Don't Forget to Breathe: A Controlled Trial of Mindfulness Practices in Agile Project Teams

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Abstract. While the effects of mindfulness are increasingly explored across different fields, little is known about the application of these practices in agile project teams. In this paper we report on a rigorous controlled trial executed to understand the impact of the three minute breathing exercise on the perceived effectiveness of stand-up meetings. We compare (1) an active group using a three minute breathing exercise, to (2) a placebo, and (3) a control group in 3 organizations and 8 teams with over 152 measurements. Our findings indicate an immediate positive impact on perceived effectiveness, decision-making and improved listening in the active groups compared to the placebo and natural history groups. We provide a preliminary agenda for future research based on our findings and previous evidence from other fields.

Keywords: Empirical study · Mindfulness · Scrum · Teamwork · Resilience · Agile software development

1 Introduction

In a world led by 'volatility, uncertainty, complexity and ambiguity', depending solely on automatic pilots can have disastrous effects on human life [1]. Present-day organizations are facing the same problem as they are operating in a highly unpredictable and stressful environment to which they daily need to respond adequately. It is difficult for organizations to adapt to changing circumstances and demands in a highly volatile world. Carefully crafted plans, that should work like business or project auto-pilots, are met by a stubborn reality that does not fit the envisioned strategy. Such an increase in speed and uncertainty leads to an increase in stress for teams and management [2,3]. As a consequence people fall back on autopilot behavior with suboptimal results.

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This is a problem because organizations that do not possess the agility to reply to the present and its changed demands, run a great risk of becoming obsolete or at least lose some of their striking power within the market that they operate. Big corporations like Atari, Kodak, DeLorean, Polaroid, Pan Am and Compaq, once cutting edge businesses, have failed to meet these changing demands and showed no signs of agility, which eventually led to their demise. Their business auto-pilot was focused on a fixed point and failed to prevent them from crashing into new competitors, new technologies, new demands and waning public interest at the next junction. Companies that cannot alter their course because they cannot recognize the changes in the market, will fail or decline. Their employees will likely have to deal with stress levels that keep on building up in their system with a great chance of burnout and demoralization.

Mindfulness, a concept increasingly popular in practice, promises relief to some of those symptoms. Mindfulness deals with a certain attitude towards reality in which the practitioner approaches the here-and-now in 'the fullest attention to whatever the moment presents' [4]. Mindfulness provides tools to increase attention and aims to create habits of mind that lead to stress reduction [5]. While there is a firm evidence base of mindfulness in clinical psychology, research on the application of these practices in the context of professional organizations such as agile teams, is still in its infancy.

In this report we present the first empirical perspective on the application of a very concrete mindfulness practice in agile teams: the three minute breathing exercise. While previous studies predominantly conducted in the field of clinical psychology only revealed results after several weeks, our findings point at an immediate effect of the exercise in a subsequent meeting. Based on our experiences we draw out an agenda for further research. Our findings provide a strong base for further exploration relevant for both research and practice.

2 Background and Related Work

While the debate on the definition of mindfulness is ongoing, it's roots can be traced to Buddhist psychology where it has been practiced for several millennia [6]. The concept has then been introduced in the field of contemporary psychology by Jon Kabat-Zinn in the mid-1980s, as 'paying attention in a particular way, on purpose, in the present moment, and nonjudgmentally' [7,8]. Since then mindfulness has been applied in many fields such as education [9], law [10], "prison programs" [11], "IT" [12], and "business" [13] to stimulate more positive responses and better-decision making. While there is a growing base of evidence that specific mindfulness practices can have a positive effect on human behaviour, little is known on its impact in professional organizations such as agile teams.

In the following subsections we will discuss existing evidence of mindfulness practices applied in clinical psychology, organizational psychology, information systems, management research, and lastly in agile teams.

Mindfulness in Clinical Psychology. Several therapies and trainings have been developed to execute mindfulness based interventions. Kabat-Zinn for example introduced Mindfulness-Based Stress Reduction (MBSR). This treatment was originally designed to "treat patients with chronic pain" [8]. Eighteen known studies have been undertaken toward fathoming the consequences of MBSR on different groups of participants [14]. All of the research indicates that there is a positive correlation between MBSR and psychological well-being. Shapiro, Schwarz and Bonner for example have conducted a study among medical students, wanting to find out if the students would be able to cope better with stress after they had gone through an official MBSR program [5]. The results indicate that participation in a mindfulness-based stress reduction intervention can effectively (1) reduce self-reports of overall psychological distress including depression, (2) reduce self-reported state and trait anxiety and (3) increase scores on overall empathy levels [5]. Studies have shown that mindfulness has a general positive impact on one's psychological health [7]. Mindfulness has been correlated to a myriad of positive effects on people with psychological issues. Good results have been shown in the areas of "self-esteem" [15], "self-efficacy" [16], "clarity" [17], "self-compassion and empathy" [18]. The correlation of mindfulness has also been associated with the reduction of "depression" [19] and "stress" [20].

Mindfulness in Organizational Psychology, Information Systems and Management Research. Several randomized controlled trials have been undertaken to prove the effectiveness of mindfulness in a business setting. In an integrative review Good et al. [21] integrate the impact of mindfulness into five areas of basic functioning (attention, cognition, emotion, behavior, and physiology) and into three clusters of workplace outcomes (performance, relationships, and well-being).

Reb et al. [22] for example examined the effect of "leader's mindfulness on employee well-being and performance". The study showed that the higher the supervisor's mindfulness: (1) the higher the employees' psychological need satisfaction, (2) the higher the job satisfaction of the employee, (3) the more favorable overall job performance ratings, (4) the higher the in-role performance, and (5) the higher the engagement with organizational citizenship behaviors. Other randomized controlled trials in this area have also shown a positive correlation between the trait mindfulness and psychological well-being, better decision-making and better handling of stress [23].

Hafenbrack et al. [23] discuss the association with a mindfulness condition towards (1) positive emotions, (2) focus on the present, and (3) better decision-making. Mindfulness practices are associated with an augmentation of a positive emotional state of being, since mindfulness "increases the willingness to tolerate uncomfortable emotions and sensations" [24] which indirectly increases the quality of decision making [25]. There is a significant direct correlation between the mindfulness state and decision making [23]. Lastly mindfulness has a focus on the present [8,23] which indirectly increases the value of decision making.

Mindfulness, Agility and Agile Teams: Initial work on agile teams and well-being indicates that teams that feel more empowered experience less stress [26]. However, while the popularity of agile methods is continuously rising, establishing the right team atmosphere and leadership approach remains a challenge [27,28]. Especially in situations of increased speed and competition, agile teams are experimenting with practices to counter the loss of focus [29].

Mindfulness, while promising relief to some of the aforementioned symptoms, has so far received little attention in the context of agile methods. In existing literature the concept has been explored in two main directions in relation to agility: (1) Mindfulness as an organizational condition and a theoretical concept that supports agility through attention to detail and reliability of systems (compare [30]), and (2) Mindfulness practices as a set of tools to achieve it.

Mindfulness as a theoretical concept to support agility in organizations has been explored by McAvoy et al. [30] to compare *'Doing' Agile* vs. *'Being' Agile* - thus understanding the effectiveness of agile practices in organizational contexts. Nagle et al. [31] utilize a mindfulness measure to understand how an organization can achieve flexibility and reliability in the context of Global Software Development (GSD).

The interaction of concrete mindfulness practices and agile practices is far less well understood. Agile practices such as stand-up meetings for team coordination [32], Iteration Reviews for continuous customer feedback, or Retrospectives for teams to reflect and improve their ways of working, are concrete routines that help teams to deliver their products and improve. Mindfulness practices, similarly to agile practices, provide very specific patterns of action and reproducible protocols, routines that can help build mindful behaviour in organizations [33]. For example, Bernárdez et al. [12] conducted an experiment comparing groups of students conducting a mindfulness exercise to a control group practicing public speaking, with the former being more efficient in developing conceptual models.

Following evidence across various fields we know that mindfulness exercise can have a positive impact on decision-making, the ability to focus and psychological well-being. However, until now little is known on the impact of those exercises in business settings, especially in agile project teams. The three minute breathing space exercise [34], for example, is a concise mindfulness exercise that can be applied relatively easy in teams with little investment. The participant approaches the short exercise with an attitude of alertness and curiosity throughout its three stages of 'becoming aware', 'focusing attention on breathing' and 'extending the attention' [34]. Similarly to meeting routines in agile teams, such as stand-up meetings, it provides a concrete and convenient protocol. As such, the two practices, stand-up meeting and the breathing exercise, can be combined into an experiment.

Based on the literature reviewed above we thus pose the following question: *What is the effect of the three minute breathing space exercise on the quality of meetings in an agile project team?*

Table 1. Stand-up meeting protocol for the three trial groups

Step	Duration	Activity			Actor(s)
		Active	Placebo	Control	
1	5 min	Execute the three minute breathing space	Listen to Tango by Igor Stravinsky	-	Facilitator & Teams
2	15 min	Participate in Stand-up meeting			Teams
3	5 min	Fill out questionnaire			Teams
4	1 min	Collect questionnaires			Facilitator

3 Research Method and Conduct

Following the research question this paper aims to help understand the impact of a specific mindfulness practice, the three minute breathing space, applied in agile project teams. As the three minute breathing exercise as well as the Scrum stand-up meetings provides reproducible and comparable routines, we embedded our research question in an experiment following the design of a controlled trial as common in clinical settings [35,36]. As the trial is executed in a social context with many interconnected factors such as teamwork, process, culture and the perceptions of individuals, we applied a mixed methods approach using quantitative and qualitative sources to analyse the data [37].

Protocol: The trial was divided into three phases, a (1) preparatory phase from April until May 2016, three organizations were asked to join and facilitators were instructed, (2) collection of a baseline measurement in the beginning of June 2016, and (3) the actual trial period lasting from mid-June until mid-July 2016.

In order to reduce bias, we designed a controlled trial including a placebo as well as a natural history control group to compare the effect of the mindfulness exercise. To do so, we created a trial protocol including three groups, (1) an active group with teams executing the breathing exercise before their meetings, (2) a placebo group, which would listen to classical music by composer Igor Stravinsky, and (3) a control group. In order to distract attention from the actual mindfulness exercise, the study was strictly framed as an *"experiment to increase effectiveness in Scrum Meetings"* across participants and supporting facilitators. The placebo[1] group was added to compare the impact to a non-meditative form of relaxation, which could have an impact on the team, and

[1] We are aware that similarly to trials in social therapy, there is no placebo for an intervention in a social environment, as even a trivial interaction across individuals does have an impact [36]. For the sake of simplicity we still call the second trial group as "placebo" although it is technically not the case.

to further remove attention from the mindfulness exercise. All data collection was kept strictly anonymous and we repeatedly asked the teams to give honest opinions.

We chose stand-up meetings as the agile practice the trial was aligned to, also referred to as "Daily Scrum". We chose that specific meeting type due to frequency, commonly accepted format and contribution to decision-making within the team [32]. The meetings are short in nature and strictly time limited. The team members address the three questions *"What have I done? What will be done? What obstacles are in my way?"* and make operational decisions [32].

The interventions for the three trial groups were designed as depicted in Table 1. For the active and placebo groups a guided 5-minute exercise was given just before the start of the stand-up meeting, the natural history control group had no exercise whatsoever. The mindfulness breathing exercises (for a protocol compare [34]) as well as the Stravinsky[2] placebo exercise were both guided by experienced mindfulness instructors to give the best results. The breathing exercise was chosen due to its short nature, accessibility and prior exploration in the context of software teams [12].

The instructors were present 5 min before the meeting started and conducted the exercise type that was assigned to the team. After the exercise had taken place the team would start with its meeting. Shortly thereafter the team would fill out the forms. The natural history control group (nh) was not guided at all, but needed to fill out the forms at exactly the same moments as the other teams to follow their heartbeat. The procedure was repeated for the active and placebo groups four times until the end of the trial. Due to different iteration lengths, and to have sufficient time between the measurements to ensure that the interventions themselves would not influence each other because of too short an interval between exercises, the measurements took place once per week.

Organizations, Teams and Participants: Between April 2016 and May 2016 we reached out to organizations with software development departments in the Netherlands. The selection criteria was to find organizations with at least three software development teams applying Scrum for a period of at least three years.

Table 2. Distribution of the three trial groups (active, placebo, control) across the three participating organizations and involved teams

Organisation	Alpha			Beta			Gamma	
Team	T1	T2	T3	T4	T5	T6	T7	T8
Trial group	Active	Placebo	Control	Active	Placebo	Control	Active	Control
Team size	5	8	7	8	10	10	5	8
Measurements	4	4	1	4	4	4	4	2
Total responses	32	13	7	24	24	19	19	14

[2] "Igor Stravinsky - Tango (audio + sheet music)", URL to the video: https://www.youtube.com/watch?v=VcXTFRXenwI.

This ensures that these teams are working with short cyclical iterations in which working software is completed after each sprint, and applying stand-up meetings. Out of the 10 inquired organizations, three organizations and a total of 8 teams agreed to participate. After gaining the commitment of the teams, we assigned them to one of the three trial groups as depicted in Table 2. Organisation Gamma originally included a placebo team as well, however, the team dropped out due to internal deadlines before the trail execution. At last there were 8 teams included in the trial and respective analysis. Furthermore, seven facilitators were instructed to conduct the respective exercises and collect the data on-site.

Questionnaire Design and Data Collection: Following our literature study we compiled a questionnaire based on two dimensions: mindfulness and effectiveness. The questions can be found in Table 3. The questions addressing mindfulness (Q03, Q05, Q07, Q08, Q09, Q10) have been selected based on the dimensions mindfulness has been reported to have an impact on, such as: improved decision-making, better emotional responses, focus on the present [23]. In addition to that we added questions on effectiveness of the meeting (Q01, Q02, Q04, Q06). The questions have been administered with a 7-point Likert scale: *1 = Never, 2 = Rarely, 3 = Sometimes but infrequently, 4 = Neutral, 5 = Sometimes, 6 = Usually, 7 = Always*

Before the actual trial we conducted a baseline measurement which would later serve as a base for comparison. The baseline measurement was collected at the beginning of June 2016, the actual trial followed in mid-June 2016. During the trial team members were asked to fill out the questionnaire directly after the meeting and respective intervention (compare Table 1). In order to have sufficient time between the measurements, the exercises were conducted and data was collected once per week across the participating teams. After each allocated meeting, being three stand-up meetings per team, the stated items were graded by each team participant and were handed over to the facilitators. The time frame in which these measurements took place is from May 30th until July 25th of the year 2016. The facilitators made sure that the forms were then forwarded to the researcher.

At the end of the trial we asked the participants that took part in both the active and the placebo group to answer a number of open questions to get a more qualitative view on their perceptions. The questions were: *How valuable did you find this exercise? Would you continue this exercise without the trainers? What are the challenges you had? What worked well?*. For this qualitative view we used a deductive and exploratory approach in order to understand whether the personal perceptions of the participants would confirm or refute the quantitative analysis.

Data Analysis: The data generated was analyzed by question and by preparation type, i.e. the baseline of each question of each preparation type was aggregated and compared to the figures that were the result of the actual

Table 3. Questions Q01–Q10

• Q01 - Everyone is involved in the decision-making process.
• Q02 - The team vision was well defined.
• Q03 - The meeting atmosphere was constructive, calm and open
• Q04 - The meeting was effective
• Q05 - All meeting participants listened well to each other
• Q06 - The meeting objectives were met
• Q07 - The level of disagreement during the meeting was acceptable
• Q08 - The tension during the meeting was tolerable
• Q09 - The interaction in the meeting was good
• Q10 - The emotional responses within the meeting were healthy

measurements that were taken after the experiments had been conducted. With that aggregation level a t-test was executed on the difference between the baseline and the experiment per preparation type, finding the difference in average scores on all questions and the significance value (the p.value) of all these differences indicating if the difference could be explained through the intervention itself. The significance value we sought was a p-value $< 0{,}05$.

Besides the differences in average per question given the preparation type, we also took an average on the aggregated sum of the questions per team and tried to identify the maturity of the team. Furthermore the variance of all questions per team was measured to ensure the homogeneity of the given answers per team. To control for any unexpected influences T-values were measured.

4 Results

This section presents the results of the experiment. Table 2 depicts the participating teams, the respective team size, the number of measurement points, as well as the number of completed questionnaires. Every team consisted of approximately eight members. Each team, with the exception of the control groups, had four measurement moments. Those consisted of one baseline to measure the effectiveness and culture of the team before any intervention was provided and three guided measuring moments.

Table 4 summarizes the results for the ten questions (Q01–Q10) for the three trial groups. As depicted in the table teams that submitted themselves to the mindfulness exercise showed a slight but statistically significant ($p < 0.05$) increase in some key elements of effectiveness and cultural aspects of the team. Specifically our data indicates an improvement on the perception of (1) listening, (2) decision-making, (3) effectiveness of the meeting, (4) good interaction and (5) healthiness of emotional responses. Neither the placebo nor the natural history control groups showed statistically significant differences.

Table 4. Difference to baseline measurement for questions Q01–Q10 (Total n = 152)

Question/Trial group	Active (n = 75)	Placebo (n = 37)	Control (n = 40)
Q01 Decision-making	0.6659*	0.1666	0.1190
Q02 Team-vision well defined	0.2513	−0.4666	0.2857
Q03 Atmosphere constructive	0.3170	0.4	0.0238
Q04 Meeting effective	0.6139*	0.1333	0.2142
Q05 Listening	0.6299**	0.0666	0.4285
Q06 Objectives met	0.2905	0.2666	0.2857
Q07 Disagreement acceptable	0.3276	0.1000	−0.0238
Q08 Tension tolerable	0.3382	−0.0666	−0.1190
Q09 Interaction good	0.5673*	0.1333	0.0000
Q10 Emotional responses	0.4178*	0.2333	0.4333

* $p < 0.05$, ** $p < 0.01$

5 Discussion

The main query of this paper is whether a short mindfulness intervention has an impact on the effectiveness and culture in stand-up meetings of agile development teams. In the following subsections we will discuss (1) the perceptions of the teams with respect to our research question, (2) the embedding of the exercise in a broader organizational setting and barriers to its adoption, and (3) directions for future research.

5.1 Three Minute Breathing Exercise in Agile Teams, Does It Work?

The trial shows that even short mindfulness exercises, such as the here presented three minute exercise have a positive impact on the teams similarly to those reported in other domains (compare Table 4). The data indicates a self-reported improvement along five of the ten questionnaire items, particularly: (1) participants listened well to each other, (2) Everyone is involved in the decision-making process, (3) the meeting was effective, (4) the interaction in the meeting was good, and (5) the emotional responses within the meeting were healthy. The questions with the biggest difference to the baseline were *Q01 Everyone is involved in the decision-making process*, and *Q05 participants listened well to each other*. These perceptions were supported by the qualitative data (n = 14), e.g.: *"The 3 min of silence helped me rest and relax. It helped gather my senses back after a few hours of (usually) stressful work."* (Participant Team 4). We did not observe any statistically significant negative effects in our data. In the placebo group the question Q02 had a statistically not significant decrease compared to the baseline measurement. Here we could raise the question if the Stravinky song had a distracting effect on the team and its vision during the meeting. Looking back at our research question we will now lead the discussion in

two ways: (1) how the exercise can support building emotional intelligence and leadership skills in the individual, and (2) how the exercise can help building mindful teams.

Taking the perspective of the individual our findings indicate that the breathing exercise could help agile team members and team leaders to build up their emotional leadership skills. As pointed out by Porthouse and Dulewicz [38] emotional leadership competencies (e.g., emotional resilience, sensitivity, self-awareness, conscientiousness) are of greater importance for leaders in agile projects compared to traditional projects. As the leadership skills and style of individual managers have a big impact on the culture of an organization, emotional leadership skills are important for the success of agile methods. A meta-analysis conducted by Giluk [39] on the relationship between mindfulness and the Big Five personality traits shows relationships with neuroticism, negative affect, and conscientiousness, but also with agreeableness.

Taking the perspective of the team our findings indicate that the practice could help building agile teams. Self-managing teams are considered to be one of the corner stones of agility, yet they are difficult to establish [28]. The five dimensions of agile teamwork, such as shared leadership, team orientation, redundancy, learning and autonomy [28,40] require shared decision making and the ability to listen to each other and understand each others opinions, as supported by the breathing exercise. Further, similarly to what McAvoy et al. [30] call *'Doing' Agile* vs. *'Being' Agile*, our experiences with the trial indicate that the exercise could help build up mindful behaviour, which helps the team understand agility and agile practices in context rather than blindly following them. The lack of focus can be an issue for agile and entrepreneurial teams [29]. Hafenbrack et al. [23] researched the positive influence of mindfulness on decision making and the sunk-cost bias, the tendency to continue investing in a project once time, money or effort was invested, although that project might not be a viable initiative after all. Stettina and Smit [29] researched agile teams working in entrepreneurial settings. The results reveal that when trying to handle many project requests due to customer pressure, mindfulness could help making better decisions on what projects to follow.

5.2 Mindfulness in Our Case Organisations: Barriers to Adoption

Our quantitative results show that mindfulness enhances qualities of effectiveness and team cooperation in the daily working culture of an agile team. The qualitative open questionnaires distributed to the teams after the trial, however, draw another perspective on our findings. While several participants saw the personal use of the exercise, none would continue it in a public setting. As a participant from Team 2 commented: *"For some members, the pause before the standup was useful, because they could focus on their activities done in the previous day. But for the rest of the team, the exercise was considered just not suitable with their own way of working."* Several participants in Team 4, for example, indicated that the fact that they conducted the exercises in an open space, they felt looked at by other teams. Others indicated, they would continue

with the breathing exercise on their own rather than in the team setting: *"Yes, I want to do those exercises more often. I have chosen to do this at home and not at work."* (Participant Team 7). So, although the results show statistically significant increases of effectiveness on several entries, the perceived usefulness does not raise to the level that the participants want to keep on using it in a public setting. The teams apparently encountered a barrier to introduction of these practices.

This raises the more general question of what conditions could support the adoption of these type of mental practices in agile teams. From the literature (cf. [21]) we know a few: support of management for these practices, voluntary participation and a safe team climate. Management support for these practices seems obvious: if leaders do not support these practices it will not happen. In that respect these mental practices do not differ from other agile team practices that help teams perform better. As a line of research, this would be interesting to look into.

Voluntary participation is a necessary corollary of these type of practices. It enhances intrinsic motivation, which is an important mediator of success of team practices (cf. [41,42]). Lastly, also a safe team climate is important. If, as the qualitative data examples showed, people feel exposed, the practices will not function very well. That is a general factor for well-functioning teams: psychological safety is a crucial characteristic of successful teams. If such a climate is absent, social defense mechanisms will come into play and diminish team performance. Safety has both an environmental side (what space is the team working of meeting in, open or closed) and a communicative side: do people feel safe to utter difficulties, ask questions, disagree, praise each other, etc. In general it means that within the team culture or the organization, it is recognized that emotions play a role and are not subdued. It is generally known from psychological research into emotional agility that if this happens, they will play out in a different but uncontrolled way with mostly negative effects on team climate and effectiveness.

5.3 Mindfulness in Agile Project Teams: A Preliminary Research Agenda

Having studied the results of a mindfulness intervention in agile teams and discussed its relation to existing literature, we now continue to discuss a potential future research agenda. The following is a thematic list of questions, not aiming to be exhaustive, but as possible entry points for an exploration of mindfulness in agile teams:

Effects on leadership competencies and team development. From Porthouse and Dulewicz [38] we know that emotional leadership competencies are more important in agile project teams compared to traditional project teams. Also shared leadership is an integral aspect of agile teams and can be difficult to acquire [28]. *How does mindfulness influence the development of leadership competencies and emotional intelligence? What role do mindfulness practices play in team development?*

Effects on decisions. From Hafenbrack et al. [23] we know that meditation practices are reducing sunk-cost bias. *What types of decisions do mindfulness practices have an impact on?*

Lengths of training and lengths of effect. In this trial we worked with a brief mindfulness exercise at the beginning of a short agile meeting. We did not, however, measure the impact of this short exercise on a longer type of meeting. It could be that the enhancing effect wears off quickly and that for longer meetings the exercise needs to be repeated several times in order to gain its lasting effect. Also, in clinical research, experiments have been more intense in nature. It would be interesting to see if a whole team that volunteers to submit to a whole intensive program will see even better results. *Do longer, more intense mindfulness exercises have greater impact on agile teams? Do short mindfulness exercises also have an impact on longer agile meetings? Do short mindfulness practices become increasingly more effective over time?*

Implementation. Although teams indicated that they benefited from the mindfulness exercise they also communicated that they did not want to continue the exercise once the experiment ended. This is an interesting observation which has a contradicting tension. It would be interesting to find out why we were confronted with this tension. *What is the best possible organizational culture in which mindfulness will thrive? What is the correlation between the effectiveness of a mindfulness exercise and the maturity of a team? If the teams are to sustain such a practice on their own, how would they teach to new team members? And if they have to teach the practice to new members, will it be as good as they have learned is form a mindfulness teacher?*

Interaction with other practices and routines. In this paper, we have only focused on stand-up meetings during this experiment. Future research can broaden the scope and could determine if there is a correlation between the trait mindfulness and the effectiveness of other types of Agile meetings like retrospectives, sprint planning, sprint review or refinements. It would be interesting to find the effect of other types of mindfulness exercises on the effectiveness of team meetings in Agile teams. *What is the effect of other expressions of mindfulness exercises on the effectiveness of meetings in agile project organisations? What is the effect of a mindfulness exercise on other type of meetings in an Agile project organisation?*

Types of teams and domains of practice. Our research has focused on software development teams, it would be interesting to expand our understanding towards other domains of practice. We have seen that the trait mindfulness helps make better decisions and is an enabler for the handling of stress. Some types of teams might benefit even more from exercises in the mindfulness spectrum. Teams that are dealing with higher stress levels than software teams or teams that have an acute need for clear and effective decisions would potentially be better candidates in this regards. Portfolio management teams, innovation teams or board room teams would be suitable candidates to consider. *What type of teams benefits most from the trait mindfulness?*

Costs vs. Benefits. Understanding the costs of a potential implementation is important for management. Hales et al. [43] discuss the costs of implementing mindfulness in a health care context. *What are the costs of implementing mindfulness in project organizations compared to their benefits?*

5.4 Threats to Validity

A controlled trial executed within eight teams in three organizations can be more of a challenge to set up in the operational phase than when designed on paper. To avoid potential sources of bias, we followed the recommendations of Pannucci et al. [44] to prevent bias in clinical trials across stages of research in the planning, data collection, analysis, and publication.

In the pre-trail phase study design and in recruitment selecting a favourable population could impact study results. We addressed selection bias by masking the study purpose. During trail execution, the facilitators educated mindfulness trainers, could have consciously or subconsciously influenced the responses of the team members which could result in higher scores for the treatment teams. We used standardized protocols for execution, data collection and carefully instructed the facilitators, reiterating that masking the study purpose is important for its outcomes. Further, participants might be prone to please the experiment leader and give him the answers he needs for his experiment to be successful. Due to masking the purpose, the participants were not aware of the actual study purpose. Another potential source of bias could be the concept of the breathing exercise, which could polarize some of the participant. Potential skepticism could influence the answers of the participants, provoking interest and random answers. We have tried to notice this within the data set but did not find statistically relevant outliers or noise in the data. In the post-trial phase, bias can occur during data analysis and publication. To address external validity, we compared our findings to existing evidence in the fields of clinical psychology [14] and in professional organizations [21]. To further improve construct validity we applied a mixed methods approach in collecting and data analysis using qualitative and quantitative sources.

6 Conclusions

The goal of this study was to explore the impact of a short mindfulness exercise on the quality and effectiveness of meetings in agile project teams. A controlled trial was designed to observe effects associated with mindfulness in the context of eight Scrum teams in three organizations.

The participants perceived the practice as useful, and statistically significant improvement was reported on some of the dimensions in the groups performing the exercise (listening, decision-making, meeting effectiveness, interaction, emotional responses). The teams in our case organizations will not continue with the exercise in their particular setting. Nonetheless, the result is quite remarkable as the trial shows an instant effect while other studies had a preparation phase of

several weeks or more. Further research needs to be done in order to understand the circumstances under which its effects are perceived more or less. If there is more collaboration and more pressure in future business settings to keep our organizations healthy, sustainable and effective, the use of mindfulness might be more essential. To do so we provide concrete ideas for a research agenda to explore the effects further.

The conclusion that we can draw is that mindfulness in the form of breathing exercises indeed enhances the quality of meetings in an agile team. Research indicates the increasing importance of emotional intelligence and empathy to be for future workforce next to analytical skills. Practices such as the here discussed exercise could help build up some of those skills in the future.

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