

Investigating How Psychological Safety Can Be Fostered in Agile Teams

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ABSTRACT

Context: Psychological safety is defined as a shared belief that team members can take interpersonal risks at work without fear of reprisal. Technical, social, cultural, organizational, and personal factors can all influence psychological safety. Its absence in agile environments can negatively affect both software quality and project success. **Problem:** Although psychological safety has been studied in other areas, it is still underexplored in the agile context. Existing research examines only a few factors and the relationships between them. The lack of understanding of the factors that influence psychological safety limits the ability to take action to foster a psychologically safe workplace. **Objective:** Our goal is to summarize studies that investigate psychological safety in agile contexts, as well as to identify the factors that promote or affect psychological safety, in addition to the effects of its absence or presence. **Method:** We conducted a mapping study. **Results:** We found 21 studies that investigate psychological safety in the agile context. We identified that team performance, engagement, reflexivity, learning, software quality, and open communication, among other factors, emerge in organizational cultures that promote psychological safety, and that leadership behavior is a key element in sustaining a psychologically safe environment. **Conclusion:** We captured relevant factors for the study of psychological safety in agile contexts. The results can support future research on the topic and contribute to the development of new solutions to address it. Furthermore, the findings may serve as a basis for defining approaches to promote a psychologically safe environment and organizational culture.

KEYWORDS

Psychological Safety, Agile Methods, Agile Transformation, Mapping Study, Human Factors, Organizational Climate, Software Quality, Leadership Behavior

1 Introduction

The concept of agile methods was developed to propose best practices for delivering value to customers in a continuous manner [6, 11]. Despite their original purpose for software development [11], they have been widely adopted and have become consolidated as recurring practices in the industry [37].

Agile practices rely on regular iterations, collaboration, and self-organized teams [10, 26]. They aim to add value to customers through products that are continually developed and delivered. In traditional methods, for example, planning and defining work are done by management. In agile methods, this task is shared with

the team, which participates in decision-making and is responsible for software development. Thus, leadership can facilitate team autonomy [41], and the quality of interactions among members can be improved [39]. These interpersonal relationships can affect software quality [5, 8] and project delivery [12]. Examples of interpersonal challenges in software development environments include reluctance to admit mistakes, avoiding seeking help, and the fear of sharing negative feedback [46]. In this context, different human factors can contribute to the effectiveness of the development team [15] and to the success of software development and agile practices [10, 22, 38]. For example, communication, collaboration and leadership are considered key to project success [19].

Psychological safety is a human factor that has been investigated in psychology since the 20th century, particularly in organizational teams. This concept is defined as “a shared belief among team members that they can take interpersonal risks at work without fear of reprisal” [21]. In recent years, the study of psychological safety has gained prominence in the area of information technology, as it addresses human factors such as team reflexivity [12] (i.e., the ability to reflect on oneself, on one’s actions, values and social contexts and, based on this, adjust one’s behavior [17]), autonomy [7], and a culture of non-blame [3], among others. Additionally, it is crucial that employees feel psychologically safe to ensure effective communication, project performance, and the quality of the products they develop [5, 43]. It is worth noting that Edmondson [21], in her seminal work, addresses safety at the team level; however, other authors indicate its relevance at both the cultural level of an organization [47] and the personal level [30].

Although psychological safety is a subject of study in other areas, it remains relatively underexplored in the context of agile development. Existing research identifies several factors associated with psychological safety in this context. The lack of understanding of factors related to psychological safety in the agile context can limit action to promote a psychologically safe environment.

This study presents a systematic mapping of the literature to summarize academic studies that address psychological safety within the context of agile teams. We identified 21 studies that answered our research questions. These studies revealed: (i) effects of the presence or absence of psychological safety in agile contexts, for example, confidence to speak up and feelings of hesitation, respectively; (ii) factors that promote or negatively affect psychological safety in agile contexts, for example, supportive and no-blame culture and lack of interpersonal relationships, respectively; and approaches used to assess psychological safety in these contexts, notably, the instrument proposed by Edmondson [21].

In addition to the introduction, the sections of this study are organized as follows: Section 2 presents the related works, Section 3 describes the research method, Section 4 displays the found results, the discussion of the results is made in Section 5, while in Section 6 the limitations and threats to validity are presented and, finally, Section 7 shows final considerations.

2 Related Works

Abror and Patrisia [1] conducted a systematic literature review aimed at identifying and analyzing key aspects of psychological safety and organizational performance. The authors considered publications associated with the areas of business management, applied psychology and research management operations. Organizational performance is presented as a multidimensional construct that utilizes both financial and non-financial indicators. In these studies, psychological safety was found to be related only to organizational performance. The delimitation of context (such as software engineering) or specific work methods (such as agile methods) was not performed. The research also did not consider the analysis of factors associated with psychological safety; instead, it focused on the relationship between psychological safety and organizational performance.

Junker et al. [29] conducted a systematic literature review to propose a model of how agile teams mobilize resources to achieve team effectiveness, which includes psychological safety, and psychological well-being. Seven of the identified studies refer to psychological resources (psychological safety, psychological well-being and psychological empowerment). According to the study, the high level of autonomy created by the use of agile practices explains why members of agile teams are dedicated, take risks and find satisfaction in their work. The study found no effects of psychological safety on agile teams, either in terms of factors that promote or affect psychological safety.

Khanna et al. [33] sought to understand the hybrid work of agile teams through a systematic literature review. Only one identified study addressed psychological safety in the hybrid work model. Although it addressed agile contexts, psychological safety was not an explicit object of investigation; only one study referring to the phenomenon was identified.

Newman et al. [42] investigated factors in which psychological safety plays a moderating role, whether at the organizational, team or individual level. The identified studies allowed for the identification of factors influenced directly (such as communication, shared knowledge, and leader behavior) and indirectly (such as performance, innovation, and creativity) by psychological safety. The study did not aim to understand what promotes this phenomenon or the impacts of its absence; instead, it examined the antecedents of psychological safety across various contexts, making it difficult to compare the results.

In summary, only Junker et al. [29] have investigated studies on psychological safety in agile teams; however, they do not present the factors that promote and negatively affect psychological safety, as this study proposes. The other studies did not address agile teams, which is an essential limitation given the needs that exist in the agile context [3], the benefits of use [5] and the increased

possibility of success when promoting psychological safety in agile teams [10, 27].

3 Research Method

This research presents a systematic literature mapping, conducted in accordance with the recommendations proposed by Kitchenham et al. [36] and Petersen et al. [44]. Three phases were carried out, as shown in Figure 1: (i) *Planning* – research protocol definition; (ii) *Execution* – studies identification and selection; (iii) *Results analysis* – data extraction from primary studies.

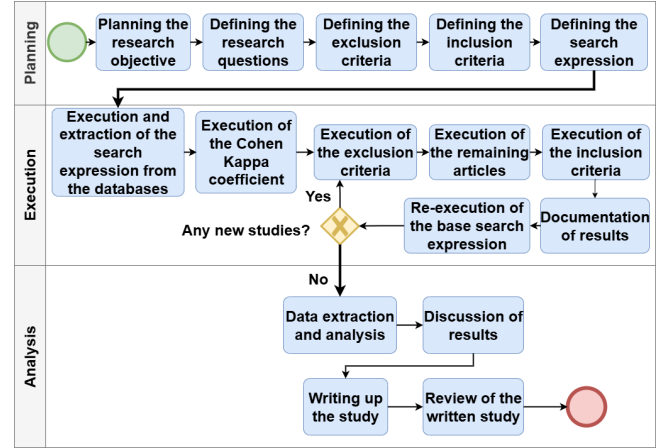


Figure 1: Phases and Tasks of the Research Method

3.1 Planning

3.1.1 Objective and Research Questions: This study aims to identify factors that promote or affect psychological safety, the effects of their absence and presence, and the instruments used to assess psychological safety. To support this, the research questions presented in Table 1 were defined.

Table 1: Research Questions

Code	Description
RQ1	What studies address psychological safety in agile teams?
RQ2	What are the effects of the absence of psychological safety?
RQ3	What are the effects of the presence of psychological safety?
RQ4	What approaches are used to assess psychological safety?
RQ5	What factors promote psychological safety?
RQ6	What factors negatively affect or reduce psychological safety?

3.1.2 Definition of Inclusion and Exclusion Criteria: To achieve the above objective, exclusion (EC) and inclusion (IC) criteria were defined and are presented in Table 2.

3.1.3 Search Strategy: The searches were conducted in digital libraries of great relevance to the area of Computer Science and Information Systems [20]. The digital libraries consulted were Scopus, IEEE Xplore, SpringerLink, Engineering Village, Web of Science, ScienceDirect, ACM DL, and Wiley InterScience. Some of these

Table 2: Inclusion (IC) and Exclusion (EC) Criteria

Code	Description
IC1	Study addresses psychological safety in agile teams.
EC1	Duplicate study.
EC2	The study does not include search expression terms in the title, abstract, or keywords.
EC3	Study with limited or unavailable access.
EC4	Secondary or tertiary study.
EC5	Non-peer-reviewed study.
EC6	Study in progress, short paper or less than four pages.
EC7	Study in a language other than English or Portuguese.
EC8	The study does not address psychological safety in agile teams.

libraries index studies from other databases, which increases the scope of the search.

The chosen language was English. National conferences, when indexed in the consulted databases, were considered.

3.1.4 Search Expression: Kitchenham et al. [35] recommend using simple search expressions based on the main topic of interest. One suggested strategy is to identify keywords based on the most essential concepts and terms present in the research questions. Thus, the keywords “psychological safety” e “agile” were initially chosen. Terms such as “agile methods,” “agile development,” “agile context” and similar were not considered so as not to limit the result, allowing the investigation to identify the maximum number of factors that impact or promote psychological safety. The following studies were used as control articles to calibrate the search expression: [7, 8, 49]. Thus, it was ensured that the final search expression would be able to return such studies.

During the initial tests, it was noted that the term “*psychological safety*” was also cited in other variants, such as “*psychologically safe*”. Finally, the search expression was redefined to: “*psychologic* safe**” AND agile.

Due to the particularities of the digital library search engines, the search expression was adapted as needed to find information with the exact equivalence. Details are provided in the supplementary material [31].

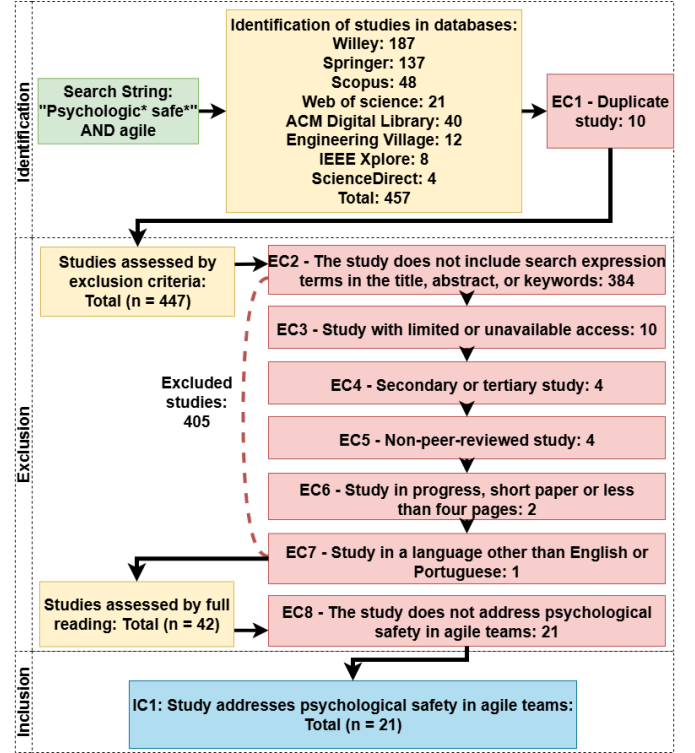
3.2 Execution

The searches were conducted in February 2025 across the selected databases. Two filters were applied to the identified studies. The first filter consisted of reading the title, keyword and abstract and applying the inclusion and exclusion criteria. The second filter involved reading the complete list of resulting studies and reapplying the inclusion and exclusion criteria to each study.

To ensure consistency in the evaluation of studies in the first filter, *Cohen’s Kappa coefficient* [14] was used to compare the assessments of the first and third authors. Three steps were performed: (i) individual reading of the title, keyword and abstract; (ii) individual voting of the studies; (iii) discussion of the reasons for the vote applied. After two rounds, the degree of agreement was 0.73, indicating substantial acceptance among researchers.

A total of 457 studies were identified. Of these, 10 were excluded because they were duplicates (EC1), and 406 were excluded due to the application of other exclusion criteria (EC2 to EC7). Of the

42 studies selected for full reading, 21 were excluded because they did not address psychological safety in agile teams (EC8). Thus, 21 studies remained for data extraction and analysis that met the inclusion criteria (IC1). These steps are summarized in Figure 2.

**Figure 2: Study Selection Summary**

3.3 Analysis

3.3.1 Data extraction: A template was created in Google Sheets to enter data in a standardized manner, containing the title, author, year of publication, publication outlet, country of authors, researchers’ origin (academic or industrial), and the research method used. Additionally, specific fields were created to detail how each study addresses the research questions.

3.3.2 Data analysis: Data extraction to answer the research questions was based on content analysis [45]. Initial data analysis and coding were performed independently by two authors. Initial codes were consolidated into more abstract codes. Finally, categories were generated for the two research questions (RQ3 and RQ5) with the most significant number of findings. Disagreements were discussed until a consensus was reached.

For example, some studies investigate psychological safety in the organizational climate (e.g., S04 and S14), while others examine it in the context of agile development teams (e.g., S03 and S07) or association with agile roles, such as the Scrum Master (e.g., S19). To answer research question RQ4, the approaches and instruments used to measure psychological safety were mapped, and the questions used in semi-structured interviews were noted when mentioned.

In some cases, the initial identification of effects (RQ2 and RQ3) and factors (RQ5 and RQ6) was direct and nominal. For example, S03 mentions *brain drain*¹ as a negative effect of lack of psychological safety (i.e., it answers RQ2). In other cases, the text was interpreted based on the context presented. For example, the negative effect “*being uncomfortable with forced transparency of work*” was derived from this excerpt present in S11: “*Sure, it becomes very transparent how I do something, how I work. ... you also have to share a lot [e.g., during retrospectives]. And that’s just difficult for many people at first.*”

After consensus, the initial codes were consolidated into more abstract codes. Finally, the findings of RQ3 and RQ5 were categorized. For example ‘*speaking up more about software quality problems*,’ ‘*admitting more software quality mistakes*,’ and ‘*sharing knowledge to improve software quality potentially*’ (S15) gave rise to the positive effect of the presence of psychological safety (RQ3) ‘*collective reflection on quality*’ and were associated with the ‘*Software Quality*.’

4 Results

Table 3 presents the 21 selected studies, including the following data: study identification code, title, reference, year of publication, and author affiliation (A for Academia and I for Industry).

Figure 3 shows the distribution of studies over time. Ten studies were published in conferences and eleven in journals. The first study was published in 2018, while eight studies were published in 2022 and seven in 2024. It can be seen that 85.7% (18) of the studies were published between 2022 and 2025, indicating a growing interest in the topic. However, it should be noted that the identification of only one study in 2025 is related to the fact that the searches were conducted at the beginning of the year.

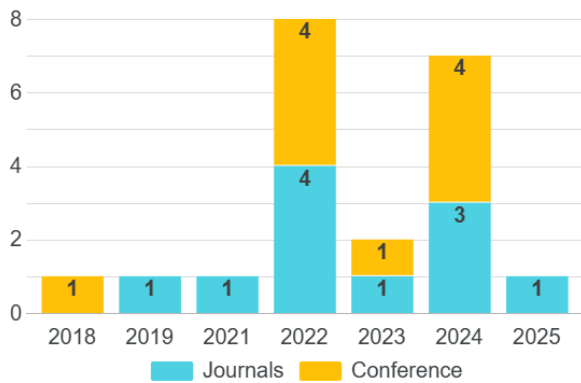


Figure 3: Distribution of Studies Over Time

The most commonly used research methods were survey and semi-structured interviews, individually or in combination, as shown in Figure 4.

Figure 5 shows the country of origin of the studies considering the affiliation of all authors. It is noticeable that the majority of authors are from the European continent, particularly from Sweden and Denmark.

¹Social phenomenon of professional dissatisfaction that leads to loss of talent as people seek a better work environment [2].

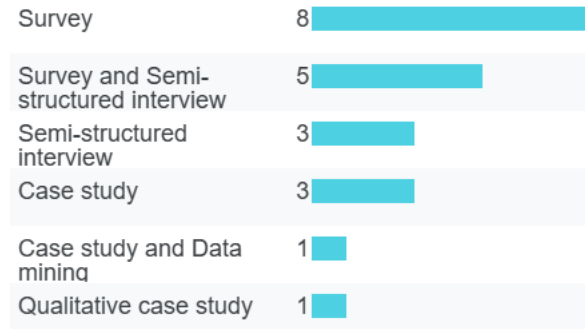


Figure 4: Research Methods Used

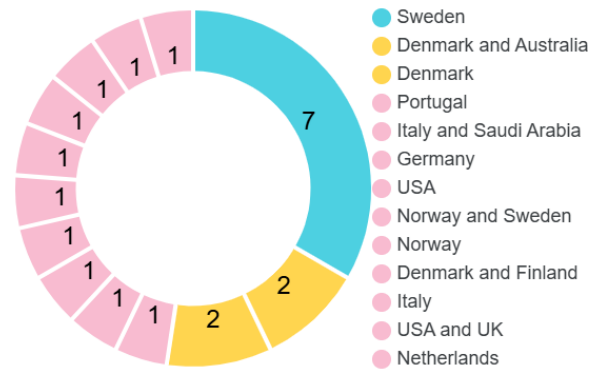


Figure 5: Authors' Country of Affiliation

4.1 RQ1: What Studies Address Psychological Safety in Agile Teams?

The studies present six different contexts for investigating psychological safety in agile teams, as shown in Table 4.

4.1.1 Small and large-scale agile: Studies S01, S02, S04 to S06, S08, S10 to S13, S15, S17 to S19 and S21 are associated with the use of agile methods in a single agile software development project. The remaining studies (i.e., S03, S07, S09, S14, S16 and S20) are associated with large-scale agile contexts, in which software development projects are composed of two or more agile teams [16].

4.1.2 Tools/Interventions: Study S06 aimed to collect concrete experiences of psychological safety through digital means (utilizing Zoom, a video conferencing tool, and Miro, a collaborative whiteboard platform) and develop an artifact to propose actions that enable employees to experience a psychologically safe environment.

4.1.3 Organizational context: S04 aimed to understand the role of psychological safety in implementing agile methodologies within a company that may have a diverse culture, depending on its physical location. S10 aimed to understand the software development of agile teams one year after the COVID-19 pandemic. The results suggest that the mindset of those who work remotely, combined with reduced psychological safety, can cause consequences related to returning to the office, such as disagreements and arguments. S13

Table 3: Selected Studies

ID	Study	Ref.	Year	Origin
S01	The effects of working agile on team performance and engagement	[43]	2022	A
S02	Exploring Success Factors of Agile Teams: The Impact of Personality Traits, Psychological Safety, and Team Reflexivity on Performance	[22]	2024	A
S03	Psychological Safety, Leadership and Non-Technical Debt in Large-Scale Agile Software Development	[2]	2023	A
S04	The Role of Psychological Safety in Implementing Agile Methods across Cultures	[49]	2019	A
S05	Are Your Online Agile Retrospectives Psychologically Safe? the Usage of Online Tools	[34]	2022	A
S06	Building a Toolbox for Working with Psychological Safety in Agile Software Teams	[13]	2022	A
S07	Impacts on Team Performance in Large-Scale Agile Software Development	[24]	2018	A
S08	How Scrum adds value to achieving software quality?	[5]	2022	A
S09	Nexus Between Psychological Safety and Non-Technical Debt in Large-Scale Agile Enterprise Resource Planning Systems Development	[4]	2024	A
S10	Agile software development one year into the COVID-19 pandemic	[52]	2022	A
S11	Investigating the “Socio” in Socio-Technical Development: The Case for Psychological Safety in Agile Information Systems Development	[26]	2021	A
S12	Agile software development projects—Unveiling the human-related critical success factors	[10]	2024	A
S13	The journey to technical excellence in agile software development	[6]	2022	A
S14	Understanding the Difference between Office Presence and Co-presence in Team Member Interactions	[40]	2024	I/A
S15	The role of psychological safety in promoting software quality in agile teams	[8]	2024	A
S16	Team Performance in Large-Scale Agile Software Development	[25]	2022	A
S17	Antecedents of psychological safety in agile software development teams	[7]	2023	A
S18	Agile Practices and it Development Team Well-Being: Unveiling the Path to Successful Project Delivery	[27]	2024	A
S19	Exploring Emotions in Online Team Meetings: Unpacking Agile Retrospective	[32]	2024	A
S20	Strengthening Large-Scale Agile Teams: The Interplay of High-Quality Relationships, Psychological Safety, and Learning From Failures	[3]	2025	A
S21	Psychological Safety in Agile Software Development Teams: Work Design Antecedents and Performance Consequences	[12]	2021	I

Orig. = origin of the authors (A for Academia and I for Industry)

Table 4: Contexts Present in the Identified Studies

Context	Studies
Small-scale agile	S01, S02, S04, S05, S06, S08, S10, S11, S12, S13, S15, S17, S18, S19, S21
Large-scale agile	S03, S07, S09, S14, S16, S20
Organizational context	S04, S10, S13
Remote or hybrid environment	S05, S10, S14, S19
Agile retrospective	S05, S19
Tools/Interventions	S06

presents recommendations for the development team and organizations to operationalize technical excellence. One of the presented recommendations emphasizes that psychological safety, combined with leadership and customer support, enables software development teams to allocate time for continuous architecture and learning, both of which are essential for technical excellence.

4.1.4 Remote or hybrid environment: S05 and S19 investigated agile retrospectives and concluded that online interactions can negatively impact psychological safety. S10 investigated a post-pandemic scenario in which employees held a higher volume of meetings. The authors suggest that the remote work model, when combined with low psychological safety, can lead to increased conflicts, disagreements, and arguments. S14 indicates that the hybrid model can determine the effectiveness of communication, team coordination, and psychological safety. Although this is not a finding exclusive to this study (it is also cited by Tkalic et al. [50], for example), the results are relevant because they prompt a discussion about coordination models and the role of psychological safety in these contexts.

4.1.5 Agile retrospectives: S05 sought to understand whether the use of online tools influences the perception of psychological safety in retrospective meetings (an agile practice aimed at revisiting deliveries and seeking ways to improve processes continuously). The study concluded that the online execution of this practice can influence factors such as collaboration. According to S19, when employees can express their emotions, psychological safety can be promoted during agile retrospectives.

4.2 RQ2: What Are the Effects of the Absence of Psychological Safety?

Four studies (S03, S09, S10, S11) addressed this research question, as shown in Table 5. Most of the effects identified are associated with the fear of expressing oneself openly and the negative situations that result from this. Two studies, however, also associate the lack of psychological safety with the loss of talent.

Table 5: Effects of the Absence of Psychological Safety

Effect	Studies
Brain drain	S03, S09
Fear of speaking up	S10
Unresolved conflicts	S11
Feelings of hesitation	S09
Feelings of rejection	S11
Information hiding	S03
Hiding mistakes	S03
Not admitting mistakes	S09
Not acknowledging performance issues	S09
Being uncomfortable with the forced transparency of work	S11

Brain drain is a phenomenon characterized by mental exhaustion, leading to consequences for the employee, including demotivation, feelings of being overworked, and a sense of inadequate remuneration [2]. Talent loss can be influenced by the lack of psychological safety in the workplace and within collaborative cultures. S03 and

S09 relate the lack of psychological safety to brain drain. S03 suggests that in an organizational culture where there is a lack of psychological safety, there is a greater likelihood of brain drain. According to the authors, an employee who does not feel psychologically safe tends to hide events and mistakes. S09 suggests that the lack of psychological safety can generate a feeling of hesitation, from which failure to recognize performance problems and to admit mistakes may emerge.

S10 investigated agile teams in the wake of the COVID-19 pandemic and found that during online meetings, developers are hesitant to leave digital footprints, may exhibit introverted behavior, and struggle to be spontaneous and open during meetings. These effects emerge in the absence of psychological safety.

S11 suggests that the absence of psychological safety can impact the team's sense of trust and is a prerequisite for the success of agile practices. The study presents reports from interviewees such as: *"Sure, it becomes very transparent how I do something, how I work. (...) you also have to share a lot [e.g., during retrospectives]. And that's just difficult for many people at first. (...) Sometimes there was pure rejection and statements like 'we have tried agile before and it didn't work.' If you look more closely and ask what went wrong—this had nothing to do with Scrum or the methodology, but rather with [affective and task-related] conflicts in the team that had not been resolved."*

RQ2 Analysis

Few effects of the absence of psychological safety were identified in agile contexts. This aspect may be due to the studies having used instruments focused on identifying the presence of psychological safety and exploring ways to promote it. Thus, investigating the absence of psychological safety is an opportunity for future research.

4.3 RQ3: What Are the Effects of the Presence of Psychological Safety?

Sixteen studies (S01, S02, S03, S05, S07, S08, S09, S11, S12, S13, S15, S16, S17, S18, S20, and S21) addressed this research question, as shown in Table 6. The findings were grouped into five categories.

Organizational climate is defined as the meaning employees attach to the policies, practices, and procedures they experience and the behaviors they observe getting rewarded, supported, and expected [48]. Team climate differs from organizational climate, as team climate focuses on the proximate work environment of individuals who relate to each other more closely [51]. Thus, we grouped in "Organizational and Team Climate" category the findings that serve as enablers of team psychological safety (that according to Edmondson [21] describes a team climate characterized by interpersonal trust and mutual respect in which people are comfortable being themselves) and, consequently, of better "Team interactions" and "Individual Initiative." "Human factors" have influence on software engineering development teams and in agile teams in particular [18]. We identified some that are impacted by psychological safety. Finally, we also identified positive effects on "Software Quality," which is associated with both the quality of the software product and the software process used to develop it [28].

Table 6: Effects of the Presence of Psychological Safety

Effect	Studies
Organizational and team climate	
Supportive, friendly, and open environment	S11
Open communication	S03, S15, S20
Confidence to speak up	S03, S15, S17
Learning culture	S17, S20
Reduced blame culture	S15, S20
Leadership support	S20
Team interactions	
Teamwork	S09
Team dynamics and interactions	S09, S20
Mutual support	S11, S15, S17
Shared sense of responsibility	S08, S11, S17
Collective problem-solving	S15, S20
Conflict minimization	S03, S09
Individual initiative	
Learning behaviors (feedback seeking, experimentation, and discussion of errors)	S13, S15, S17, S20
Learning from failures or mistakes	S15, S20
Showing initiative	S13
Striving for technical excellence	S13
Challenging the status quo	S05
Human factors	
Collaboration	S02, S03, S09, S15, S20
Motivation	S03
Innovation	S02, S20
Sense of togetherness	S15
Transparency	S08
Trust	S15
Reflexivity	S21
Cohesiveness	S03
Engagement	S01
Creativity	S02
Adaptability	S20
Job satisfaction	S18
Software quality	
Project success	S18
Customer involvement	S12
Team performance	S01, S02, S07, S11, S16, S20, S21
Team capability	S12
Initiatives aimed at enhancing software quality	S08, S15
Collective reflection on quality	S15
Promoting continuous improvement	S17
Engagement in agile practices and ceremonies	S17
Continuous architecting practices	S11

4.3.1 Organizational and team climate: A supportive, friendly, and open environment was observed in S11 as a key factor in fostering psychological safety. S03, S15, and S20 suggest that open communication is a factor observed in the presence of psychological safety. S15 presents hypothesis H1, which indicates that a high level of psychological safety in agile teams is positively associated with open dialogue. The hypothesis was supported. S03 and S20 imply that actions that promote psychological safety (such as encouraging interactions among members) enable open communication in the

team. S03, S15, and S17 indicate that confidence to speak up is a factor that is evident when psychological safety is enabled.

Learning culture is another factor observed in studies S17 and S20. Cultures in which team members can discuss and learn from their mistakes are enablers of psychological safety. To achieve this, the reduction of the blame culture (S15, S20) should be developed, and for this, leader support (S20) is necessary.

4.3.2 Team interactions: Teamwork (S09), strengthening interactions, and improving work dynamics (S09, S20) are factors present when there is psychological safety within the agile team. In addition to these factors, mutual support (S11, S15, S17), a shared sense of responsibility (S08, S11, S17), and collective problem-solving (S15, S20) were observed as aspects present in team interactions. Besides, conflict minimization was also observed (S03, S09).

4.3.3 Individual initiative: Learning behaviors, such as the search for experimentation and discussion of errors, were among the aspects present in the individual initiative presented in studies S13, S15, S17, and S20. The search for feedback and open discussion of errors enables the behavior of learning from mistakes, or the pursuit of excellence (S13). S05 investigated interactions during retrospective meetings and observed that developers seek to challenge the *status quo* when they feel psychologically safe..

4.3.4 Human factors: Collaboration, sense of unity and trust (S15), transparency (S08), cohesion (S03), creativity (S02), adaptability (S20), and reflexivity (S21) were observed in the studies. In addition to these factors, in the presence of psychological safety, creativity (S02), engagement (S01) and job satisfaction (S18) were also observed in agile teams.

4.3.5 Software Quality: S15 supports the hypothesis that the presence of psychological safety is positively associated with an increase in initiatives aimed at software quality. One of the participants indicates that *“initiatives do some great things we have observed in our team (...) When people bring initiatives, eventually everything improves over time, processes, relationship in the team, and the quality of our software”*. Participants also noted that collective reflection on quality is observed as an effect. S18 indicates that in the presence of psychological safety, the chances of project success are also increased.

QP3 Analysis

The effects of psychological presence can be observed at the individual level (whether associated with personal initiative or human factors), at the team and organizational levels, and even in the software quality of the software. The effects found permeate the organizational culture and climate, influencing how team members interact, perform their roles, and ultimately impact the project’s success. Examples of identified impacts include learning behavior, collaboration, confidence in expressing opinions, and the pursuit of technical excellence. Knowledge of these effects can encourage organizations to undertake efforts to foster a psychologically safe organizational climate.

Team performance (S01, S02, S07, S11, S16, S20, S21) was also observed as an effect, as well as continuous architecture practices (S11), engagement in agile practices and ceremonies, and promotion of continuous improvement (S17) in agile teams. S12 investigated the relationship among customer involvement, team capability, and psychological safety. It presented hypotheses H3a (positive influence of psychological safety on team capability) and H3c (positive influence of psychological safety on customer involvement), which were supported.

4.4 RQ4: What Approaches Are Used to Assess Psychological Safety?

Fifteen studies (S01, S03, S04, S06 to S09, S11, S12, S15 to S18, S20, and S21) helped answer this research question, as shown in Table 7.

Table 7: Approaches Used

Approach	Studies
Instrument proposed by Edmondson [21]	S06, S18, S20, S21
Instrument adapted from Edmondson [21]	S01, S07, S12, S15, S16
Semi-structured interview questionnaire	S03, S04, S08, S09, S11, S17

The most widely used instrument was proposed by Edmondson [21]. It contains seven questions, using a 7-point Likert scale (with 1 corresponding to 'totally disagree' and 7 corresponding to 'totally agree'). The instrument’s questions are [21]:

- (1) If you make a mistake on this team, it is often held against you;
- (2) Members of this team are able to bring up problems and tough issues;
- (3) People on this team sometimes reject others for being different;
- (4) It is safe to take a risk on this team;
- (5) It is difficult to ask other members of this team for help;
- (6) No one on this team would deliberately act in a way that undermines my efforts;
- (7) Working with members of this team, my unique skills and talents are valued and utilized.

S06, S18, S20 and S21 used the instrument as proposed by Edmondson [21]. However, other studies used it after adaptations. S01 and S07 used a 5-point Likert scale. S07, S12, S15 and S16 used only a few questions or changed or reversed questions, without disqualifying the intention of the evaluation.

For example, S07 and S16 used only questions 1 to 4, S12 changed question 3 to *“People on this team never reject anyone for being different.”* and question 5 for *“It is easy to ask other members of this team for help.”*, S15 changed the use of the third person to the first person in some questions, changing *“from this team”* to *“my team”* and included examples in question 4 (which became *“It is safe to take a risk (e.g., experiment with a new technology, propose initiatives, raise difficult issues, disclose own knowledge gaps) on my team.”*).

Studies S03, S04, S08, S09, S11 and S17 used semi-structured interviews for data collection. The questions used investigated factors related to psychological safety.

In study S11, for example, the following questions were asked: *“How do you think team members feel in your team?” “Do they feel*

free to express unconventional or new ideas/voice concerns/raise tough issues?” Do you think it is easy for team members to ask each other for help? Do you think team members trust each other? Do you feel controlled?

QP4 Analysis

The scale to measure team psychological safety developed by Edmondson [21] is the most widely used instrument in the studies identified, with or without adaptations. This instrument enables the identification of psychological safety in teams and can be used in various contexts, including software development. It does not aim to identify the causes, effects or promotional actions associated with psychological safety.

4.5 RQ5: What Factors Promote Psychological Safety?

Studies S02 to S05, S08, S09, S11, S12, S14, S15, S17 to S21 (totaling fifteen studies) provided inputs to answer this research question. Table 8 summarizes the findings.

The findings were grouped into four categories. Three of them (“Organizational and team climate,” “Team interactions,” and “Human Factors”) also appear in the response to RQ3. The findings for this research question, however, make “Leadership support for the team” more evident as very important for promoting a psychologically safe work climate.

4.5.1 Organizational and team climate: Open communication (S11, S18) and feedback (S03, S09) are promoting factors at the organizational level. Agile teams require regular communication, such as during retrospectives, to foster a free, open, and honest exchange of project issues among team members. Developing a culture of support and non-blame (S08, S09, S15, S17, S18, S20), encouraging (S08) and recognizing (S08, S20) the courage to speak up, the behavior of offering ideas without worrying about showing vulnerability (S08), the behavior of taking risks and sharing experiences (S20). Promoting an inclusive, supportive environment (S18) where employees can propose ideas, offer feedback, take risks, and experiment (S09), as well as facilitating collective decision-making (S17), also affects the organizational level. Promoting an organizational culture of non-blame (S15, S17, S20) that acknowledges mistakes as acceptable (S08) fosters psychological safety in agile teams. S03 and S09 also suggest that fair and secure compensation are relevant factors that allow the promotion of psychological safety.

4.5.2 Leadership support for the team: Promoting psychological safety is also directly related to the role of leadership. Preparing an efficient onboarding process (S03, S09) enables employees to feel a sense of belonging to the team. Organizing trust-building tasks and activities (S03, S09) and promoting knowledge sharing (S03) are leadership tasks that foster psychological safety in agile teams. The leader’s mindset and behavior, such as proactivity (S03, S09), inclusion (S04), the work environment coordination (S09), actions to promote openness in communication terms (S08), ownership demonstration and exercise of psychological safety (S17), as well

Table 8: Factors that Promote Psychological Safety

Factor	Studies
Organizational and team climate	
Promoting a psychologically safe work climate	S08, S09
Supportive and non-blame culture	S08, S09, S15, S17, S18, S20
Open communication	S03, S09, S11, S18
Collaborative decision-making	S17
Fair and secure compensation	S03, S09
Leadership support for the team	
Leadership behaviors	S03, S04, S08, S09, S15, S17
Well-prepared onboarding process	S03, S09
Trust-building activities	S20
Designing a team for learning	S03, S09, S20
Promoting knowledge sharing	S03
Team interactions	
Promoting social interaction	S03, S05, S14
Fostering interpersonal relationships	S20
Shared Responsibility	S17
Team dynamics (supervisory coaching, regular feedback mechanisms, boundary-spanning role)	S20
High-quality relationships (shared goals, shared knowledge, and mutual respect)	S20
Use of social agile practices	S11
Knowing the emotions in digital interactions	S19
Team behavior	S17
Human Factors	
Autonomy	S12, S21
Openness	S02, S04, S08, S15, S17
Feedback	S03, S09, S11
Honesty	S11
Candor	S11
Trust	S17

as team development for learning (S03, S09, S20) are also relevant in promoting psychological safety in agile teams.

4.5.3 Team interactions: Promoting social interaction (S03, S05, S14) and the use of agile social practices (S11), such as daily meetings or retrospective meetings, were shown to promote psychological safety. S19 suggests that knowing emotions in digital interactions promotes psychological safety. S20 proposes that fostering interpersonal relationships and team dynamics has a positive influence on psychological safety. Ahmad [3] presented hypothesis H1, in which the impact of quality interpersonal relationships and psychological safety was assessed. The hypothesis was supported. Shared responsibility was presented in S17, which confirmed hypothesis H3 that it has a positive influence on psychological safety. One of the interviewees contributed the following statement: “*Since we are all a team, and the entire responsibility of the product comes down to us, we should take decisions in a joint meeting to actually still keep the quality high (...)*”. S17 also presents a relevant finding that, for psychological safety to transcend hierarchy and become present in the team, leadership must take it as its own. From this, the team’s behavior and strategies will be able to promote psychological safety in a meaningful way, ensuring openness and non-blame.

4.5.4 Human factors: Finally, human factors were also found to be relevant for the promotion of psychological safety. Honesty, openness (S11), open communication (S02, S04, S08, S15, S17, S21) and feedback (S03, S09, S11) were presented in the analyzed studies. An example regarding open communication was presented in S15. According to one of the participants, *“if you are communicating and honest with the team, then you definitely have the solution. Hiding your problems, then you’re going to suffer”*. Regarding feedback, as cited in studies S03, S09, and S11, it was explained that the practice of feedback provides the basis for psychological safety to emerge in agile teams by creating a safe environment that fosters honesty, openness, and mutual support.

QP5 Analysis

An organizational culture that values open communication and non-blame can facilitate the promotion of psychological safety, enabling leadership to foster quality interactions, develop the team for learning, and ultimately enhance the interactions among team members. This, in turn, can improve various human factors associated with a psychologically safe environment, as expected in agile teams.

4.6 RQ6: What Factors Negatively Affect or Reduce Psychological Safety?

Three studies (S08, S10, S16) enabled the identification of factors that affect or reduce psychological safety, as shown in Table 9.

Table 9: Factors Reducing Psychological Safety

Factors	Studies
Fear of speaking up	S08, S10, S16
Lack of interpersonal relationships	S10
Fear of leaving digital traces	S10
Introversion	S10
Shyness	S16
Team tensions	S08
Unilateral decisions by management	S08
Inconsistent Scrum implementations	S08

S08 suggests that several aspects can negatively influence psychological safety, including inconsistent implementation of Scrum, fear of expressing oneself, and even tensions among team members. A senior developer discusses his insecurity when presenting problems to the company’s CTO and the tension that arises from these interactions, which can lead to indifference among team members regarding software quality aspects. Unilateral management decisions can negatively influence the psychological safety of the agile team. S10 and S16 suggest that, in addition to fear of expressing oneself, personality traits can affect psychological safety. S10 proposes that introversion can impact psychological safety, which in turn affects communication. One of the interviewees also mentions the fear of leaving digital traces during online meetings. S16 suggests that one of the reasons for the reduction in psychological safety is also related to shyness as a factor that can negatively influence psychological safety.

QP6 Analysis

Several factors were identified that negatively impact or reduce psychological safety. Two studies negatively associate psychological traits (introversion and shyness) with psychological safety. Unilateral decision-making by leadership may present a counterbalance to the autonomy and collective decision-making of the team, which are factors that promote psychological safety, thereby reinforcing the consistency of the finding.

5 Discussion

Psychological safety is understood as a critical success factor [10, 22, 23] and has been studied more frequently in the agile context in the last five years. Promoting psychological safety is not related to a single factor, but a set of interconnected factors. The organization should strive to create an organizational climate that fosters psychological safety (S15, S17). Enabling a non-punitive and non-blame culture (S15, S17, S20) is one of the factors cited in the studies investigated, but with few recommendations on how to achieve it.

Cultural differences within the same company can be a challenge in enabling and promoting psychological safety [49]. Leadership plays a key role in this process (S20). Leadership must take on psychological safety as a commitment (S15, S17), becoming responsible for promoting it. The first step towards this begins with the leader himself, developing a mindset of inclusion and support for the team (S03, S04, S08, S09, S15, S19, S20) and ensuring that teams feel in a welcoming and non-blaming environment (S17), both in the context of their interpersonal relationships and in following agile practices and ceremonies (S11). Such efforts can facilitate the delivery of quality software (S08, S15).

Daily meetings, joint planning, review meetings, and retrospectives require interactions among team members, between individual team members and leadership, and between the team and leadership. The effectiveness of these interactions depends on factors such as communication, collaboration, autonomy, and collective problem-solving (S15, S17), enabling employees to work together to ensure the effectiveness and quality of deliveries (S08, S15), while also meeting deadlines and maintaining a maintainable code. Additionally, leadership can promote transparency (S18) and share common strategies with all levels (S17) while also fostering open and honest communication (S11).

Finally, other human factors associated with psychological safety should also be fostered, as they also affect individuals in the agile context. For example, feedback (S03, S09, S11), the relentless pursuit of openness (S12, S21) and the promotion of autonomy (S02, S04, S08, S15, S17), trust (S17), honesty and openness (S11).

6 Limitations and Threats to Validity

The study followed the recommendations proposed by Kitchenham et al. [36] and Petersen et al. [44], ensuring the reliability of the results through quality, rigor, and criticality in the planning, execution, and analysis processes, thereby explaining the entire systematized process. This mitigation allows the reproduction of the study following the same steps. Possible limitations include the lack of quality assessment of the selected studies and the use

of keywords in the search expression. The search was conducted across 8 databases, thereby increasing the likelihood of finding relevant studies. The choice of metabases in this investigation also aimed to mitigate threats to the *validity of the research*, as proposed by and Ampatzoglou et al. [9]. This strategy seeks to maximize the scope available at the time of the search. However, a limitation of the study is that snowballing was not performed, which may have contributed to some relevant studies not being identified.

Words that allowed for the most significant possible scope in elaborating the search expression were also used, enabling greater coverage of relevant studies. The expression “agile” was chosen to define the context after testing in several databases, as well as “psychologic* safe*” to prevent similar keywords from being excluded due to excessive restriction in the search process. Another limitation is that the study considered only agile contexts. Therefore, other experiences and approaches associated with different software development contexts (which may also be applicable in the agile context) may not have been identified.

To mitigate threats to *theoretical validity*, studies were systematically selected and read in their entirety as documented. Interpretations were discussed among researchers to minimize potential biases during the extraction and classification processes.

The threat to *interpretative validity*, arising from the coherent interpretation of the results, may arise as a result of the extraction process. To mitigate this, review sessions were held among the authors to discuss the read and the written content, aiming to minimize possible biases. The reported findings represent the consensus among the researchers.

7 Final Considerations

This paper describes the results of a systematic literature review on psychological safety in agile contexts. The findings from the 21 selected studies showed a growing interest in the subject over the past five years (RQ1). The benefits investigated and attributed to the presence of psychological safety can provide organizations with an environment that yields higher-quality deliveries, engaged teams, and a more collaborative, respectful, and innovative organizational climate.

Among the findings of this study, examples of the following stand out: (i) effects of the absence of psychological safety (RQ2), such as brain drain and fear of expressing oneself; (ii) effects of its presence (RQ3), in which we list factors such as organizational climate, team interaction, individual initiative, human factors, and software quality; (iii) factors for its promotion (RQ5), also presenting organizational climate, team interaction, human factors, and leadership support for the team; (iv) factors that reduce psychological safety (RQ6), such as those linked to personality, such as introversion and shyness. Future work may involve further investigations into the causes, effects, and factors that promote psychological safety in development teams, regardless of whether they are agile or not, for example, through case studies or field studies. Additionally, the relationship between personality traits and the presence of a psychologically safe organizational climate can be explored.

Some of the studies investigated psychological safety (RQ4) using the instrument proposed by Edmondson [21]. Other authors opted for modifications to the instrument, either in the scale or

in the questions. Other authors chose to investigate psychological safety through semi-structured interviews. This aspect presents an opportunity to develop new instruments for investigating psychological safety, given the complexity of this phenomenon and the variety of factors present in this context.

These findings allow for further research, both in academia and industry. In academia, in addition to the possibilities mentioned above, a diagnostic instrument for psychological safety in agile teams or in organizations undergoing agile transformation could be created, identifying its causes and proposing actions to promote it. Other possible future work includes improving the understanding of leader behavior and their perception of the organization, considering contexts with and without psychological safety.

Psychological safety among leaders who do not hold senior management positions, as well as the factors that lead the organization to be perceived as promoting psychological safety, are also potential research topics. In industry, the results can support management action. For example, senior management can use the findings to implement mechanisms that foster a psychologically safe organizational climate. In addition, project managers or other individuals in leadership positions can seek to enable the factors necessary to promote psychological safety as they perceive the effects of its absence in the contexts, whether team or organizational, in which they are directly involved.

ARTIFACT AVAILABILITY

Supplementary material for this study is available at [31].

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