. So like I like the real time. I missed the one yesterday. Apologies for that.
norm	Discussing or establishing a norm, best practice, or standard	How is how would be best to capture stuff like this, like I want to, I know this is probably not the best way to do a review, with everyone.
not the expert	Acknowledging that you are not the expert, lack the knowledge or skills. Or recognizing that someone else IS the expert and has the knowledge or skills.	Because I think I'm really close to getting that potplayer stuff, at least for the attestation flow figured out. But I know I'm missing something. And it's probably just a knowledge gap and realm and whatnot.
on the same page	Sharing or receiving information to get up to speed with other team members or the client	Yeah. You made a change last Friday Panda for updating the environment file, the END file. Just making sure that everyone's aware of that. Check the comment that Panda left on the PR channel and it should be ready to merge from what we talked about on Friday. I'll bring it through the PR too.
opinion	Offering an opinion on something	I think that a couple of these might be important to hit every time. And that you can push back on it, but like the, the how you feel about having a work app on your phone feels like a really important one for us to get
passing conversation	Handing off the conversation to another team member	And let's kick it over to Thomas.

regroup or sync with teammate	Informal meeting between teammates that either has already happened or will happen in the future. Differs from invitation_meeting in that invitation_meeting is for a formal meeting.	I synced with Alicia, I like to make sure we get her update as well. I need to sync with the team and Panda on, I made a few changes in this PR to do more functional things in the code. So I want to sync with the all of you on that later today.
request	A request or ask of someone on the team or the team in general	There is one ask that I have for this one, Daniel, if you scroll down a little bit, the first AC, can we change that to the ticket 756.
self-deprecate	"modest about or critical of oneself, especially humorously so" (from OED)	Yeah, hopefully I got my microphone working. Daniel 05:11 Yes, we can hear you. Nick 05:13 It's amazing what will happen when you take a month off, right?
self-disclosure	Sharing personal information with the team unprompted.	So my family's in Pennsylvania and they're always like, it's snowing. And I'm like, hey, you guys have fun. I'm out starting Wednesday for a time. I'm getting married on Friday. So it's very exciting for me.
social	Social discussions such as small talk at the beginning of meetings. Differs from self-disclosure in that "social" is less personal and less vulnerable like talking about the weather as opposed to sharing what you did because of the weather	Zelda: Jeff I really like that sweater Jeff: Thank you very much, my mom knit it for me Zelda: I love it Voting is tomorrow. So I'm gonna be out for some point to the vote. you should too

structuring meeting	Anything done to structure the current meeting such as discuss agenda items, decide speaking order, refocus the team, etc.	Okay, team. That's it for standup. I'm going to sign us out. CLIENT CLIENT CLIENT. And post stand up we're doing Jeff mentioned, Sam, did you mention FEATURE errors? Okay I think we're ready to get started. Sam and folks are still at the conference, so NAME, you wanna kick us off? And again, this is an internal design review, the goal is to ask these type of questions so we can figure out what we need to look at and explore next.
support the team	Offering to help the team, expressing support for the team	I have like a relatively meeting free day today. So if anyone on the development side or test side wants to pair, I'd be more than happy to do that. Just let me know. I wanted to ask if anybody has tickets assigned to them. And if they could update the status on the ticket, and just make sure that everything that's done is like, makred as such. **And I also wanted to make sure that everybody can access it.** Yeah, hopefully, we can avoid having to adjust as many, many times but if you are seeing, like, I think Nick pointed out like conjunctions versus not conjunctions. Like, we would like to at least have the language feel aligned. So if it's not a huge lift to have to make, you know, we find those inconsistencies to change.
taking responsibility/ownership	Taking ownership or responsibility of a task or mistake	I'll reply to his hype video question. Okay, that sounds good. So I will do that. I remember that thing that I forgot. So I think I volunteered to DRI wolf time. And so now that things have died down a little bit, I'll just look over everyone's calendars again and send out a poll which dates would work best.

that was good	Expressing a win or something that went well	We got sales goal stuff merged. And that was awesome. We were able to get a CLIENT team that work. And we were able to proof that later in the day. So that was good.
tough question	Bringing up a problem, issue, or tough question. The problem, issue, or tough question should be big enough that it has potential implications for the project.	I want to be sure we're not just blindly following design. Do you think we want to need to do like do some realignment on that? Weren't we just saying that we wanted to try to get one whole feature out the door like as soon as possible?
uncertainty	Expressing uncertainty at a high level - for example, uncertainty about expectations, goals, strategy. Different from "I don't know" - "I don't know" is expressing uncertainty or lack of knowledge at a smaller, more task-based level.	There's also some uncertainty on the business side, which we are hoping to get some finalization on as soon as possible.
us versus them	Situation where it's the internal team versus or against the client	What I recommend is let's not asked about this one directly, if they bring it up, we can clarify that we are under the impression it's approved. Do we have an agenda for what we want to get out of the call other than this? Okay, so if that's helpful for our team, that's one discussion. And we can like, figure out how to make sure that you guys are getting what you need. But as far as like, what CLIENT requires, it's only the sequence diagram and we want to make sure we have a single source of truth for the API's. Their source of truth is the API documentation they have in their Confluence. The difficulty is that's not always not always up to date. So what we talked about yesterday was pushing them to make sure those API contracts in those in that documentation is exact.
validating	Recognizing or affirming the validity or worth or a person or their feelings or opinions; causing a person to feel valued or worthwhile	That’s a good question. Actually, I think we would probably still do it in order. But I can see what you mean. (Hotdog)

we work well together	Expressing agreement, collaboration, building internal consensus, including team members, etc.	Sam What I'm trying to get at is how are we feeling about smoke testing and getting them out today. John We should be able to do it Sam Okay, perfect. We're all feeling good. It's great, actually. I mean, I don't want to make it too vague. But on our side, I don't care who's in the meeting, because we work well together.
what "x" said_general	Connecting to, repeating, or emphasizing something another team member has said without mentioning anyone by name	same thing as everyone else lots of meetings this week trying to debrief from those. Okay, so as she mentioned, we got our JIRA board. Most of this is just shell tasks, or shell cards, which I will continue to flesh out and as we get more information,
what "x" said_specific	Connecting to, repeating, or emphasizing something another team member has said and addressing those team members specifically by name	And then, like Bob said, we're also shooting to have a research deck with findings that we're going to help out to create.
who is behind	Describes one team or team member waiting on something from another team member, or someone expressing that they are behind	So I'm still not caught up on all the day to day work from being in LOCATION.
your choice	Deferring a choice or decision to another team member or providing agency for team member to make their own decision	Makes sense? Thank you for setting this up. Bob. had really great questions here. Bob right now you're not on the wireframe review. It is at 515. There's no pressure. But would you like me to just add you as optional to that one?