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The effectiveness of a team intervention to enhance team regulation in hybrid teams: a randomized controlled trial

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ABSTRACT

This article evaluates the effectiveness of a team intervention for hybrid work teams. In the intervention, hybrid work teams engaged in team-regulatory strategies with the aim to improve hybrid team collaboration. In a cluster-randomized controlled trial, data from 478 individuals across 56 hybrid work teams working with flexible work designs (FWD, flexibility in where, when and how to work) were used to examine the intervention effectiveness on FWD-specific social support, psychological safety, and psychosocial management as an indicator of team collaboration. Teams were assigned to an intervention group that received the intervention immediately ($n = 229$) or to a waitlist control group ($n = 249$). Participants received questionnaires before and after the intervention and at a 9-week follow-up. The results of multilevel analyses showed that the intervention improved FWD-specific social support and psychological safety with small to medium effect sizes and psychosocial management with a large effect size. Team regulation mediated effects. Medium effects on team regulation and psychosocial management as well as a small effect on psychological safety persisted over 9 weeks.

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Psychological safety; randomized controlled trial; social support; team regulation; psychosocial management

As flexible work designs (FWD) such as flexitime and remote work become increasingly common, many so-called hybrid work teams face different collaboration challenges. The definition of flexible work designs is in line with Lauring and Jonassons' (2025) recent conceptualization of hybrid work: described by dynamic switches between various work modes referring to where (i.e., switching between different work spaces), how (i.e., switching between face-to-face and virtual team meetings), and when (i.e., working together synchronously vs asynchronously) people work. Within these various work modes hybrid work teams need to find new ways to collaborate, for example to organize their communication, to socially support team members, to establish a team culture of psychological safety, and to find a way for psychosocial management of the challenges going along with FWD. Marks et al. (2001) and Mathieu et al. (2017) have described different team processes and their impact on team outcomes. Team processes can be categorized according to different phases in which they occur: transition phases (e.g., goal specification, planning for future), action phases (e.g., progress monitoring towards goals, providing feedback for team members), and interpersonal processes. The interpersonal process phase timely overlaps with the action and transition phase and includes for example affect management. Team processes occurring in the transition and action phase are in line with self-regulation at the team level (see Marks et al., 2001). In this intervention study we focus on and refer to self-regulation of teams as team regulation, and we define it as the ability of teams to steer team-level actions to attain collective team goals (Chen & Kanfer, 2006; van Hooft & van Mierlo, 2018). This is important for hybrid teams as it enables them to successfully adapt to change (Inzlicht et al., 2021). Specifically, it allows them to address team processes in hybrid work settings as well as new challenges that come with FWD, thus facilitating the transition to hybrid work modes. Until now, researchers have mostly explored the critical role of self-regulation at the individual level in coping with challenges of FWD (Althammer et al., 2025; T. Müller & Niessen, 2019). Self-regulation facilitates the development of individual work routines (Kubicek et al., 2015; Mäkikangas et al., 2022) and is required for behavioural adaptation (Inzlicht et al., 2021).

Despite these promising findings, research on self-regulation remains limited in important ways. First, prior research has primarily considered the self-regulation process within individuals (Zacher & Frese, 2018) and has mostly evaluated self-regulation intervention programmes

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at the individual level (e.g., Ebner et al., 2018; Marques-Quinteiro et al., 2019). Moreover, the similarity of processes and concepts at the individual and team level remains debated (e.g., DeShon et al., 2004; Dierdorff & Ellington, 2012). Luciano et al. (2025) have pointed out the importance of team development interventions for improving virtual team collaboration by using action-focused planning and team-specific feedback. Despite this, little research has focused on interventions to improve team regulation (Panadero et al., 2015). Furthermore, research has primarily focused on performance-related outcomes (Schlaegel et al., 2023), but not on team-related outcomes which are especially important for the collaboration of hybrid teams.

To address these gaps, we transferred self-regulation process models from the individual level (Bandura, 1977, 1991; Kanfer, 1977; Zacher & Frese, 2018; Zimmerman, 2000) to the team level. In doing so, we draw on research that has proposed self-regulation processes to be functionally similar to team-level regulation processes (Chen & Kanfer, 2006; Chen et al., 2005; DeShon et al., 2004; Dierdorff & Ellington, 2012; Marks et al., 2001; Panadero et al., 2015). We then developed a team regulation intervention for hybrid work teams to promote team regulation, and to enable team processes to overcome the challenges related to hybrid work. Thus, the central research question of our study was whether a team intervention based on self-regulation theories can effectively improve team regulation in hybrid teams, and whether this effectively helps hybrid teams master the collaboration challenges going along with hybrid work. In our study, we focus on FWD-specific social support, psychological safety, and psychosocial management as indicators of dynamic team collaboration processes.

This study contributes to team intervention research for hybrid work teams in several ways. First, we aim to extend research on team interventions by developing a theory-based team intervention for hybrid teams to promote their team collaboration and empirically testing it with organizational work teams. By conducting this evaluation study as a randomized controlled trial with a sample of employees working in 56 teams, we respond to the call for more high-quality randomized controlled trials of work-specific interventions (Michel et al., 2015; O'Shea et al., 2016).

In addition, we build on the notion that developing a high-quality intervention requires a strong theory or reasonable rationale (Briner & Walshe, 2015). Given the extensive evidence that self-regulation models can serve as a theoretical basis for effective individual interventions (e.g., Ebner et al., 2018), we aim to provide evidence that regulation process models can be used as a framework for designing an effective team regulation intervention being also in line with team process research (Marks et al., 2001; Mathieu et al., 2017).

Finally, this study aims to expand the understanding of team regulation by extending research on action regulation which has traditionally focused on individual self-regulation that occurs within persons (Zacher & Frese, 2018), thus lacking a focus on team regulation, which involves the coordination of each other's actions. In addition, in our proposed theoretical framework for team regulation, we draw on process models of self-regulation (Bandura, 1977, 1991; Kanfer, 1977; Zacher & Frese, 2018; Zimmerman, 2000) and adapt the postulated processes to the team level. We thereby integrate the entire regulation process (i.e., team-goal setting, team-monitoring, team-evaluation, and team-rewarding). This extends previous research suggesting that applying the individual-level concept of self-regulation cycles to groups can be fruitful (Tschan, 2002) and, thus, advances theory building on team regulation and its outcomes.

Team regulation and self-regulation

In their integrative theoretical model of individual and team goal-directed processes, Chen and Kanfer (2006) suggested that self-regulation processes traditionally studied at the individual level are functionally similar to regulation processes at the team level. Self-regulation describes the ability to steer thoughts, feelings, and actions to attain individual goals (Bandura, 1991). According to process models of self-regulation, people engage in self-regulatory strategies to achieve their goals (Bandura, 1977, 1991; Kanfer, 1977; Zacher & Frese, 2018; Zimmerman, 2000). First, they formulate objectives and performance standards (*self-goal setting*); then they observe their behaviour (*self-monitoring*); then they reflect on the consistency of their behaviour with their self-set goals (*self-evaluation*); then they reinforce themselves with treats or positive affective responses (*self-reward*), the anticipation of which motivates them. These strategies form the basis for purposeful action (Bandura, 1991) and are in line with postulated team processes (Marks et al., 2001; Mathieu et al., 2017).

Hence, based on previous definitions of similar constructs (Chen & Kanfer, 2006; van Hooft & van Mierlo, 2018), we define team regulation as the ability to steer team-level actions to attain collective team goals. As such, it is a team-level construct that refers to collective behaviour of a team (cf. van Hooft & van Mierlo, 2018). Similar to individuals, work teams generate collective goals towards which they work. Teams then achieve their goals through collective and coordinated activities of team members. Analogous to self-regulation, team regulation should be

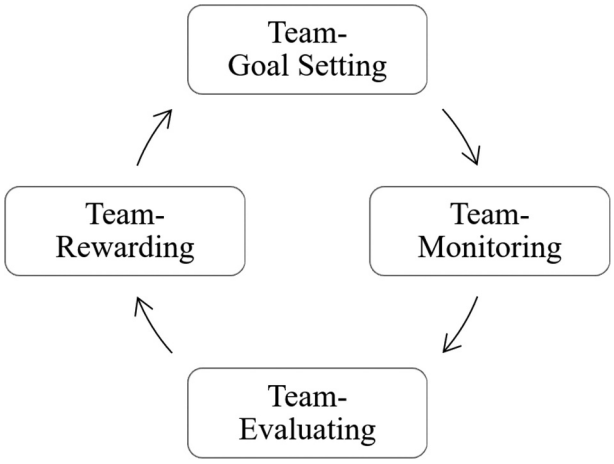

Figure 1. The team regulation process model.

organized sequentially (McGrath & Tschan, 2004). Consistent with process models of self-regulation, we propose a process model of team-regulation, that is, teams engage in team-regulatory strategies of team-goal setting (i.e., setting clear goals for improving collaborative work practices), team-monitoring (i.e., tracking progress), team-evaluating (i.e., reviewing progress), and team-rewarding (i.e., appreciate achievement of goals) to achieve their collective goals (Figure 1). Previous research has postulated similar individual- and team-level regulatory processes. It has demonstrated the existence of team-level analogues of individual-level regulatory constructs, such as team-goal setting (DeShon et al., 2004; Panadero et al., 2015), team self-monitoring (Chen et al., 2005), or team-evaluating (Bandura, 1977; Panadero et al., 2015). However, none of these studies have developed and evaluated an intervention based on the entire team regulation process.

Effectiveness of a team regulation intervention

The team intervention evaluated in this study was designed to promote team regulation in hybrid work teams and to help hybrid teams to improve their collaboration. They learn how to engage in team-regulatory strategies (i.e., team-goal setting, team-monitoring, team-evaluating, and team-rewarding). These strategies are based on the process phases of individual self-regulation models (Bandura, 1977, 1991; Kanfer, 1977; Zacher & Frese, 2018; Zimmerman, 2000) and can be adapted to the team level (see Marks et al., 2001).

Previous research has shown that individual self-regulation is malleable through self-regulation training, with positive effects on self-efficacy (Ebner et al., 2018), well-being (Mrazek et al., 2021; A. Müller et al., 2016), adaptive performance and job satisfaction (Marques-Quinteiro et al., 2019), and time management and decision making (Oettingen et al., 2010). However, there have been few attempts to train team regulation (e.g., Panadero et al., 2015), and to date no study has evaluated a team regulation intervention in hybrid work teams. Analogous to interventions that aim to train individual self-regulation capacity with self-regulation strategies, we expect the intervention based on a team regulation process model to enhance team regulation in hybrid teams by promoting team-regulatory strategies:

Hypothesis 1: After the intervention, participants of the team regulation intervention will report more team regulation compared to participants in the control group.

As outlined above, it can be assumed that processes of individual and collective regulation are related (DeShon et al., 2004; Dierdorff & Ellington, 2012; Panadero et al., 2015). Also, rooted in multilevel research, focal constructs assessed at the individual level and aggregated to the team level (direct consensus model) can result in conceptually distinct new forms of the construct when the referent of the construct shifts (referent-shift consensus composition; Chan, 1998). Thus, a team level construct of self-regulation could emerge in different ways when the referent shifts – in our case from the individual team member to the whole team, and result in conceptually distinct constructs, that is aggregated individual self-regulation and team regulation (e.g., Chan, 2019). Individual self-regulation refers to the individual's engagement in self-regulatory behaviour (e.g., individual goal setting) while team regulation refers to the whole team's engagement in regulatory behaviour (e.g., team-goal setting). Thus, we aimed to explore whether team regulation is conceptually different from the average individual self-regulation of team members. In other words (cf. van Hooft & van Mierlo, 2018), we wanted to investigate whether team regulation refers to self-regulation of teams (i.e., team-level regulation) rather than individual self-regulation within teams (i.e., individual-level self-regulation in a team context). Therefore, we posed the research question whether team regulation is distinct from aggregated individual self-regulation of team members.

Research Question: Will the evaluation yield similar results for aggregated self-regulation as for team regulation?

In line with the categorization of dynamic team processes by Marks et al. (2001), we expect the implementation of team regulation strategies (i.e., team-goal setting, team-monitoring, team-evaluating, and team-rewarding) in hybrid teams to improve different team outcomes. Mathieu et al. (2017) have proposed that team processes

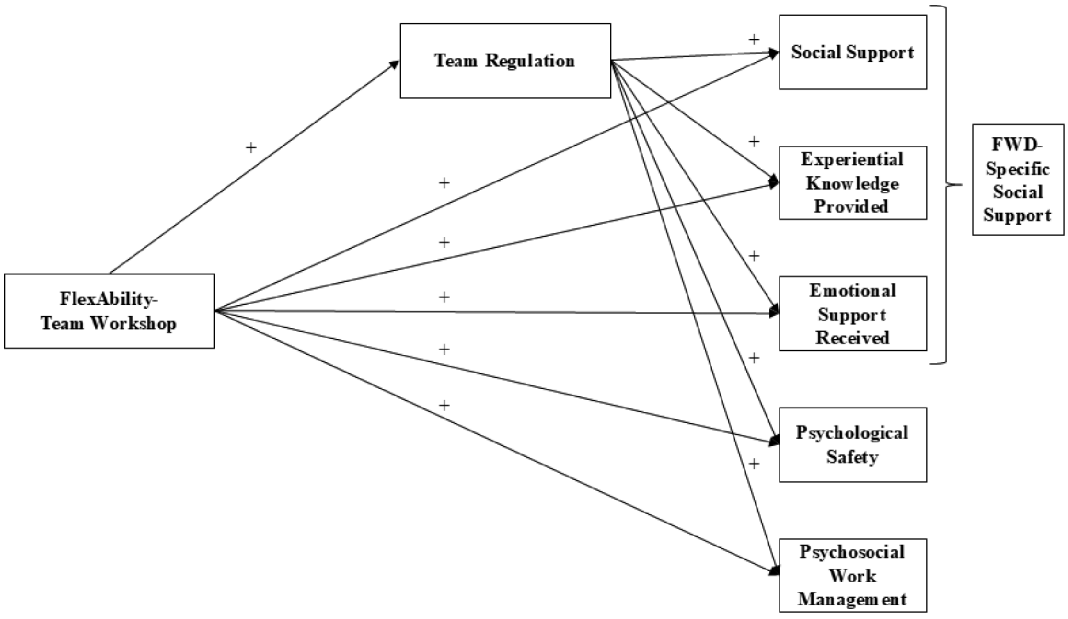

Figure 2. The proposed research Model.

can be followed by emergent states, described as cognitive, motivational, and affective states of teams. These states are dynamic and can vary due to for example team context and processes. At the group level such states are closely related to interpersonal team processes. In our study we focus on affective states of teams, specifically FWD-specific social support, psychological safety, and psychosocial management (Figure 2). We expect that team regulation is likely to create an environment where hybrid team members will provide each other with social support and feel psychologically safe to share their ideas and knowledge. Further, we expect that engaging in team regulation strategies should improve psychosocial management within teams. This is indicated by teams' increased awareness and ability to address and manage issues related to psychosocial aspects of hybrid work collaboration.

Team regulation intervention effects on social support

Social support describes the extent to which employees perceive that supervisors and colleagues care about their well-being through social interactions or provision of resources (e.g., practical or emotional aid). It can be perceived either in general or in a specific context (French et al., 2018; Kossek et al., 2011). Social support can be categorized as an emergent state of team processes (Mathieu et al., 2017). In the context of hybrid work, team members may face different collaboration challenges due to, for example, different working times and locations. Social support plays a pivotal role in this context, helping employees to cope with hybrid work challenges such as social isolation and positively impacting their well-being and performance (B. Wang et al., 2021).

Thus, social support can be specific in the FWD context of hybrid teams. This includes whether employees feel that they receive help from colleagues and supervisors regarding collaboration in the FWD context (*social support*), whether employees share personal challenges regarding FWD with others (*experiential knowledge provided*), and whether employees feel that others listen to them regarding how to manage work in the FWD context (*emotional support received*). Based on social identity theory, social interactions and a sense of belonging to a group can enhance social support (Haslam et al., 2019). Team members who are participating in a team regulation intervention together are likely to develop a sense of increased shared identity because they are working towards a common goal. As a result, their mutual social support should increase (Haslam et al., 2019; Nielsen, 2013):

Hypothesis 2: After the intervention, participants of the team regulation intervention will report more FWD-specific social support compared to participants in the control group.

Team regulation intervention effects on psychological safety

Psychological safety is a shared belief that a work group is safe for interpersonal risk-taking (Edmondson, 1999) and can be described as an emergent state in line with

the taxonomy depicted by Mathieu et al. (2017). It is positively related to work engagement, satisfaction, commitment, task performance, information sharing, and learning behaviours (Frazier et al., 2017; Newman et al., 2017). The aim of the team regulation intervention based on the proposed team regulation process model is to facilitate teams to steer team-level actions to attain collective team goals by engaging in team regulation strategies. Thereby, team members openly share their expectations for teamwork in the context of FWD (e.g., preventing extended availability during leisure time). After learning about the team regulation process model and how using it can facilitate their teamwork, team members discuss which aspect of their teamwork they would like to improve and set a goal for doing so (e.g., respecting business hours when communicating with each other). They also decide how they will monitor and evaluate how well the team has met its goal and how they will reward goal achievement (i.e., team regulation strategies). Engaging in this team regulation process should help team members to share their worries, problems and wishes, to clearly communicate and agree on goals as well as to develop joint strategies to achieve them. As a result, team members are then likely to know exactly what is expected of them and to have a better understanding of what they should be doing. This should increase psychological safety beliefs (Frazier et al., 2017):

Hypothesis 3: After the intervention, participants of the team regulation intervention will report higher psychological safety compared to participants in the control group.

Team regulation intervention effects on psychosocial management

Psychosocial management of FWD refers to the awareness of the psychosocial work environment within the hybrid team, as well as team members' capability to manage their psychosocial work environment in the specific hybrid team work context (previous studies have addressed the psychosocial work environment in general rather than in a specific context, cf. Abildgaard et al., 2020; von Thiele Schwarz et al., 2017). Psychosocial management can be described as an emergent state following team processes (Mathieu et al., 2017). In the work context of hybrid teams, psychosocial management refers, for example, to communication processes aiming to improve collaboration and work organization among team members. During the intervention, in line with the proposed team regulation process model, team members reflect on how to change their work practices and procedures in the hybrid team work context. For example, they discuss how to organize hybrid meetings or how to deal with team members' availability during remote and office work. They set common goals for the design of their hybrid teamwork, and they work towards achieving these goals by monitoring and evaluating their progress and rewarding their achievements (i.e., they adopt team regulation strategies). Thus, team members learn in the intervention to cope with hybrid work-specific challenges together as a team. We therefore expect them to perceive an increased focus and ability as a team to successfully address and manage issues related to psychosocial aspects of FWD, such as team members' work organization, well-being, recovery, and work-life balance. Therefore:

Hypothesis 4: After the intervention, participants of the team regulation intervention will report higher psychosocial management of FWD compared to participants in the control group.

Team regulation as a mediator

Last, with reference to the above rationale for intervention effectiveness, this study focuses on team regulation as a potential mechanism. Hybrid teams are trained and coached how to use team regulation strategies to achieve their collective goals with regard to improving their collaboration addressing the challenges of FWD. We therefore expect team regulation to be the key mechanism explaining the relationship between intervention participation and outcomes. That is, we expect enhanced team regulation to explain the proposed effects on outcomes:

Hypothesis 5: Team regulation (after the intervention) mediates positive effects of intervention participation on (a) FWD-specific social support, (b) psychological safety, and (c) psychosocial management nine weeks after the intervention.

Method

Study design and procedure

To recruit participating teams, we used snowball sampling, newsletters, and online professional networking sites. We advertised the study as a free intervention for hybrid teams (i.e., at least three people working together) in which all or some members had some flexibility (e.g., teleworking, remote working) to develop

agreements for future teamwork in the face of FWD challenges. Team members confirmed that they were of age and willing to participate in the intervention and all questionnaires. Participants took part in a cluster-randomized waitlist-control design from November 2021 to January 2023. To register for the study, individual team members were required to sign an informed consent and data protection form. They were informed that at least 70% of team members had to participate in the study to take part in the interventions. Teams were randomly assigned to an intervention group (IG) or a waitlist control group (CG), with 28 teams in each condition. Randomization was stratified by organizations. The IG received a baseline questionnaire (T0) three weeks before participating in the team intervention. One week before the intervention, teams received a preparation document. After the IG had attended the team intervention, we sent them the post-questionnaire (T1). Nine weeks after T1, the IG filled in a follow-up questionnaire (T2). The CG completed the baseline questionnaire, then the post- (five weeks after T0) and follow-up questionnaire (9 weeks after T1), and then participated in the team intervention. Teams were blind to their experimental conditions. We invited all participants to complete post- and follow-up questionnaires, regardless of whether they had completed the baseline questionnaire. We gave participants two weeks to complete questionnaires and excluded from analyses those who completed questionnaires afterwards. As an incentive for active participation, we offered training participation certificates and information about project results.

Intervention

Intervention sessions were held online, followed a standardized procedure and started between December 2021 and September 2022. They were facilitated by eight professional external coaches with certified coaching and training education and at least 10 years of training experience. These facilitators were hired as part of the research project. The interventions for six teams were co-facilitated by a member of the author team to ensure consistency across teams and facilitators. Prior to the first session, team members received a preparation document in which they were invited to reflect both their personal situation and team collaboration in the context of FWD. They were asked how they dealt individually and as a team with four key challenges of FWD (i.e., effective work organization, boundary management between work and private life, detaching mentally from work during leisure time, recovery during work breaks and leisure time), based on their perceptions of the previous working week. In particular, we asked them what went well, and what they would like to change. For further preparation, facilitators conducted short semi-standardized briefings with supervisors prior to the first session to explain the intervention procedure. Supervisors were not informed which team members had participated in the study questionnaires.

The team intervention consisted of two sessions: Session 1 was a 4-hour session in which teams were introduced to the concept of team regulation based on self-regulation theories, shared their views on current challenges in the context of FWD, and agreed on a goal to improve their hybrid teamwork. Specifically, they set a SMART goal (Doran, 1981) and used mental contrasting with implementation intentions (Gollwitzer & Oettingen, 2013) to bolster goal striving. They then planned how they would monitor (i.e., track progress), evaluate (i.e., review progress), and reward themselves (i.e., celebrate achievements) as a team. In Session 2, which took place two to three weeks later, teams reviewed their progress towards their goal and identified areas for improvement regarding their team goal. Moreover, they reflected the implementation of their team regulation strategies and discussed next steps. A detailed overview of the intervention sessions is provided in the Appendix (see also Michel et al., 2024).

Participants

A total of 478 employees from 56 work teams participated in the study ($n_{IG} = 229$, $n_{CG} = 249$). Figure 3 shows the number of participants from pre-questionnaire to follow-up assessments. Team sizes varied from three to 20 members ($M = 8.54$, $SD = 3.63$). Participants were 21 to 64 years old ($M = 42.78$, $SD = 10.01$); 67.8% were women; 73.1% held a university degree. Participants worked on average 38.49 ($SD = 8.57$) hours per week. Participants reported to have on average high temporal flexibility[1] ($M = 3.99$, $SD = 0.83$). Regarding spatial flexibility, participants had the possibility to decide where to work on an average of 3.40 days ($SD = 1.89$) per week, and worked from home or other locations on an average of 3.02 days ($SD = 1.63$). On 3.74 days per week on average ($SD = 1.51$), team members with whom they collaborated closely usually worked in different locations than they did. Participants came from 27 different organizations: three large companies, 11 small companies and 13 public sector organizations. More than a quarter of participants (25.8%) was employed in the public sector. The study was conducted at the end of the COVID-19 pandemic; 43.0% reported working from home just as often as before the pandemic; 28.3% reported working from home more frequently in

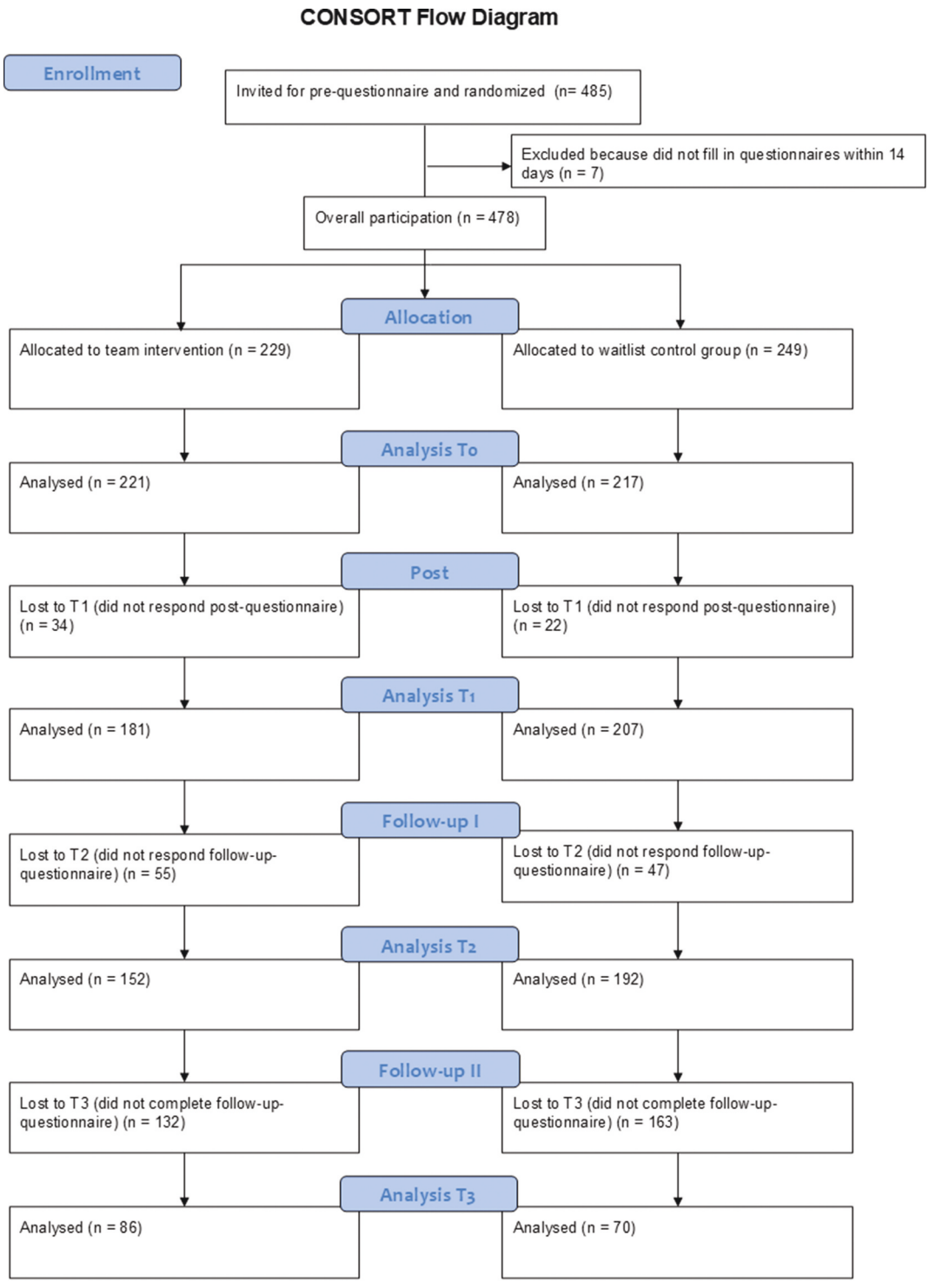

Figure 3. CONSORT flow diagram.

response to the pandemic; 12.1% had not worked from home before the pandemic. The proportion of gender, $\chi^2(2, 453) = 7.14$, $p < .05$, and professional degree, $\chi^2(8, 453) = 19.19$, $p < .05$, was uneven across IG and CG.[2] In the IG, team members worked longer hours, $F(1, 448) = 5.14$, $p < .05$, more often in different locations, $F(2, 716) = 6.00$, $p < .05$, and had less influence when to start or end each workday, $F(1, 451) = 4.68$, $p < .05$. Moreover, participants in the IG had the possibility to decide where to work more often, $F(1, 451) = 4.58$, $p < .05$, and their team members usually worked in different locations than they did more often, $F(1, 451) = 11.55$, $p < .001$. Univariate ANOVAs revealed no significant differences regarding study variables

between CG and IG at T0, except that team regulation was higher in IG participants, $F(1, 448) = 3.95$, $p < .05$. Participants who dropped out at T1 showed differences in their school certificate[3], $\chi^2(4, 453) = 17.78$, $p < .01$, reported less flexibility when to start or end each workday, $F(1, 451) = 4.61$, $p < .05$, and higher team regulation, $F(1, 448) = 4.40$, $p < .05$, compared to non-dropouts. Participants who dropped out at T2 were younger, $F(1, 451) = 4.60$, $p < .05$, and reported less flexibility when to start or end each workday, $F(1, 451) = 5.15$, $p < .05$.

Measures

We assessed all variables except demographics at all measurement points. We included evaluation questions about intervention content and process in the post-questionnaire. All online questionnaires were in German. We used translation/back-translation procedures for scales available only in other languages (Brislin, 1980; Graham & Naglieri, 2003). Unless otherwise stated, participants answered items on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) referring to the previous two weeks.

For team regulation, psychological safety, FWD-specific social support, and psychosocial management of FWD, we used the team as a referent (i.e., referent-shift composition model; Chan, 1998). This approach allows team-level constructs to be assessed in terms of shared perceptions (cf. DeShon et al., 2004; Dierdorff & Ellington, 2012; van Hooft & van Mierlo, 2018), as the constructs are conceptually meaningful at the team level. Individual team members responded to team-referent items, asking them to reflect on the team's position. We then averaged these individual-level questionnaire responses across teams. To justify aggregated team-level scores, we report the intraclass correlation ICC(1).

Team regulation. The items were based on subscales of the German version (Andreßen & Konradt, 2007) of the revised self-leadership questionnaire (Houghton & Neck, 2002). This was originally an individual-level self-regulation measure, adapted to focus on collective actions in general, rather than task-based actions. Consistent with the reference-shift approach, items were framed as referring to the individual team member's perceptions of regulatory behaviour of the team. We measured *team-goal setting* (e,g., "We establish specific goals"), *team-observation* (e.g., "We make a point to keep track of how well we are accomplishing our goals"), *team-reward* (e.g., "When we have successfully completed something, we reward ourselves with something we like"), and *team-visualizing successful performance* (e.g., "We visualize ourselves successfully achieving a goal before we implement it") with three items each. Individual-level coefficient alphas for this scale were $\alpha_{T0} = .89$, $\alpha_{T1} = .90$, $\alpha_{T2} = .90$, indicating very good reliability. Team-level scores were calculated by averaging scores of individual team members per team. The ICC(1) was 0.26, thus supporting aggregation to the team level.

FWD-specific social support was operationalized with three measures. *Social support* from colleagues and supervisors was measured with the German version of the 4-item social support subscale of the Copenhagen Psychosocial Questionnaire (Lincke et al., 2021), adapted to focus on the context of FWD. For example, "In terms of how we work together in the context of FWD, I get help and support from my colleagues, if needed." Items were rated on a 5-point frequency scale (1 = rarely or never; 5 = often or always). The subscale showed very good reliabilities ($\alpha_{T1} = .84$, $\alpha_{T1} = .85$, $\alpha_{T2} = .87$). The ICC(1) was 0.15, justifying aggregating team-member's scores to the team level. Moreover, we measured FWD-specific social support with the three-item subscales *Experiential Knowledge Provided* (e.g., "I shared my feelings regarding my temporal and spatial flexibility") and *Emotional Support Received* (e.g., "Other people listened carefully when I talked about managing my temporal and spatial flexibility") of the Self-Help Support Group Social Exchange Scales (Brown et al., 2014), also adapted to focus on the context of FWD. Items were rated on a 5-point frequency scale (1 = rarely or never; 5 = often or always). The subscales showed very good reliabilities (Experiential Knowledge Provided: $\alpha_{T0} = .90$, $\alpha_{T1} = .89$, $\alpha_{T2} = .90$; Emotional Support Received: $\alpha_{T0} = .87$, $\alpha_{T1} = .88$, $\alpha_{T2} = .90$).

Psychological safety was assessed with the respective 7-item scale (Edmondson, 1999). For example, "Members of this team are able to bring up problems and tough issues." This scale showed acceptable reliabilities at all time points ($\alpha_{T0} = .72$; $\alpha_{T1} = .75$; $\alpha_{T2} = .74$). The ICC(1) was 0.24, justifying aggregation to the team level.

Psychosocial management of FWD was assessed with a tailored 5-item scale, following the example of previous studies assessing psychosocial risk management (Abildgaard et al., 2020; von Thiele Schwarz et al., 2017). We measured generic changes in working conditions, the extent to which participants had experienced an increased focus on issues related to the area of FWD, their well-being in this context, as well as the extent to which they felt there had been changes in their ability as a team to manage such issues successfully. Items were "During the past two weeks, I have had an influence on implementing change in my team.", "During the past two weeks the dialogue concerning collaboration in the context of FWD has improved.", "During the past two weeks we have had good opportunity to improve

work organization, well-being, recovery and work-life balance in the context of FWD in the team.", "During the past two weeks my workplace has, all in all, become better.", and "During the past two weeks we have had more focus on work organization, well-being, recovery and work-life balance in the context of FWD in the team." This scale showed good reliabilities at all time points ($\alpha_{T0} = .84$; $\alpha_{T1} = .88$; $\alpha_{T2} = .89$). The ICC(1) was 0.17, which justifies aggregating this measure to the team level.[3]

We assessed *individual self-regulation* with four subscales of three items each of the German version (Andreßen & Konradt, 2007) of the revised self-leadership questionnaire (Houghton & Neck, 2002), adapted to focus on goals in general. This scale showed good reliabilities at all time points ($\alpha_{T0} = .83$; $\alpha_{T1} = .85$; $\alpha_{T2} = .87$). We aggregated individual-level responses to a team-level average score, which is justified by an ICC(1) of 0.13.

Analysis strategy

Since the data were collected from different work teams, multilevel analysis should be conducted, if suitable (Hox, 2010). To test hypotheses regarding intervention effectiveness, we conducted multilevel regression analyses with measurement occasions (Level 1) nested within participants (Level 2), who are nested in work teams (Level 3). The calculation of intra-class correlation coefficients (ICC(1)) suggested that substantial amounts of variance could be attributed at the between-person level of analysis in all outcome variables (team regulation: 72.2%; FWD-specific social support: 55.7%, experiential knowledge provided: 40.0%; emotional support received: 41.9%; psychological safety: 68.7%; psychosocial management of FWD: 43.8%). Moreover, substantial percentages of outcome variance depended on belonging to a certain work team (team regulation: 25.7%; FWD-specific social support: 15.3%; experiential knowledge provided: 10.8%; emotional support received: 9.4%; psychological safety: 23.9%; psychosocial management of FWD: 17.3%) justifying the use of multilevel analyses. We performed analyses in R (R Core Team, 2021), using the R package lme4 (Bates et al., 2015).

To evaluate intervention effectiveness, we analysed changes across intervention and control groups. Our linear mixed models included fixed effects of group, time, and their interaction effect, and a random effect of teams.[4] Time was dummy coded (pre vs. post, pre vs. follow-up; Lischetzke et al., 2015). Group was contrast coded (CG vs. IG; Hox, 2010). Mean centring was not necessary because the multilevel model only contained dummy variables as independent variables (Ohly et al., 2010). To examine whether team regulation acted as the mechanism of change for outcome variables (Hypothesis 5), we conducted a mediation analysis with the IG and CG. We used bootstrap confidence intervals for indirect effects (Hayes, 2017) using the R package lavaan (Rosseel, 2012). In our bootstrap analysis, we specified 10,000 resamples and 95% confidence intervals with confidence intervals including zero indicating a null effect. We included T0 values as covariates when predicting T1 values of mediators and T2 values of outcomes (i.e., ANCOVA model; Valente & MacKinnon, 2017) and used non-aggregated individual scores. The dataset generated and analysed during this study is available in the OSF repository (Althammer, 2025).

Results

Table 1 presents means, standard deviations, and intercorrelations for all study variables. Table 2 provides descriptive information for the intervention and control groups. Figure 4 shows mean scores of all groups.

Intervention effectiveness

Hypothesis 1 proposed that intervention participants would report more team regulation compared to control group participants. The results showed a significant intervention effect at Time 1 (i.e., group $_{\text{IG vs CG}}$ x time $_{\text{Pre vs Post}}$ interaction), $b = 0.14$, $SE = 0.04$, $t = 3.41$, 95% CI [0.06; 0.22], $f^2 = 0.19$. To answer the research question of whether aggregating individual self-regulation at the team level would yield similar results to analyses using the team-referent regulation scale, we examined whether intervention participants reported more aggregated individual self-regulation than the control group (i.e., group $_{\text{IG vs CG}}$ x time $_{\text{Pre vs Post}}$ interaction). The results showed no significant intervention effect at Time 1, $b = -0.03$, $SE = 0.03$, $t = -0.85$, 95% CI [−0.10; 0.04], $f^2 = 0.01$. Hence, our intervention effectively improved team regulation and did not affect aggregated individual self-regulation.

Hypothesis 2 proposed that intervention participants would report more FWD-specific social support compared to control group participants. The results showed a significant intervention effect at Time 1 for the group $_{\text{IG vs CG}}$ x time $_{\text{Pre vs Post}}$ interaction for social support, $b = 0.15$, $SE = 0.05$, $t = 3.04$, 95% CI [0.05; 0.25], $f^2 = 0.15$, experiential knowledge provided, $b = 0.66$, $SE = 0.12$, $t = 5.61$, 95% CI [0.43; 0.89], $f^2 = 0.08$, and emotional support received, $b = 0.55$, $SE = 0.12$, $t = 4.69$, 95% CI [0.32; 0.78], $f^2 = 0.07$. These results support Hypothesis 2.

Hypothesis 3 proposed that intervention participants would report higher psychological safety compared to

Table 1. Means, standard deviations, and correlations over both groups.

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. TR.t0	2.81	0.70																				
2. SR.t0	3.26	0.63	.39**																			
3. SSt0	4.18	0.72	.22**	.12**																		
4. EKP.t0	2.63	1.04	.26**	.19**	.12*																	
5. ESR.t0	2.89	1.05	.30**	.20**	.22**	.74**																
6. PS.t0	4.03	0.61	.31**	.10*	.45**	.08	.21**															
7. PSM.t0	2.72	0.87	.38**	.15**	.31**	.38**	.38**	.21**														
8. TR.t1	2.85	0.73	.73**	.39**	.15**	.25**	.28**	.25**	.38**													
9. SR.t1	3.22	0.65	.36**	.68**	.04	.19**	.14**	.05	.20**	.42**												
10. SS.t1	4.12	0.70	.19**	.15**	.58**	.15**	.21**	.41**	.30**	.23**	.13**											
11. EKP.t1	2.84	1.06	.24**	.13**	.17**	.38**	.31**	.12*	.31**	.32**	.16**	.22**										
12. ESR.t1	3.07	1.06	.24**	.19**	.23**	.35**	.40**	.20**	.34**	.33**	.23**	.34**	.73**									
13. PS.t1	4.02	0.64	.23**	.14**	.35**	.15**	.19**	.69**	.19**	.25**	.10	.48**	.16**	.25**								
14. PSM.t1	2.93	0.95	.31**	.23**	.20**	.22**	.23**	.20**	.40**	.41**	.27**	.29**	.54**	.52**	.24**							
15. TR.t2	2.85	0.75	.66**	.35**	.16**	.25**	.24**	.22**	.43**	.74**	.38**	.25**	.41**	.43**	.24**	.52**						
16. SR.t2	3.19	0.68	.40**	.69**	.11*	.19**	.15**	.07	.24**	.48**	.76**	.19**	.23**	.26**	.06	.34**	.49**					
17. SS.t2	4.09	0.75	.21**	.10	.49**	.16**	.17**	.36**	.29**	.23**	.14**	.60**	.22**	.25**	.33**	.30**	.27**	.26**				
18. EKP.t2	2.70	1.02	.20**	.15**	.18**	.39**	.33**	.09	.30**	.27**	.14**	.15**	.41**	.36**	.05	.32**	.37**	.22**	.18**			
19. ESR.t2	2.92	1.05	.30**	.22**	.27**	.35**	.38**	.20**	.38**	.36**	.17**	.29**	.38**	.51**	.19**	.36**	.46**	.26**	.27**	.76**		
20. PS.t2	3.99	0.63	.25**	.08	.36**	.10	.21**	.66**	.21**	.28**	.03	.40**	.17**	.27**	.70**	.23**	.28**	.12**	.44**	.10*	.25**	
21. SS.t2	2.85	0.96	.30**	.20**	.17**	.31**	.30**	.14*	.44**	.41**	.21**	.22**	.42**	.42**	.18**	.56**	.57**	.35**	.34**	.45**	.45**	.28**

Note: *M* and *SD* are used to represent mean and standard deviation, respectively. * indicates $p < .05$. ** indicates $p < .01$. t0 = Pre, t1 = Post, t2 = Follow-up, TR = Team Regulation, SR = Self-Regulation, SS = Social Support, EKP = Experiential Knowledge Provided, ESR = Emotional Support Received, PS = Psychological Safety, PSM = Psychosocial Management of FWD. $N = 478$.

Table 2. Means and standard deviations for the outcome variables at time 0 (pre-questionnaire), time 1 (post-questionnaire), and time 2 (9-week follow-up).

Variable			TR	SR	SS	EKP	ESR	PS	PSM
T0 ($n = 697$)	IG	*M*	2.87	3.30	4.14	2.66	2.93	4.02	2.74
		SD	0.70	0.62	0.73	1.03	1.01	0.63	0.87
	CG	*M*	2.74	3.23	4.23	2.60	2.84	4.04	2.69
		SD	0.69	0.64	0.70	1.05	1.09	0.60	0.86
T1 ($n = 596$)	IG	*M*	3.00	3.25	4.17	3.20	3.38	4.04	3.34
		SD	0.73	0.69	0.64	0.95	0.86	0.63	0.85
	CG	*M*	2.71	3.19	4.09	2.54	2.81	4.00	2.57
		SD	0.70	0.62	0.74	1.05	1.14	0.65	0.88
T2 ($n = 454$)	IG	*M*	3.08	3.30	4.11	2.88	3.04	4.03	3.14
		SD	0.73	0.69	0.72	1.01	1.07	0.63	0.94
	CG	*M*	2.65	3.10	4.07	2.54	2.82	3.97	2.60
		SD	0.71	0.66	0.77	1.00	1.01	0.63	0.91

Note: *M* and *SD* are used to represent mean and standard deviation, respectively. TR = Team Regulation, SR = Self-Regulation, SS = Social Support, EKP = Experiential Knowledge Provided, ESR = Emotional Support Received, PS = Psychological Safety, PSM = Psychosocial Management of FWD.

control group participants. The results showed a significant intervention effect at Time 1 (group $_{\text{IG vs CG}}$ x time $_{\text{Pre vs Post}}$ interaction: $b = 0.11$, $SE = 0.03$, $t = 3.44$, 95% CI [0.05; 0.17], $f^2 = 0.17$), supporting Hypothesis 3.

Hypothesis 4 proposed that intervention participants would report higher psychosocial management of FWD compared to control group participants. The results showed a significant intervention effect at Time 1 (group $_{\text{IG vs CG}}$ x time $_{\text{Pre vs Post}}$ interaction: $b = 0.72$, $SE = 0.06$, $t = 11.94$, 95% CI [0.60; 0.84], $f^2 = 2.06$), supporting Hypothesis 4.

Mediation analysis

Hypotheses 5 predicted the intervention to affect the outcome variables positively via increases in team regulation. Table 3 shows that the indirect effects of the intervention on FWD-specific social support (social support, experiential knowledge provided, emotional support received), psychological safety, and psychosocial management of FWD via team regulation were significant, as the confidence intervals did not include zero. This supports Hypotheses 5. Increased team regulation fully mediated intervention effects on FWD-specific social support, emotional support received, and psychological safety, as direct effects on outcomes became insignificant when the mediator was included in the model. Increased team regulation partially mediated effects on experiential knowledge provided and psychosocial management of FWD (i.e., influenced outcomes independently of its effect on team regulation) because direct pathways remained significant with the mediator in the model.

Additional analyses

To explore whether effectiveness of the intervention held over 9 weeks, we analysed the interaction effect of group and time, with dummy coded time (pre vs. post, pre vs. follow-up) and group (control group vs. IG). The effects at Time 2 were significant for team regulation ($b = 0.33$, $SE = 0.08$, $t = 4.12$, 95% CI [0.17; 0.48]), $f^2 = 0.32$, psychological safety ($b = 0.13$, $SE = 0.06$, $t = 2.24$, 95% CI [0.02; 0.25], $f^2 = 0.09$), and psychosocial management of FWD ($b = 0.36$, $SE = 0.11$, $t = 3.24$, 95% CI [0.14; 0.58], $f^2 = 0.20$). Results were not significant for FWD-specific social support ($b = 0.08$, $SE = 0.10$, $t = 0.84$, 95% CI [−0.11; 0.27], $f^2 = 0.01$), experiential knowledge provided ($b = 0.23$, $SE = 0.13$, $t = 1.69$, 95% CI [−0.04; 0.49], $f^2 = 0.05$), and emotional support received ($b = 0.06$, $SE = 0.14$, $t = 0.44$, 95% CI [−0.21; 0.33], $f^2 = 0.00$) as well as aggregated individual self-regulation ($b = 0.09$, $SE = 0.07$, $t = 1.34$, 95% CI [−0.04; 0.22], $f^2 = 0.03$). Thus, the effects on team regulation, psychological safety, and psychosocial management of FWD sustained over 9 weeks compared to a control group.

Discussion

With FWD such as teleworking and remote working increasing, working in hybrid work teams seems to be the new normal. The aim of this study was to examine the effectiveness of a team intervention in promoting team regulation, defined as the ability to steer team-level actions to attain collective team goals. In the intervention, hybrid work teams learned and practiced team regulation strategies based on self-regulation process models (i.e., team-goal setting, team-monitoring, team-evaluating, and team-rewarding) being in line with established team process taxonomies (Marks et al., 2001; Mathieu et al., 2017). Multilevel analyses supported the effectiveness of the intervention approach in promoting team regulation and improving FWD-specific social support, psychological safety, and psychosocial management of FWD in hybrid teams. Team regulation mediated intervention effects.

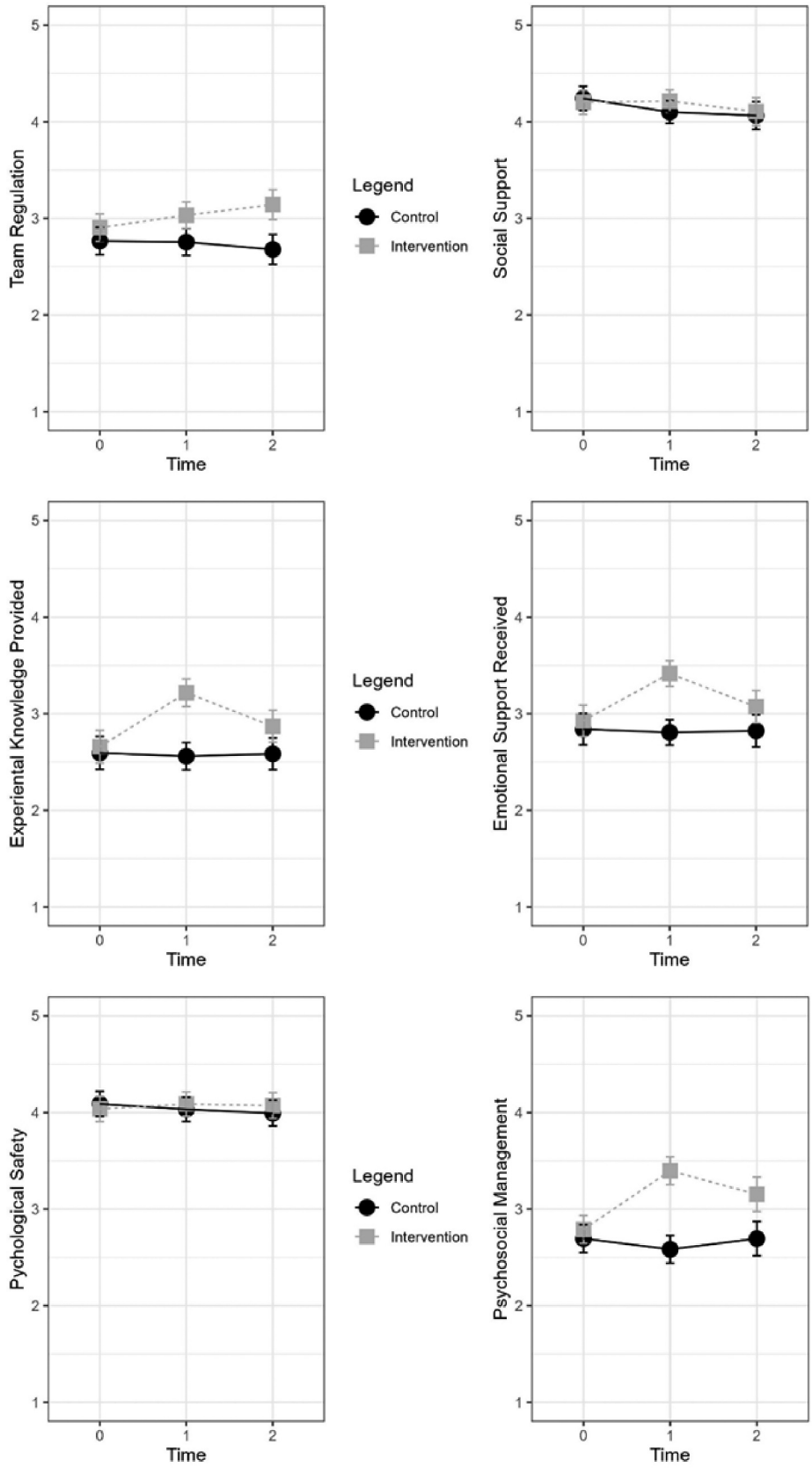

Figure 4. Means of outcome variables for intervention group (IG) and control group (CG) before (T0) and after training completion (T1) and at 9-week follow-up (T2).

Table 3. Regression table for the mediation analysis.

					95% CI	
Outcome Variables	*b*	*c*	*c'*	*ab*	Lower	Upper
Social Support	0.19 (0.05)***	0.04 (0.07)	0.01 (0.08)	0.028 (0.02)**	0.02	0.08
Experiential Knowledge Provided	0.18 (0.08)**	0.13 (0.10)*	0.11 (0.10)*	0.027 (0.02)*	0.02	0.10
Emotional Support Received	0.30 (0.08)***	0.08 (0.11)	0.03 (0.11)	0.044 (0.03)**	0.04	0.15
Psychological Safety	0.12 (0.04)*	0.03 (0.05)	0.01 (0.05)	0.018 (0.01)*	0.00	0.05
Psychosocial Management of FWD	0.24 (0.08)***	0.29 (0.09)***	0.25 (0.09)***	0.036 (0.02)**	0.03	0.12

Note: * indicates $p < .05$. ** indicates $p < .01$. *** indicates $p < .001$. The effect of the intervention on team regulation (*a* path) was $b = 0.15$, $SE = 0.05$, $p < .001$. All coefficients reported for paths *b* (unique effect of team regulation), *c* (total direct effect), *c'* (direct effect), and *ab* (indirect effect) are standardized slopes with the corresponding standard error of the slope in parentheses. Bias-corrected CIs of each indirect effect are based on 10,000 resamples. Zero is not included in the reported confidence intervals if the lower and upper bound of the confidence interval have the same sign. In these reported confidence intervals, numbers not equal to zero would appear if more decimal places were reported.

Results revealed that this intervention improved team regulation compared to a control group immediately after the intervention ended and 9 weeks later with medium effect sizes. These findings demonstrate that team regulation is malleable, and that a team intervention based on the proposed team regulation process model can strengthen a team's ability to regulate its actions to achieve its team goals.

In terms of coping with FWD challenges hybrid teams need to master, participants perceived their colleagues and supervisors as more supportive with medium effect sizes, and they reported sharing more experiences and experiencing more emotional support with small effect sizes. These findings are also in line with social identity theory, which proposes that a sense of shared identity through belonging to a work team can increase social support (Haslam et al., 2019; Nielsen, 2013). This is particularly important as social support is critical particularly when team members see each other less face-to-face and there is less social interaction (Bentley et al., 2016). Moreover, results showed that the intervention increased perceptions of psychological safety with medium effect sizes. This is consistent with psychological safety research suggesting that clear communication of mutual expectations and shared collaboration goals promote perceptions of safety (Frazier et al., 2017), which teams experienced during the team intervention. Finally, the intervention also improved psychosocial management as an indicator of team member collaboration with large effect sizes. Specifically, psychosocial management of FWD, which describes team members being more aware of and more capable to change the psychosocial working environment within the team regarding FWD, improved.

A medium effect sustained over 9 weeks on team regulation and psychosocial management of FWD and a small effect on psychological safety. Hence, the intervention appeared to initiate team processes that maintained or unfolded over time. However, effects on FWD-specific social support in participating hybrid teams did not persist. A possible explanation is that FWD-specific social support is more strongly influenced in the long term by other variables that could be examined in future research, such as work climate in hybrid teams.

Effects of intervention participation on FWD-specific social support, psychological safety, and psychosocial management of FWD were mediated by increases in team regulation. This indicates that enhanced team regulation elicited intervention effects. That is, implementing team regulation strategies (e.g., setting a goal for improving certain team practices, working towards this common goal by monitoring and evaluating progress, rewarding each other for achieving the goal) improved FWD-specific social support, psychological safety, and psychosocial management of FWD. This underscores the importance of designing theory-based interventions and highlights the relevance of team regulation for hybrid work teams.

Theoretical contributions

This study contributes to the literature in three ways. First, this study contributes to research on team regulation by proposing a team regulation model which also aligns with established taxonomies of team processes (see Marks et al., 2001; Mathieu et al., 2017). It also empirically demonstrates that models of individual self-regulation processes (Bandura, 1977, 1991; Kanfer, 1977; Zacher & Frese, 2018; Zimmerman, 2000) can be adapted to the team level. In doing so, we tested and added evidence to the proposition that self-regulation processes are functionally similar to team regulation processes (Chen & Kanfer, 2006). By emphasizing the focus on team regulation, we extend research on action regulation, which has traditionally focused on individual self-regulation (Zacher & Frese, 2018). Study results indicated that aggregated team regulation (i.e., a consensus across teams about the extent to which they perceive themselves to be regulating their team actions) changed significantly after participation in the intervention, whereas aggregated self-regulation (i.e., an average indicating whether some people self-regulate a lot and

others do not) did not. This adds to research showing that team regulation is conceptually distinct from aggregated self-regulation at the team level (van Hooft & van Mierlo, 2018). That is, with regard to regulatory processes, team processes do not equal the sum of individual processes.

Second, we extend research on team intervention by providing evidence that self-regulation models (Bandura, 1977, 1991; Kanfer, 1977; Zacher & Frese, 2018; Zimmerman, 2000) adapted to the team level can serve as a theoretical framework for designing effective team interventions. We have proposed and tested a team regulation model that integrates the entire team regulation process, going a step beyond previous theoretical approaches that focused on isolated process elements (e.g., Chen & Kanfer, 2006; Panadero et al., 2015) and thus following theoretical approaches of applying the individual-level concept of self-regulation cycles to groups (Tschan, 2002). Our findings highlight that when developing theory-based team interventions, it is useful to have a strong theory or reasonable evidence for the expected effects (Briner & Walshe, 2015). In particular, we were able to design an effective team regulation intervention by building the intervention content and process on the proposed team regulation model. This approach may even be useful for developing team intervention concepts not only for hybrid teams, but also beyond the context of FWD. Moreover, the results show that enhancing team regulation can foster positive emergent states (see Mathieu et al., 2017) in hybrid teams, such as FWD-specific social support and psychological safety, and improve psychosocial management. This finding also extends research focusing on predictors for effective teamwork such as effort gains (Torka et al., 2021). We contribute to this line of research by showing that the training of team regulation has positive effects on social support, psychological safety, and collaboration.

Third, we extend research on team regulation, which has predominantly focused on performance-related outcomes (Schlaegel et al., 2023). We show that a team regulation intervention fosters FWD-specific social support and psychological safety, and improves psychosocial management in hybrid teams. In addition, this study had several methodological strengths, such as the cluster-randomized controlled trial design with a sample of hybrid work teams of different sizes and a longer-term follow-up questionnaire. This provides robust evidence for our research questions and responds to calls for more randomized controlled trials of work-specific interventions (Michel et al., 2015; O'Shea et al., 2016).

Limitations and implications for future research

This study has several limitations. We used self-rated measures of team regulation, FWD-specific social support, psychological safety, and psychosocial management. However, given our interest in team members' subjective perceptions, self-reports were generally reasonable (Spector, 2006). Future research could extend our research by investigating whether enhancing team regulation can improve performance-related team outcomes such as meeting deadlines and coordinating actions, team members' self-rated performance and motivation, or peer-rated performance evaluations (Schlaegel et al., 2023).

This study was conducted with a focus on mastering challenges of hybrid team work, that is, teams were asked to set their goals in this context, and all questionnaires referred to this context. Moreover, a substantial proportion of over a third of the work teams in our sample worked in the public sector and almost all participants were knowledge workers. Future research should attempt to replicate our findings in different contexts (i.e., not related to FWD and hybrid work) and with different types of work teams (e.g., production or management teams).

This study compared the team intervention to a waitlist control group. It would be interesting to examine whether alternative intervention programmes are similarly or more effective, and whether participation expectations serve as a demand characteristic that evoke hypothesis-conforming behaviour (Nichols & Maner, 2008). Thus, future research could add another control group that receives an alternative or placebo team intervention (O'Shea et al., 2016). Participants were asked not to share the content of the intervention with other company members before the project ended and facilitators reported no instances of participants seeming to be aware of the intervention content beforehand. However, there is still a potential risk of communication between intervention and control groups during the intervention and assessment of its effects cannot be fully ruled out.

We found mostly small to medium intervention effects sizes for our outcome variables. However, prior research has pointed out positive crossover processes at work (e.g., Bakker & Xanthoplolou, 2009). Building on prior crossover research, we could assume that even if intervention effects are small to medium, due to positive crossover effects among colleagues these intervention effects are likely to spread around and trigger even more benefits for other organizational members. Nevertheless, although we have already included one booster session in our team training, a second booster session could

help to improve sustainable and long-term intervention effects for participating teams.

Future intervention research should apply both process and outcome evaluation approaches (Nielsen & Randall, 2013) to identify boundary conditions for team intervention implementation success as well as sustainable intervention effects. For example, intervention implementation success may depend on organizational factors such as organizational and leadership support as well as team characteristics such as team types, team climate, or team members' conflict (Lacerenza et al., 2018; Rhoades & Eisenberger, 2002; Smith-Jentsch et al., 2001; S. C. Wang et al., 2023). For example, teams with high levels of conflict should first participate in a conflict solving training before participating in a team regulation training where team members need to take joint actions to reach shared goals. Also, the psychological team processes underlying our assumptions and explaining our findings could be investigated in more detail.

Practical implications

Hybrid work teams, in which some or all members have FWD, face unique challenges, such as dealing with social isolation, managing hybrid or virtual meetings, coordinating each other's availability, and other novel collaborative processes. This study can provide guidelines on how to increase team regulation helping to improve collaboration in hybrid teams. We recommend that intervention programmes for work teams teach such team regulation strategies. They can help teams set a goal for improving collaborative work practices, work towards that common goal by monitoring and evaluating progress, and reward the team's success when the goal is achieved. Therefore, occupational health managers or supervisors may offer such team regulation interventions to support hybrid work teams. Improving social support in hybrid teams may also reduce the risk of social isolation. Social isolation is one of the major disadvantages perceived by employees in remote work (Mann et al., 2000). Thus, it is important to improve social support, psychological safety, and psychosocial management in hybrid teams in which employees are likely to work in different locations and have fewer social contacts.

Conclusion

In this study, we show that a team regulation intervention for hybrid teams building on the entire team regulation cycle as proposed in our team regulation process model is effective: In a cluster-randomized controlled trial, multilevel analyses showed that participation in the team regulation intervention increased team regulation, which improved FWD-specific social support, psychological safety, and psychosocial management in hybrid work teams. The share of hybrid teams in which team members collaborate both virtually and face-to-face is expected to remain at a high level in the future. Thus, a team regulation intervention may be a helpful tool to support teams in not only setting but also achieving their common goals in the context of FWD challenges. The findings of this study contribute to the theoretical understanding of team regulation processes and its benefits and highlight the practical importance of enhancing team regulation.

Notes

1. We asked participants how much influence they had when to start or end each workday, when to take a break, and when to take a few hours off. Participants answered on a scale from 1 = very little influence to 5 = very high influence.
2. The omnibus chi-square tests were significant, but post-hoc tests revealed no pairwise proportion difference to be significant.
3. We conducted a confirmatory factor analysis (CFA) including psychological safety and psychosocial management measured at T1 using the R package lavaan (Rosseel, 2012) to evaluate the distinctiveness of this tailored scale from psychological safety. The CFA revealed an acceptable fit of the two-factor model: $\chi^2(53, 478) = 173.61$, $p < .001$, comparative fit index (CFI) = .93, Tucker – Lewis index (TLI) = .91, root mean square error of approximation (RMSEA) = .07; standardized root mean square residual (SRMR) = .07. A one-factor model revealed a worse fit: $\chi^2(54, 478) = 611.24$, $p < .001$, CFI = .66, TLI = .58, RMSEA = .15; SRMR = .15. A model comparison of the two-factor model and the alternative one-factor model was significant, with the one-factor model (AIC = 14584, BIC = 14683) fitting the data significantly worse than the two-factor model (AIC = 14149, BIC = 14251; $\chi^2_{diff} = 437.63$, $df_{diff} = 1$, $p < .001$). This confirms the distinctiveness of these scales used.
4. We also conducted all multilevel analyses with an additional random effect of participants as well. Model fit was best for models with a random effect of teams. However, results were similar for all models.

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Data availability statement

The data that support the findings of this study are openly available in OSF at https://doi.org/10.17605/OSF.IO/PWNZR.

Ethical approval

Ethical approval for this study was granted by the ethics committee of the Federal Institute for Occupational Safety and Health in Germany.

References

Abildgaard, J. S., Nielsen, K., Wåhlin-Jacobsen, C. D., Maltesen, T., Christensen, & K. B. (2020). 'Same, but different': A mixed-methods realist evaluation of a cluster-randomized controlled participatory organizational intervention. *Human Relations*, *73*(10), 1339–1365. https://doi.org/10.1177/0018726719866896

Althammer, S. E., Wöhrmann, A., & Michel, A. (2025). Meeting the challenges of flexible work designs: Effects of an intervention based on self-regulation on detachment, well-being, and work-family conflict. *Journal of Happiness Studies*, *26*(2), 1–28. https://doi.org/10.1007/s10902-024-00825-9

Andreßen, P., & Konradt, U. (2007). Messung von Selbstführung: Psychometrische Überprüfung der deutschsprachigen Version des Revised Self-Leadership Questionnaire. *Journal of Personnel Psychology*, *6*(3), 117–128. https://doi.org/10.1026/1617-6391.6.3.117

Bakker, A. B., & Xanthoplolou, D. (2009). The crossover of daily work engagement: Test of an actor-partner interdependence model. *Journal of Applied Psychology*, *94*(6), 1562–1571. https://doi.org/10.1037/a0017525

Bandura, A. (1977). *Social learning theory*. Prentice-Hall.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, *50*(2), 248–287. https://doi.org/10.1016/0749-5978(91)90022-L

Bates, D., Mächler, M., Bolker, B. M., & Walker, S. C. (2015). Fitting linear mixed-effects models using lme4 [sparse matrix methods; linear mixed models; penalized least squares; cholesky decomposition]. *Journal of Statistical Software*, *67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Bentley, T. A., Teo, S. T. T., McLeod, L., Tan, F., Bosua, R., & Gloet, M. (2016). The role of organisational support in teleworker wellbeing: A socio-technical systems approach. *Applied Ergonomics*, *52*, 207–215. https://doi.org/10.1016/j.apergo.2015.07.019

Briner, R. B., & Walshe, N. D. (2015). An evidence-based approach to improving the quality of resource-oriented well-being interventions at work. *Journal of Occupational & Organizational Psychology*, *88*(3), 563–586. https://doi.org/10.1111/joop.12133

Brislin, R. W. (1980). Translation and content analysis of oral and written material. In H. C. Triandis & J. W. Berry (Eds.), *Handbook of cross-cultural psychology* (vol. 2, pp. 389–444). Allyn and Bacon.

Brown, L. D., Tang, X., & Hollman, R. L. (2014). The structure of social exchange in self-help support groups: Development of a measure. *The American Journal of Community Psychology*, *53*(1–2), 83–95. https://doi.org/10.1007/s10464-013-9621-3

Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology*, *83*(2), 234–246. https://doi.org/10.1037//0021-9010.83.2.234

Chan, D. (2019). Team-level constructs. *Annual Review of Organizational Psychology & Organizational Behavior*, *6*(1), 325–348. https://doi.org/10.1146/annurev-orgpsych-012218-015117

Chen, G., & Kanfer, R. (2006). Toward a systems theory of motivated behavior in work teams. *Research in Organizational Behavior*, *27*, 223–267. https://doi.org/10.1016/S0191-3085(06)27006-0

Chen, G., Thomas, B., & Wallace, J. C. (2005). A multilevel examination of the relationships among training outcomes, mediating regulatory processes, and adaptive performance. *Journal of Applied Psychology*, *90*, 827–841. https://doi.org/10.1037/0021-9010.90.5.827

DeShon, R. P., Kozlowski, S. W. J., Schmidt, A. M., & Milner, K. R., Wiechmann, D. (2004). A multiple-goal, multilevel model of feedback effects on the regulation of individual and team performance. *Journal of Applied Psychology*, *89*, 1035–1056. https://doi.org/10.1037/0021-9010.89.6.1035 6

Dierdorff, E. C., & Ellington, J. K. (2012). Members matter in team training: Multilevel and longitudinal relationships between goal orientation, self-regulation, and team outcomes. *Personnel Psychology*, *65*(3), 661–703. https://doi.org/10.1111/j.1744-6570.2012.01255.x

Dolan, Y. M. (1991). *Resolving sexual abuse: Solution-focused therapy and Ericksonian hypnosis for adult survivors*. W W Norton & Co.

Doran, G. T. (1981). There's a S.M.A.R.T. way to write management's goals and objectives. *Management Review*, *70*(11), 35–36.

Ebner, K., Schulte, E.-M., Soucek, R., & Kauffeld, S. (2018). Coaching as stress-management intervention: The mediating role of self-efficacy in a framework of self-management and coping. *International Journal of Stress Management*, *25*(3), 209–233. https://doi.org/10.1037/str0000058

Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, *44*(2), 350–383. https://doi.org/10.2307/2666999

Frazier, M. L., Fainshmidt, S., Klinger, R. L., & Pezeshkan, A., Vracheva, V. (2017). Psychological safety: A meta-analytic review and extension. *Personnel Psychology*, *70*(1), 113–165. https://doi.org/10.1111/peps.12183

French, K. A., Dumani, S., Allen, T. D., & Shockley, K. M. (2018). A meta-analysis of work-family conflict and social support. *Psychological Bulletin*, *144*(3), 284–314. https://doi.org/10.1037/bul0000120

Gollwitzer, P. M., Oettingen, G. (2013). Planning promotes goal striving. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of*

self-regulation: Research, theory, and applications (2 ed., pp. 162–185). The Guildford Press.

Graham, J. R., Naglieri, J. A. (2003). *Handbook of psychology. Assessment psychology*. Wiley.

Haslam, D., Mejia, A., Thomson, D., & Betancourt, T. (2019). Self-regulation in low- and middle-income countries: Challenges and future directions. *Clinical Child & Family Psychology Review*. https://doi.org/10.1007/s10567-019-00278-0 *22* 1 104–117

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis, second edition: A regression-based approach*. Guilford Publications.

Houghton, J. D., & Neck, C. P. (2002). The revised self-leadership questionnaire: Testing a hierarchical factor structure for self-leadership. *Journal of Managerial Psychology*, *17*(8), 672–691. https://doi.org/10.1108/02683940210450484

Hox, J. J. (2010). *Multilevel analysis: Techniques and applications*. Routledge/Taylor & Francis Group. https://doi.org/10.4324/9780203852279

Inzlicht, M., Werner, K. M., & Briskin, J. L. (2021). Integrating models of self-regulation. *The Annual Review of Psychology*, *72*(1), 319–345. https://doi.org/10.1146/annurev-psych-061020-105721

Kanfer, F. H. (1977). Sebstmanagement-Methoden. In F. H. Kanfer & A. P. Goldstein (Eds.), *Möglichkeiten der Verhaltensänderung (helping people change)* (pp. 350–406). Urban & Schwarzenberg.

Kossek, E. E., Pichler, S., Bodner, T., & Hammer, L. B. (2011). Workplace social support and work-family conflict: A meta-analysis clarifying the influence of general and work-family-specific supervisor and organizational support. *Personnel Psychology*, *64*(2), 289–313. https://doi.org/10.1111/j.1744-6570.2011.01211.x

Kubicek, B., Paškvan, M., & Korunka, C. (2015). Development and validation of an instrument for assessing job demands arising from accelerated change: The intensification of job demands scale (IDS). *European Journal of Work & Organizational Psychology*, *24*(6), 898–913. https://doi.org/10.1080/1359432X.2014.979160

Lacerenza, C. N., Marlow, Shannon, Tannenbaum, L., & Salas, E. (2018). Team development interventions: Evidence-based approaches for improving teamwork. *The American Psychologist*, *73*(4), 517–531. https://doi.org/10.1037/amp0000295

Lauring, J., & Jonasson, C. (2025). What is hybrid work? Towards greater conceptual clarity of a common term and understanding its consequences. *Human Resource Management Review*, *35*(1). https://doi.org/10.1016/j.hrmr.2024.101044

Lincke, H.-J., Vomstein, M., Lindner, A., Nolle, I., Häberle, N., Haug, & A., Nübling, M. (2021). COPSOQ III in Germany: Validation of a standard instrument to measure psychosocial factors at work. *Journal of Occupational Medicine and Toxicology*, *16*(1), 50. https://doi.org/10.1186/s12995-021-00331-1

Lischetzke, T., Reis, D., & Arndt, C. (2015). Data-analytic strategies for examining the effectiveness of daily interventions. *Journal of Occupational & Organizational Psychology*, *88*(3), 587–622. https://doi.org/10.1111/joop.12104

Luciano, M. M., Leslie, J. B., Mathieu, J. E., & Hoole, E. R., Anderson, R., Fenters, V. W. (2025). Improving virtual team collaboration paradox management: A field experiment. *Organization Science*, *36*(1), 429–451. https://doi.org/10.1287/orsc.2023.17952

Mäkikangas, A., Juutinen, S., Mäkiniemi, J.-P., & Sjöblom, K., Oksanen, A. (2022). Work engagement and its antecedents in remote work: A person-centered view. *Work & Stress*, *36*(4), 392–416. https://doi.org/10.1080/02678373.2022.2080777

Mann, S., Varey, R., & Button, W. (2000). An exploration of the emotional impact of tele-working via computer-mediated communication. *Journal of Managerial Psychology*, *15*(7), 668–690. https://doi.org/10.1108/02683940010378054

Marks, M. A., Mathieu, J. E, & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review*, *26*(3), 356–376. https://doi.org/10.2307/259182

Marques-Quinteiro, P., Vargas, R., Eifler, N., & Curral, L. (2019). Employee adaptive performance and job satisfaction during organizational crisis: The role of self-leadership. *European Journal of Work & Organizational Psychology*, *28*(1), 85–100. https://doi.org/10.1080/1359432X.2018.1551882

Mathieu, J. E., Hollenbeck, J. R., van Knippenberg, D., & Ilgen, D. R. (2017). A century of work teams in the *Journal of Applied Psychology*, *102*(3), 452–467. https://doi.org/10.1037/apl0000128.supp

McGrath, J. E., & Tschan, F. (2004). Dynamics in groups and teams: Groups as complex action systems. In M. S. Poole & A. H. Van de Ven (Eds.), *Handbook of organizational change and innovation* (pp. 50–73). Oxford University Press.

Michel, A., Althammer, S. E., & Wöhrmann, A. M. (2024). *FlexAbility-Flexibel und gesund arbeiten: Interventionen für Individuen und Teams*. Springer. https://doi.org/10.1007/978-3-658-44898-1

Michel, A., O'Shea, D., & Hoppe, A. (2015). Designing and evaluating resource-oriented interventions to enhance employee well-being and health. *Journal of Occupational & Organizational Psychology*, *88*(3), 459–463. https://doi.org/10.1111/joop.12131

Mrazek, A. J., Mrazek, M. D., Maul, A., Mrazek, K. L., & Schooler, J. W. (2021). Taking charge: Characterizing the rapid development of self-regulation through intensive training. *Journal of Health Psychology*, *26*(12), 2304–2319. https://doi.org/10.1177/1359105320909856

Müller, A., Heiden, B., Herbig, B., Poppe, F., & Angerer, P. (2016). Improving well-being at work: A randomized controlled intervention based on selection, optimization, and compensation. *Journal of Occupational Health Psychology*, *21*(2), 169–181. https://doi.org/10.1037/a0039676

Müller, T., & Niessen, C. (2019). Self-leadership in the context of part-time teleworking. *Journal of Organizational Behavior*, *40*(8), 883–898. https://doi.org/10.1002/job.2371

Newman, A., Donohue, R., & Eva, N. (2017). Psychological safety: A systematic review of the literature. *Human Resource Management Review*, *27*(3), 521–535. https://doi.org/10.1016/j.hrmr.2017.01.001

Nichols, A. L., & Maner, J. K. (2008). The good-subject effect: Investigating participant demand characteristics. *The Journal of General Psychology*, *135*(2), 151–166. https://doi.org/10.3200/GENP.135.2.151-166

Nielsen, K. (2013). Review article: How can we make organizational interventions work? Employees and line managers as

actively crafting interventions. *Human Relations*, *66*(8), 1029–1050. https://doi.org/10.1177/0018726713477164

Nielsen, K., & Randall, R. (2013). Opening the black box: Presenting a model for evaluating organizational-level interventions. *European Journal of Work & Organizational Psychology*, *22*(5), 601–617. https://doi.org/10.1080/1359432X.2012.690556

Oettingen, G., Mayer, D., & Brinkmann, B. (2010). Mental contrasting of future and reality: Managing the demands of everyday life in health care professionals. *Journal of Personnel Psychology*, *9*, 138–144. https://doi.org/10.1027/1866-5888/a000018 3

Ohly, S., Sonnentag, S., Niessen, C., & Zapf, D. (2010). Diary studies in organizational research. *Journal of Personnel Psychology*, *9*(2), 79–93. https://doi.org/10.1027/1866-5888/a000009

O'Shea, D., Connell, O, & Gallagher, S. (2016). Randomised controlled trials in WOHP interventions: A review and guidelines for use. *Applied Psychology: An International Review*, *65*(2), 190–222. https://doi.org/10.1111/apps.12053

Panadero, E., Kirschner, P. A., Järvelä, S., Malmberg, J., & Järvenoja, H. (2015). How individual self-regulation affects group regulation and performance: A shared regulation intervention. *Small Group Research*, *46*(4), 431–454. https://doi.org/10.1177/1046496415591219

R Core Team. (2021). R: A language and environment for statistical computing. In *R Foundation for Statistical Computing*. https://www.R-project.org/

Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support: A review of the literature. *Journal of Applied Psychology*, *87*(4), 698–714. https://doi.org/10.1037/0021-9010.87.4.698

Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, 48(2). https://doi.org/10.18637/jss.v048.i02

Schlaegel, C., Gunkel, M., & Taras, V. (2023). COVID-19 and individual performance in global virtual teams: The role of self-regulation and individual cultural value orientations. *Journal of Organizational Behavior*, *44*(1), 102–131. https://doi.org/10.1002/job.2671

Smith-Jentsch, K.A., Salas, E., & Brannich, M. T. (2001). To transfer or not to transfer? Investigating the combined effects of trainee characteristics, team leader support, and team climate. *Journal of Applied Psychology*, *86*(2), 279–292. https://doi.org/10.1037/0021-9010.86.2.279

Spector, P. E. (2006). Method variance in organizational research: Truth or urban legend? *Organizational Research Methods*, *9*(2), 221–232. https://doi.org/10.1177/1094428105284955

Torka, A.-K., Mazei, J., & Hüffmeier, J. (2021). Together, everyone achieves more-or, less? An interdisciplinary meta-analysis on effort gains and losses in teams. *Psychological Bulletin*, *147*(5), 504–534. https://doi.org/10.1037/bul0000251

Tschan, F. (2002). Ideal cycles of communication (or cognitions) in triads, dyads, and individuals. *Small Group Research*, *33*(6), 615–643. https://doi.org/10.1177/1046496402238618

Valente, M. J., & MacKinnon, D. P. (2017). Comparing models of change to estimate the mediated effect in the pretest-posttest control group design. *Structural Equation Modeling: A Multidisciplinary Journal*, *24*(3), 428–450. https://doi.org/10.1080/10705511.2016.1274657

van Hooft, E. A. J., & van Mierlo, H. (2018). When teams fail to self-regulate: Predictors and outcomes of team procrastination among debating teams. *Frontiers in Psychology*, *9*. https://doi.org/10.3389/fpsyg.2018.00464

von Thiele Schwarz, U., Nielsen, K. M., & Stenfors-Hayes, T., Hasson, H. (2017). Using kaizen to improve employee well-being: Results from two organizational intervention studies. *Human Relations*, *70*(8), 966–993. https://doi.org/10.1177/0018726716677071

Wang, B., Liu, Y., Qian, J., & Parker, S. K. (2021). Achieving effective remote working during the COVID-19 pandemic: A work design perspective. *Applied Psychology: An International Review*, *70*(1), 16–59. https://doi.org/10.1111/apps.12290

Wang, S. C., McLarnon, M., O'Neill, T. A., & Turner, A. L. E. (2023). Location, location, location: Centrality in team conflict networks and individual outcomes. *Group Dynamics: Theory, Research & Practice*, *27*(4), 257–275. https://doi.org/10.1037/gdn0000197

Zacher, H., & Frese, M. (2018). Action regulation theory: Foundations, current knowledge, and future directions. In N. Anderson, D. S. Ones, C. Viswesvaran, & H. K. Sinangil (Eds.), *The SAGE handbook of industrial, work & organizational psychology* (2 ed., vol. 2, pp. 122–143). SAGE Publications Ltd. https://doi.org/10.4135/9781473914957

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic Press. https://doi.org/10.1016/B978-012109890-2/50031-7

Appendix

Team intervention overview

Session	Intervention Elements
Session 1 (4 hours)	• Small group sharing to listen to each other's individual positive experiences and challenges with FWD (as a starting point for identifying team issues) • Introduction to the concept and process of self- and team regulation (Bandura, 1991; Kanfer, 1977; Zacher & Frese, 2018; Zimmerman, 2000) • Collecting positive aspects and challenges regarding teamwork in the FWD context • Applying the self-regulation process at the team level: *team-goal setting* • Identifying a key challenge (realistic to work on until the booster session and noticeable, i.e., behaviour is demonstrated several times during that time) • Setting a Specific, Measurable, Achievable, Relevant, Time-bound (SMART) (Doran, 1981) collective goal how to change collaborative working practices during the next two weeks (until the booster session) • Reflecting the team's motivation and potential obstacles using mental contrasting with implementation intentions (Gollwitzer & Oettingen, 2013) to strengthen goal striving • Applying the self-regulation process at the team level: *team-monitoring, team-evaluating, and team-rewarding* • In three small groups, team members discuss how they can monitor (reflect team behaviour, remind themselves of their goal), evaluate (review progress), and reward (celebrate small steps, motivate and support each other) themselves, and present their ideas to each other
Session 2 (1,5 hours)	• Adapted version of the 54,321 exercise (Dolan, 1991) to focus on the session • Reviewing the team goal team members set for themselves • Reflecting and evaluating progress towards the team goal since Session 1 • Team-rewarding for success (whether the goal is achieved or first steps are taken) with mutual congratulations • Collecting additional actions to attain the goal, reflecting anticipated and actual obstacles • Reviewing measures for team-monitoring, team-evaluating, and team-rewarding teams set for themselves • In small groups, reflecting and evaluating the implementation of the team regulation process (what was successful and helpful, what do we want to improve next time) and summarizing the results • Focus on team-rewarding (why is it relevant, how can we as a team remind each other to reward ourselves) • Reviewing challenges in the context of FWD at the team level and identify the next challenge the team wants to address