Perspectives on group flow: Existing theoretical approaches and the development of the Integrative Group Flow Theory

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Author Note

Conflict of Interest

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Abstract

Objective: The existing theoretical approaches to group flow deviate from each other and have several limitations. Given that the assumptions of the existing approaches are not incompatible with each other and instead can be regarded as being complementary, the purpose of this paper is to propose the Integrative Group Flow Theory as a theory that integrates and extends existing approaches. Results: The Integrative Group Flow Theory is based on action theoretical principles and describes group flow as balanced group action. Balanced group action is a continuously perfectly fitting handling of the task by the group system in a given situation. This involves relationships within and between the three action theoretical components of group action (i.e., group system, group task, group environment) and three major functions of the group system (i.e., state of mind, behavior, skills). Group flow is described as dynamic due to changes of the group situation and due to regulatory processes within the group, particularly interpersonal coordination. Conclusion: In terms of systematics, the Integrative Group Flow Theory meets the goodness criteria (i.e., comprehensiveness, parsimony, openness). Moreover, the theory also meets specific recommendations for the development of theories for group phenomena. In terms of empiricism, the results of the existing studies already confirm many aspects of the Integrative Group Flow Theory. Further research is needed to test the remaining aspects. This requires the development of a measurement instrument and an experimental paradigm. The theory can be expected to fulfil the functions of scientific theories (i.e., epistemology, praxeology, communication).

Highlights and Implications

- The Integrative Group Flow Theory describes and explains that group flow is balanced group action. Balanced group action is a continuously perfectly fitting handling of the task by the group system in a given situation.
- The Integrative Group Flow Theory comprises a structure (*fitting* handling of the task) and a dynamics (*continuously* fitting handling) part.
- Group flow is assumed to be regulated by interpersonal coordination.
- The Integrative Group Flow Theory meets the criteria for scientific theories.
- The theory is consistent with existing empirical evidence. Future research should develop a measurement instrument and an experimental paradigm to further validate the theory.

Keywords: team flow, shared flow, collective flow, model, multi-level

Introduction

Imagine a group on course to accomplish a challenging task in a perfect manner. The group's behavior is smooth; all of the group members seem to know what needs to be done and how to interact best with the others, the members' behavior is perfectly coordinated and harmonized. There is a collective state of mind, comprising, for example, a positive group emotion. The group's skills are high, with the specific skills of the group members being integrated. It appears like the group is one single, homogeneous unit, with its behavior, state of mind and skills fitting the high demands of the group task. This phenomenon is called group flow (Sawyer, 2003).

Although there is general agreement that the phenomenon of group flow exists, research on group flow is scarce and heterogeneous. Most grave is that existing theoretical approaches to group flow are heterogeneous (Pels et al., 2018). This is problematic given the fact that the key to investigating a phenomenon like group flow and to build suitable interventions is theory development (Lewin, 1939; Patterson, 1983). A theory functions as a basis point of reference for all steps of scientific investigation and transfer. In order to improve the value of the group flow construct with regard to theories' functions of epistemology, praxeology and communication, the purpose of this paper is to propose a group flow theory that integrates and extends existing theoretical approaches.

The construct of individual flow

As outlined by Sawyer (2003), Pels et al. (2018) and van den Hout (2018), the construct of group flow stems from Csikszentmihalyi's (1975, 1985, 2000) concept of flow. Briefly defined, "flow is a state in which an individual is completely immersed in [an] activity without reflective self-consciousness but with a deep sense of control" (Engeser & Schiepe-Tiska, 2012). More specifically, according to Csikszentmihalyi (2000), flow is typically described as consisting of nine characteristics: (1) an above-average balance between the challenges of a task and the acting individual's skills, (2) clear goals, (3)

clear feedback during the progress of task accomplishment, (4) concentration on the task at hand, (5) a merging of action and awareness, (6) loss of self-consciousness, (7) a sense of control, (8) a transformation of time, and (9) an autotelic experience. This state is an individual experience and, therefore, also referred to as individual flow (Raettig & Weger, 2018).

Individual flow can occur in different types of social situations (Elbe et al., 2010; Schiepe-Tiska & Engeser, 2012). According to the taxonomy by Raettig and Weger (2018), solitary individual flow occurs in situations in which an individual is doing an activity alone in the absence of others (e.g., running alone) and social individual flow occurs when others are present. Social individual flow is subdivided into co-active individual flow where there is no task-related interaction with others (e.g., running in a group) and interactive individual flow where there is task-related interaction in a group with others (e.g., during playing football). In both kinds of social individual flow, the others being present may (shared individual flow) or may not (private individual flow) be in individual flow, too (Nakamura & Csikszentmihalyi, 2002; Raettig & Weger, 2018). Thus, individual flow is an individual-level construct (Raettig & Weger, 2018).

The construct of group flow

In course of time, flow literature (Nakamura & Csikszentmihalyi, 2002) has continuously assumed that another specific type of flow can emerge on a group-level during group tasks that require coordination. This type of flow is mostly termed as group flow[1], as introduced, coined and popularized by Sawyer (2003). As summarized by Pels et al. (2018), first, the existence of group flow as an emergent higher-level phenomenon was corroborated by continuous anecdotal evidence in flow research (Jimerson, 1999; Sato, 1988), often describing group flow in metaphorical terms (Sawyer, 2006). For

[1] According to the taxonomy of Raettig and Weger (2018), group flow is an umbrella term for flow at the group level. This umbrella term includes all other specific terms (e.g., flow in teams, Heyne et al. (2011); Kiili et al. (2010)) different authors had used before to name flow at the group level. This clear conceptual terminology and preference of the term group flow is also supported by other authors (e.g., Pels et al. (2018).

example, authors described group flow as a state in which a group's members are fully "'in sync' with each other" (Jimerson, 1999, p. 13) and in which "everything [in the group] seems to come naturally" (Sawyer, 2006, p. 158). Subsequently, also specific investigations have revealed the existence of this phenomenon. For example, the investigations have shown that group flow has specific characteristics (Gloor et al., 2013) and is collectively shared among group members (e.g. Hart & Di Blasi, 2015). Therefore, it can be concluded that group flow is an emergent group-level construct and different from individual flow.

Although metaphorical descriptions and first investigations of specific characteristics have an important value for an approximation to what the phenomenon of group flow is (cf., Morgan, 1983), they typically contain lacks and reveal desiderata (cf., Bourgeois et al., 1983; 2000). Lacks exist with regard to a precise, specific and systematic description and explanation of group flow. As a consequence, there is, among others, a desideratum for the development of a theoretical concept of group flow that overcomes these lacks and fulfils theories' functions of epistemology, praxeology and communication. Following the established recommendations by Kozlowski and Klein (2000) for the development of theories for higher-level phenomena, a theory aiming at describing and explaining the emergent phenomenon of group flow should meet specific criteria. First, a theory of group flow should generally take into account both levels: the higher level (i.e., the group) on which the final phenomenon emerges and the lower level (i.e., the individual group members) that constitutes the higher level. Second, it should specify the so-called elemental content of the higher-level phenomenon (Kozlowski & Klein, 2000). Elemental content is an umbrella term for (psychological) processes, states and characteristics of a lower level (e.g., an individual) which constitute (psychological) processes, states and characteristics of a higher level (e.g., a group). In this regard, for instance, cognitions as psychological processes are functions of the psychic system of individuals which serve as psychological raw material of emerging

group-level processes (e.g., group cognition) and, thus, of functions of the group system. Third, a theory of group flow should specify how the higher and the lower level are linked regarding the elemental content. Fourth, it should define (a) structures and (b) dynamic processes which establish the link of the higher and lower level. With all these aspects in mind, the aim of this work is to review and compare existing theoretical approaches to group flow, and to propose a group flow theory that integrates and extends existing approaches.

Existing theoretical approaches to group flow

A recent scoping review of peer-reviewed articles on group flow (Pels et al., 2018) and an additional systematic search for subsequently published peer-reviewed articles on group flow (using the same search terms and data bases as stated in the scoping review) revealed that, to the best of our knowledge, there are five specific theories that describe and explain group flow (a detailed description of the search strategy and a flow chart of the identification of articles can be found in Supplement 1 and Figure Supplement 1, respectively; a brief summary of the content of the existing theories can be found in Supplement 2). All of the theories emanate from Csikszentmihalyi's (1975, 1985, 2000) concept of individual flow.

Overview of the existing theoretical approaches

(1) *Group Flow Concept.* The Group Flow Concept (Sawyer, 2003, 2006, 2007) describes group flow as "a collective state that occurs when a group is performing at the peak of its abilities" (Sawyer, 2003, p. 167), involving synchrony in group members' behavior and a collective groupmind. As an emergent phenomenon, it is said to be more than just a collection of individual flow states. For example, the group can show a behavior that a single group member would not have thought of without the

group. According to Sawyer, the group as a unit can be in group flow even when the individual group members are not in individual flow, but group flow helps the individual to enter individual flow.

Sawyer (2003, 2006, 2007) defines ten conditions of group flow. These are (1) a clear *group goal* (ranging on a continuum from extrinsic (i.e., a product-oriented goal) to intrinsic (i.e., an exploration-oriented goal)), (2) *close listening* (i.e., attending to what the others are doing), (3) *complete concentration* on the task, (4) *being in control* of one's action and environment, (5) *blending egos* (i.e., subordinating the individual ego to the group), (6) *equal participation* (i.e., all group members have an equal function), (7) *familiarity* (i.e., pre-existing structures such as shared knowledge), (8) constant and clear *communication*, (9) *keeping it moving forward* (i.e., continuous working on the task), and (10) a *potential for failure* in solving the task. More specifically (1) clear goals and (7) familiarity have to concur in a way that for an extrinsic goal many pre-existing structures are necessary (e.g., a set of known courses of action) and for an intrinsic goal, less pre-existing structures are necessary.

The Group Flow Concept was developed in the context of music and acting, but it is also applicable to other contexts (e.g., education; Armstrong, 2008). Empirical evidence for this concept exists from qualitative data (interviews and observations) which already support the phenomenon description and parts of the conditions of group flow (for an overview, see Tay et al., 2019). However, only parts of the Group Flow Concept were investigated so far, it was not tested as a whole.

(2) *Networked Flow Model.* The Networked Flow Model (Gaggioli et al., 2011) is a further development of Sawyer's Group Flow Concept (2003, 2006, 2007). Stating that their model is in line with Sawyer, the authors define group flow (i.e., networked flow as termed by Gaggioli et al., 2011) as "a collective state of mind (...), a peak experience, a group performing at its top level of ability" (Gaggioli et al., 2011, p. 41). Criticizing parts of Sawyer's approach (e.g., lack of discussion of cognitive dimensions of group flow, less attention to dynamics of the emergence of group flow), the Networked Flow Model

assumes that group flow develops over six phases. The superordinate assumption is that group flow results from a situation of liminality and maximum social presence. The phases (1) "meeting", (2) "reducing the distance", and (3) "liminality-parallel action" consist of group formation including the development of shared intentions, group member similarity and group identity which are assumed to evoke collective intentions and social presence. This progression forms the basis for the final phases in which the group enters group flow. These final phases are (4) "networked flow", (5) "networked flow – creation of an artifact", and (6) "networked flow – application of the artifact in a social network". These phases describe the final state of group flow, distinguishing between (4) the onset of group flow with critical events like a transformation of collective intentions into collective actions, (5) the creation of an artifact (i.e., a product) as a further development of a pre-existing frame, and (6) the use of this artifact to the group's social context.

The Networked Flow Model was developed in the context of (online) education, but it is also applicable to other contexts (e.g., music; Gaggioli et al., 2016). Based on this model, concrete suggestions have been made for how to develop group flow measures (Gaggioli et al., 2011; Galimberti et al., 2015). These measures have partly been applied in two empirical investigations which show that social support and performance feedback facilitate group flow (Gaggioli et al., 2015; Gaggioli et al., 2016). However, only parts of the Networked Flow Model were investigated so far, it was not tested as a whole.

(3) *Multi-level Model of Flow in Sociotechnical Systems.* The Multi-level Model of Flow in Sociotechnical Systems (Duff et al., 2014) describes group flow as a state in which a (working) group of a sociotechnical system (i.e., a system that involves interaction between humans and technology) "is innovative, harmonious and productive" (p. 575) and in which things are in balance and flowing. This model extends Csikszentmihalyi's (1975, 1985, 2000) concept of individual flow across three levels in

the context of work. Overall, it is assumed that flow is an isomorphic construct (i.e., flow appears in a manner similar at different levels): (1) On the first level (i.e., the individual level), individual flow in the sense of Csikszentmihalyi (1975) occurs. (2) On the second level (i.e., the group level) flow occurs in an entire group (i.e., group flow). Two kinds of group flow can occur: either (a) group flow while accomplishing an individual task in the presence of others (which is social individual flow according to the taxonomy by Raettig and Weger (2018)) or (b) group flow while accomplishing a task together with others. It is assumed that group identity and a high challenge of the group task positively influence both kinds of group flow. (3) On the third level (i.e., the system level), flow occurs in an entire system (i.e., the whole system including all individuals, groups, and technological instruments etc. of the work system), defined as "the system's 'optimal state of function', […] indicated by the smooth progression of tasks toward organizational goals" (Duff et al., 2014, p. 574).

The Multi-level Model of Flow in Sociotechnical Systems was specifically developed for working contexts that include technical systems. Based on this model, concrete suggestions have been made for how to measure flow on different levels. However, this model has never been part of any empirical investigation.

(4) *Channel Model of Team Flow.* The Channel Model of Team Flow (Kiili et al., 2010) extends Csikszentmihalyi's (1975, 1985, 2000) classical channel model of individual flow to group flow (i.e., team flow, as termed by (Kiili et al., 2010). The initial and former channel model (as the essence of an earlier concept of individual flow) assumes that individual flow occurs when there is an individually perceived balance between challenges and skills for a given task (this can be a below-average balance consisting of low challenges and low skills, an average balance consisting of medium challenges and medium skills, or an above-average balance consisting of high challenges and high skills). The corridor of balance is the so-called channel. By adding a group dimension to the classical channel model, the model of group flow

by Kiili et al. (2010) assumes a broader spectrum of the balance between challenges and skills to allow for group flow to occur. In other words, according to this model, a wider range means that the group's overall skills can even be slightly higher or lower than the required challenges. Nevertheless, the authors still term this as a balance between challenges and skills.

The Channel Model of Team Flow was developed in the context of physical education, but it is also applicable to other contexts. Although this model was part of the theoretical foundation of an empirical study aiming to develop multiplayer exertion games for physical education (Kiili et al., 2010), it was neither examined in this study nor in any other study. Moreover, findings from Csikszentmihalyi (e.g., 2000) on the initial channel model indicate that it might be inappropriate to assume that a below-average balance between challenges and skills is sufficient for group flow. These findings show that, for individual flow, an above-average between challenges and skills is necessary.

(5) *Conceptualization of Team Flow.* The Conceptualization of Team Flow (van den Hout et al., 2018; van den Hout et al., 2019) defines group flow (i.e., team flow as termed by van den Hout et al., 2018) as "a shared experience of flow derived from an optimized team dynamic during the execution of interdependent personal tasks" (van den Hout et al., 2018, p. 400). This conceptualization assumes that in group flow, all individual group members experience "[individual] flow simultaneously and collectively while executing their personal tasks for the [group's] purpose" (van den Hout et al., 2018, p. 400). Thus, in contrast to Sawyer (2003, 2006, 2007) it is not said that group flow can occur without individual flow being present. Instead, it is assumed that individual flow is a necessary, but no sufficient prerequisite for group flow.

According to van den Hout et al. (2018), in group flow, the classical characteristics of individual flow (sensu Csikszentmihalyi, 2000) occur in a similar, but different and reconceptualized way on the group level. In other words, "in each element of [group] flow, an element of individual flow is merged

with an aspect of [group] dynamics" (van den Hout et al., 2018, p. 401). There are two sets of elements of group flow which are interrelated: (1) Group flow prerequisites and (2) group flow characteristics. (1) The group flow prerequisites comprise so-called group dynamics. In particular, the authors list (a) collective ambition, (b) common goal, (c) aligned personal goals, (d) high skill integration, (e) open communication, (f) safe environment, and (g) mutual commitment (van den Hout et al., 2018). These prerequisites need to be established in order to allow for (2) group flow characteristics to occur: (a) sense of unity, (b) sense of joint progress, (c) mutual trust, and (d) holistic focus (van den Hout et al., 2018). The group flow characteristics stabilize, in turn, the group flow prerequisites and lead to positive outcomes (e.g., higher performance and positive mood of every individual and the group).

The Conceptualization of Team Flow was developed in the context of work, but it is applicable to other contexts. Based on this conceptualization, a questionnaire was developed (van den Hout et al., 2019). In the course of its validation, parts of the theory were tested. In line with theory, group flow prerequisites were positively related to group flow characteristics and group flow characteristics were positively related to individual and group outcomes. However, the testing of the causal assumptions of the theory is limited due to the cross-sectional design. Moreover, the evaluation of specific relationships between the group flow prerequisites and the group flow characteristics is limited because both were calculated by global factors and not by a specific consideration of the specific dimensions of prerequisites and characteristics. Additionally, it remains unclear whether the elements of individual flow actually show up in group flow as assumed in the theory (whether, for example, a collective ambition of the group can be equated with the autotelic experience of a person in individual flow). The developed questionnaire has not yet been applied in any other empirical investigations. The conceptualization of team flow was investigated only in a qualitative study in the business context, identifying relationships between group flow elements (van den Hout & Davis, 2021).

Comparative summary of the existing theoretical approaches

Description and explanation of group flow. The existing theories of group flow show both similarities and differences to one another with regard to how they describe and explain group flow (see also the overview of theories in Supplement 2). First, all theories consistently describe that group flow occurs during tasks that require coordination between group members (i.e., interactive or proactive-reactive tasks; Carron & Chelladurai, 1981). Second, the approaches differ in whether they explicitly consider both the individual and the group *level* (Duff et al., 2014; Gaggioli et al., 2011; Sawyer, 2003, 2006, 2007; van den Hout et al., 2018) or only the group level (Kiili et al., 2010).

Third, the approaches differ in the *elemental content* on the individual level and properties of groups (which both compose emergent group phenomena; Kozlowski & Klein, 2000) they consider for group flow. In other words, the approaches differ in their assumptions about which psychological constructs compose group flow. In general, most of the approaches consider aspects of behavior (Sawyer, 2003, 2006), skills (e.g., Kiili et al., 2010) and state of mind (Gaggioli et al., 2011). There is one specific approach (van den Hout et al., 2018) which assumes that there are counterparts of the elements of individual flow that can be found in group flow. This approach in particular, but also other approaches, describe group flow also with entirely new constructs that have been developed and labeled specifically for group flow. For instance, the entirely new invented constructs joint progress and holistic focus are said to represent the individual flow characteristics "merging of action and awareness" and "concentration on the task at hand" in group flow (van den Hout et al., 2018).

Fourth, the approaches differ in how they describe the *link of the higher and the lower level* in terms of the *elemental content* on the individual level and properties of groups. Although all approaches describe that the link is characterized of balance within the group, they use different terms for balance (e.g., balance, synchrony; cf. Pels et al., 2018) and differ in how the balance is shaped and organized.

Some approaches assume balance on the individual level between every individual group member and the entirety of all other group members with regard to central psychological processes characterizing group flow (e.g., behavioral synchrony between every individual group member and the other group members; Sawyer, 2003, 2006). Other approaches assume balance on the group level between the properties of the group as a whole and the group task (e.g., the group's overall skills are in balance with the group task; Kiili et al., 2010).

Regarding the link of the lower and higher level, two approaches also explicitly consider the role of individual flow in the conceptualization of group flow. On the one hand, van den Hout et al. (2018) assume that individual flow is a necessary, but not sufficient prerequisite for group flow. On the other hand, Sawyer (2003) assumes that group flow can be present even when the individual group members are not in individual flow and that group flow on the contrary helps the individuals to get into individual flow.

Fifth, existing approaches set different foci with regard to *interpersonal structures and processes that influence* group flow. In our understanding, structures are qualities of and relationships between and within elemental content on the individual level and group properties. There are structures relating to state of mind (e.g., pre-existing shared cognitions among group members, common goals; Sawyer, 2003; van den Hout et al., 2018), behavior (e.g., pre-existing roles about how to behave as a group member) and skills (e.g., specific acquirements of group members, integratable skills; Sawyer, 2003; van den Hout et al., 2018). In contrast, processes can be understood as dynamic courses. In terms of group flow, processes that influence group flow were particularly mentioned with regard to coordination of behavior (e.g., coordination of behavior by communication; Duff et al., 2014; van den Hout et al., 2018), by concentrating and responding on each other (Sawyer, 2003).

Precision. The existing approaches differ in terms of their precision. These differences occur within the individual approaches (i.e., some parts of approaches are precise, others are not), but also between approaches, and relate to clarity of used constructs. More specifically, some approaches use vague constructs (e.g., sense of joint progress or holistic focus; van den Hout et al., 2018), mix up lower and higher levels within one construct (e.g., sense of joint progress is defined as comprising feeling of accomplishment and satisfaction (individual level) and synergistic interaction (group level); van den Hout et al., 2018), mix up structures and processes within one construct (e.g., high skill integration as a prerequisite of group flow comprises (a) that each group member's individual task fits his/her skills and (b) coordinated action; van den Hout et al., 2018), or do not precisely describe links between the lower level and the higher level (e.g., the conditions of group flow listed by Sawyer, 2003, 2006, 2007).

Context specificity. Except for one theoretical approach, all existing approaches are context-unspecific. This means that they can be applied to group action in any context (e.g., education, work, sport or music). Only the theoretical approach by Duff et al. (2014) is specific for working contexts that include technical systems.

Empiricism. To date, none of the existing approaches has been empirically tested as a whole. Only the Group Flow Concept (Sawyer, 2003, 2006, 2007) and the Conceptualization of Team Flow (van den Hout et al., 2018; van den Hout et al., 2019; van den Hout & Davis, 2021) have at least been partly examined. However, four of the theories (Group Flow Concept (Sawyer, 2003, 2006), Networked Flow Model (Gaggioli et al., 2011), Multi-level Model of Flow in Sociotechnical Systems (Duff et al., 2014), Conceptualization of Team Flow (van den Hout et al., 2018)) have been used to develop measures of group flow or to deduce criteria for measures of group flow. Partly, these measures and criteria have already been used to assess specific determinants of group flow (Armstrong, 2008; Gaggioli et al., 2015;

Gaggioli et al., 2016). However, with only one exception (van den Hout et al., 2019) there is no evidence for goodness criteria of existing measures.

Terminology. The theoretical approaches differ partly in their terminology (cf. Pels et al., 2018). First, this concerns the basic designation of the phenomenon of group flow. While two approaches refer to it as group flow (Duff et al., 2014; Sawyer, 2003, 2006, 2007), two name it team flow (Kiili et al., 2010; van den Hout et al., 2018) and another as networked flow (Gaggioli et al., 2011). Second, there are differences in the level of abstraction of the terms used within the approaches, but also between the approaches. For example, van den Hout et al. (2018) use the superordinate term communication, while Sawyer (2003) uses the more subordinate, concrete term listening (as an aspect of communication) for the similar issue.

Conclusion

The comparative summary of existing theoretical approaches reveals limitations and inconsistencies in the content, precision, context specificity, empiricism, and terminology of the approaches. With regard to *content*, the approaches focus on different selected aspects of group flow (whereby the selection was not explained in each case) and none of the approaches depicts group flow as whole. The existing theoretical approaches assume different kinds of balance during group flow that occur due to different considerations of elemental content (i.e., mostly behavior, state of mind, skills), group properties and levels; however, these assumptions with regard to balance are not incompatible with each other and can, instead, be regarded as complementary to each other. For example, although Kiili et al. (2010) focus only on the balance between the group's skills and the group's task, this is not incompatible with the assumption that there is also a balance between a group's behavior and the group's task during group flow. Furthermore, the different views on the function of individual flow in the context of group flow can in principle be regarded as complementary: Individual flow could have a

facilitating function for group flow, but group flow could also have a facilitating function for individual flow. Finally, existing theoretical approaches assume different structures and processes that contribute to group flow; again, these assumptions are not incompatible with each other and can, instead, be regarded as complementary to each other. In all that, *precision* in descriptions and explanations is necessary in order to ensure *context-unspecificity* for a maximum of generalizability. In terms of *empiricism*, most of the existing approaches lack empirical verification.

With regard to *terminology*, the current heterogeneity of the designation of the phenomenon of group flow and the different abstract constructs within the individual approaches call for standardization. In terms of designation, we recommend a consistent use of the term group flow. This term was established in the past (Sawyer, 2003), was built into a taxonomy (Raettig & Weger, 2018), and is supported by other authors (e.g., Pels et al., 2018). Despite this, van den Hout et al. (2018) explicitly argue that the term team flow differs from group flow because – according to their view – a team, unlike a group, is characterized by specific flow-relevant features (e.g., common purpose, goals). However, their distinction is not only questionable in general (Ferreira Peralta et al., 2018), but even not necessary for group flow: The nature of flow (Csikszentmihalyi, 1990) – be it flow on the individual or on the group (or team) level – requires that the acting unit (i.e., the individual or the group/team) accomplishes a task (during which flow occurs) with goals. Accordingly, any group that completes an interactive or proactive-reactive task is a group that can experience group flow. Therefore, the distinction between group flow and team flow could only be justified by the fact that in certain contexts of application (e.g., work, sports) the term team is more popular (Ferreira Peralta et al., 2018). Following Raettig and Weger's (2018) view, group flow and team flow can therefore be conceptually regarded as a synonyms (both are group-level flow phenomena), which is why the established term group flow is preferable for the purpose of unambiguous communication.

To sum up, as the content of existing approaches can be regarded as complementary to each other and as the terminology used to date requires standardization, an integrative theory of group flow is both necessary and possible. Such a theory would have additional functional values. Most of all, it would improve (a) epistemology as it would be comprehensive and, thereby, simplify the description and explanation of group flow within one piece of work (instead of a multitude of theories each of which focuses on selected aspects only). Moreover, it would also improve (b) communication among researchers, which is made difficult by the different focus areas and terminologies that are used in the existing approaches.

For these reasons, the purpose of this paper is to propose a group flow theory that integrates and extends existing approaches. This theory should fit goodness criteria of theories (Patterson, 1983). From a superordinate viewpoint, this means that the theory should be systematic (i.e., comprehensive, parsimonious, open) and empirically verified (i.e., fitting with existing empirical findings) or verifiable (e.g., being validatable in future studies).

The Integrative Group Flow Theory (IGFT)

Basic tenets

Group flow emerges during group action. Therefore, our integrative theory – henceforth referred to as Integrative Group Flow Theory (IGFT) – is based on action theoretical principles (Nitsch & Hackfort, 2016). The strengths of action theory lie in its integrative potential to consider the relationship between the acting group, the group's task and the group's environment, and in its proximity to the everyday reality of group action.

According to action theory, group action can be regarded as the way a group system handles its situation (Cranach et al., 1986). A situation of group action is defined as the group system, the group environment, the group task, and the relationships between these components (cf. Nitsch & Hackfort,

2016). The group system consists of two intertwining levels, where group members as individuals (e.g., individual football players) on a lower level are nested in the group as a whole (e.g., football team) on a higher level (Cranach et al., 1986). During group action, all functions of the entire group system are basically involved (cf. Nitsch & Hackfort, 2016). The constellation of individual lower level functions (e.g., behavior of a football team's individual player) constitutes the group level functions (e.g., behavior of an entire football team), but the group level also retroacts on the lower level (Kozlowski & Klein, 2000). Functions are psychological processes, states or properties of individuals or groups which serve action (Hackfort & Nitsch, 2019). The group environment is the set of social (e.g., the opposing team) and non-social (e.g., turf) surroundings of a group system in which the group is embedded. The relationship between the group system and the group environment is not fixed and stable; instead, the group system structures this relationship through the tasks it has to accomplish in its environment (e.g., scoring a goal). The characteristics of the environment have a task-dependent meaning, importance and function (e.g., for the task "scoring a goal", the members of an opposing team have a different meaning and importance than for another task).

Group action is structured along the dimensions hierarchy, sequence and complexity (Cranach et al., 1986; Steiner et al., 2017). Hierarchy means that group action comprises superordinate and subordinate steps. For instance, a superordinate task (e.g., scoring a goal) and related superordinate functions of a group system (e.g., goal-scoring-directed behavior) are divided into subordinate tasks (e.g., to produce scoring chances) and functions (e.g., ball-passing behavior). Sequence means that certain steps of group action occur consecutively. For example, the task "producing a scoring chance" and the concrete behavior "passing" would be followed by the task "shooting on goal" and the behavior "shooting". Complexity means that certain steps of group action occur simultaneously. For instance, the task "producing a scoring chance" involves simultaneous behavior of several – and not necessarily all –

group members (e.g., passing, running, blocking). According to Action Theory, the number of members of a formal group involved in (sub-)group action can vary. It depends on which respective (sub-)group members are involved in (sub-)action to handle a (sub-)task in a (sub-)environment.

Building upon these basic tenets of (group) action theory and building upon the analysis of previous theoretical approaches of group flow, we suggest the IGFT. The central assumption of the IGFT is that *group flow consists of balanced group action* (***proposition 1***; all propositions are also listed in Table 1). We define balanced group action as a *continuously perfectly fitting handling of the task by the group system in a given situation*. In this regard, *group flow (as balanced group action) involves both (a) structure (fit) and (b) dynamics (continuous maintenance of the fit)* (***proposition 1a***). In formal terms, this means that balance is a function of fit and its continuous, perfect maintenance. Balance, thus, consists of a structural (there is a fit) and a dynamic (the fit is continuously perfectly maintained) component. The (a) structure of group flow lies in the *fit* of the group's handling of the task in a given situation. Accordingly, the IGFT contains a structure part which describes and explains how the fit is constituted by the group system, the group task and the group environment, and the relationships among these. (b) Dynamics relate to the fact that the handling of the task is *continuously perfectly* undergoing processes of change to maintain the fit. *Perfectly* means that each completed sub-action is followed by further appropriate sub-action due to unambiguous feedback in the situation (Nakamura & Csikszentmihalyi, 2002), by which it is clear to the acting system which sub-action is needed next (despite or even because of the changes in the situation). In other words, perfection is made up of the consistent linking of successive sub-actions. Accordingly, the IGFT also contains a dynamics part which describes and explains how group flow occurs, persists and drops.

Table 1

List of all Propositions of the IGFT

<<<insert *Table 1* here>>>

Structure of group flow

The model of the structure of group flow postulated by the IGFT is depicted in Figure 1. Following action theory, the foundation of this structure are (1) *the group system,* (2) *the group task and* (3) *the group environment as fixed components of a situation of group action* (***proposition 2***): (1) During group flow, (a) behavior, (b) state of mind, and (c) skills are the major psychological functions of the *group system* (see, for instance, Gaggioli et al., 2011; Kiili et al., 2010; Sawyer, 2003, 2006). Behavior (i.e., any activity that can be objectively observed; American Psychological Association, 2022b), state of mind (i.e., the entire scope of the psychic system comprising cognition, emotion, motivation and volition; American Psychological Association, 2022c; Hackfort, 2019), and skills (i.e., abilities for action; American Psychological Association, 2022a, 2022d) are organized on two intertwining levels, namely the group members on a lower level (i.e., each individual's behavior, state of mind and skills are considered) who are nested in the group as a whole on a higher level (i.e., the group behavior, group state of mind and group skills are considered). (2) Also, the group task consists of two intertwining levels (i.e., individual tasks which are nested in the group task). Group system and group task are embedded in (3) the group environment. The number of members of a formal group involved in group flow can vary. It depends on which respective (sub-)group members are involved in a (sub-)action to handle a (sub-)task in a (sub-)environment.

Figure 1

Model of the Structure of Group Flow according to the IGFT

<<<insert *Figure 1* here>>>

Note. (1) = primary fit. (2) = secondary fit.

The figure includes the three action theoretical components of group action: the acting group system (with two levels (individual level and group level) and three functions (behavior, state of mind, skills)); the task of group action; the environment of group action.

The structure is further characterized by the relationships within and between the group system, the group task and the group environment: *During group flow* (which we have defined as balanced group action involving fit and its continuous maintenance) *these relationships consist of a fit*. *The fit is expressed in two interlocking structural facets: primary and secondary fit* (***proposition 3***).

Primary fit

Primary fit exists on the lower level (i.e., on the individual level). *For each of the three system functions* (i.e., (a) behavior, (b) state of mind, and (c) skills) *and for the task, there is a fit between every individual group member on the one hand and the other group members on the other hand in the given environment* (***proposition 3a***; Figure 1). This means that the characteristics of an individual's functions fit the characteristics of the other individuals' functions, and that the task of an individual also fits the tasks of the other individuals. For instance, the behavior (as one specific function) of each individual is adjusted to, and is therefore fitting the behavior of all other individuals involved in a given task (Sawyer, 2003, 2006). The behavior an individual is performing (e.g., football player 1 is passing a ball to player 2) fits the behavior the others are performing (e.g., player 2 is releasing for receiving the pass, player 3 is blocking an opponent for helping player 2 to receive the pass). The same applies to state of mind (i.e., the state of mind of an individual is fitting the state of mind of the others), skills (i.e., the skills of an

individual are fitting the skills of the others), and task (i.e., the task of an individual is fitting the tasks of the others).

The fit between the group members can be symmetric and/or complementary in nature (Heider, 1958). In symmetric fit, individuals are similar to each other (Zepp & Kleinert, 2015). For instance, an individual can have the same goals (with goals reflecting one potential cognition of state of mind) as other group members. In complementary fit, individuals add something to each other in order to expand the group's characteristics or to overcome a deficiency (Muchinsky & Monahan, 1987; Zepp & Kleinert, 2015). For example, an individual can show a creative, complementary behavior, generate a new, complementary idea or add a specific necessary, complementary skill not possessed by other group members. Symmetry and complementarity are not conflicting each other, they can coexist.

*The entirety of fit relations between every individual group member on the one hand and the other group members on the other hand (i.e., primary fit) creates a specific systemic emergence on the group level (**proposition 3b**).* This means, that there is an emergence of group behavior, group state of mind and group skills. According to Gestalt Theory (cf. Rock & Palmer, 1990), this emergence represents a new quality that is not inherent in the individuals' behavior, state of mind and skills. For instance, such a new quality is a group behavior occurring that individual group members would not have thought of or would not have been able to perform without the other group members (Sawyer, 2006) or a specific group state of mind which is characterized by a group's common focus exclusively on the group goal (holistic focus; van den Hout et al., 2018).

The systemic emergence of group behavior, group state of mind and group skills is not simply the sum or average of the individual group members' behavior, state of mind and skills (cf. Kozlowski & Klein, 2000). It originates from the simultaneous configuration of the fitting constellations of the functions of all individuals (i.e., from their individual behavior, individual state of mind and individual skills). Thus,

each group member contributes to the emergence of the group level functions (i.e., group behavior, group state of mind, group skills) which is typical for emergent group phenomena in general (Kozlowski & Klein, 2000) and for group flow specifically (Sawyer, 2003). In the course of this, on the one hand, even slight changes in an individual group member's functions (e.g., individual behavior) can cause tremendous changes in the related emerging group function (e.g., group behavior; Kozlowski & Klein, 2000). On the other hand, the group system can also have a stabilizing effect and compensate for changes on the part of the individual (Kozlowski & Klein, 2000).

Secondary fit

Secondary fit exists on the higher level (i.e., on the group level). There is a *fit between the three group system functions (i.e., (a) group behavior, (b) group state of mind and (c) group skills) on the one hand, and the given group task in the given group environment on the other hand* (**proposition 3c**; Figure 1c). In other words, group behavior, group state of mind and group skills are in accordance with the group task in the given group environment. For instance, the group's overall skills (that have emerged due to the primary fit of the individual group members' skills) fit the demands of the group's task (Kiili et al., 2010). Taken together, the two structural facets of fit (i.e., primary and secondary fit) make up the *structure* of balanced group action that characterizes group flow.

Link of primary and secondary fit

Primary fit is the mechanistic foundation of secondary fit (***proposition 3d***). In other words, secondary fit can only occur when there is primary fit. For example, the group members' behaviors need to fit each other (primary fit) to make the entire group's behavior a response that is fitting with what the group task requires in the given group environment (secondary fit). Consequently, absence of

primary fit is tantamount to absence of secondary fit. Thus, the necessity of primary fit arises as a result of the necessity of secondary fit for balanced group action. An absence of secondary fit indicates the necessity of the occurrence of primary fit.

Dynamics of group flow

We assume that *group flow is dynamic (**proposition 4**).* This means that group flow – as group phenomena in general (Kleinert & Pels, 2019) – changes over time. This change relates to the change of (primary and secondary) fit. On the one hand, change means that *group action can generally vary on a continuum between two extremes from fit to non-fit* (***proposition 4a***). During group flow, the group action is a *fitting* handling of the task by the group system in a given situation, thus, there is a (primary and secondary) fit. When there is no fitting handling of the task by the group system, there is absence of group flow. On the other hand, change also means that during group flow, the *group action permanently undergoes changes to maintain the (primary and secondary) fit as the situation of action changes* (***proposition 4b***). In other words, during group flow, group action continuously changes with tiny moments of non-fit in-between due to changes of the situation. Thus, during group flow, group action is not only a fitting handling of the task by the group system in a given situation, but a *continuously perfectly* fitting handling with a consistent linking of successive sub-actions. Thus, group flow can be understood as a dynamic equilibrium in which a group permanently flexibly adapts to given circumstances and thereby maintains (primary and secondary) fit despite tiny moments of non-fit. Taken together (primary and secondary) fit and the maintenance of it characterize balanced group action which makes up group flow.

The dynamics of group flow are influenced by a multitude of processes and factors. The most important ones are changes of the situation and regulatory processes within the group system because

the situation is the framework of action and regulatory processes organize the creation, stabilization and modification of balance within this framework.

Changes of the situation

In general, *all action-relevant components of a situation (i.e., the group system, the group task, the group environment) and their change influence the dynamics of group flow* (***proposition 4c***). The constellation of components brings constraints which shape opportunities for (group) action (Gorman, 2014; Nitsch & Hackfort, 2016). Depending on the situation, these constraints exist to a higher or lower degree. Constraints change permanently as the constellation of components of a situation changes permanently (e.g., due to a change of the group environment) and can, thus, facilitate or thwart the balance of group action (or leave it unaffected). For instance, a football team's opponent can change its defensive behavior which is equivalent to a change of the environment of the football team and, as a consequence, equivalent to a change of the entire situation. This change would facilitate the balance if the football team's offensive skills and behavior fit the defensive behavior of the opponent better than before. But in a different constellation it could also thwart the balance (or leave it unaffected). For instance, even small changes in a situation can evoke large changes in the balance of group action (Kozlowski & Klein, 2000). As a consequence, constraints and changes of a situation require regulatory processes in order to reach or maintain balance in the given situation.

Regulatory processes

All individual and group processes are basically involved in the regulation of group action. *The central regulatory process we assume to influence group flow (as balanced group action) is interpersonal coordination* (***proposition 4d***). Interpersonal coordination can be defined as "the task dependent management of interdependencies" (Kolbe & Boos, 2009, p. 7). In case of group flow, this comprises the

construction and maintenance of primary fit with the aim of reaching secondary fit as the desired target state for a fitting handling of the group task. Specifically, this involves the coordination of behavior (e.g., synchronization of behavior), state of mind (e.g., assimiliation of intentions), and skills (e.g., integration of different skills).

During group flow, coordination is implicit. This means that coordination is reached through anticipation and automatized mutual adjustment (for a detailed overview of coordination principles, see Espinosa et al., 2004; Kolbe & Boos, 2009; Rico et al., 2008; Steiner et al., 2017). Anticipation and automatized mutual adjustment involve a set of associated sub-processes (e.g., routinely concentrating on each other and being responsive to each other; Cannon-Bowers et al., 1993; Sawyer, 2003) and shared structures among group members (e.g., shared mental models; for a detailed overview, see Cannon-Bowers et al., 1993; Steiner et al., 2017), each taking into account momentary situational affordances of group action (Steiner et al., 2017). These coordination processes between individuals on the lower level construct and maintain primary fit, thereby constituting secondary fit which both together form the collective phenomenon of group flow.

Primary fit and secondary fit mutually stabilize each other (***proposition 4e***), and, thereby, further regulate the dynamics of group flow. Once secondary fit has been established through primary fit, it helps to stabilize the primary fit and, in turn, itself. The individual group members perceive the secondary fit as a positive experience (e.g., they experience joy because group action is going fine; Kaye & Bryce, 2012; Zumeta et al., 2016). Since this individual experience is shared among group members, it stabilizes and reinforces the maintenance of secondary fit in two ways: on the one hand, because the shared emotion (e.g., joy) represents primary fit in terms of the state of mind per se (e.g., joy as a symmetrical emotion among group members), which promotes secondary fit; on the other hand, because the positive valence of the experience (e.g., positive emotion of joy) leads to the tendency to

maintain primary fit for maintaining secondary fit. Consequently, secondary fit stabilizes itself by stabilizing primary fit.

The tendency of mutual stabilization of primary and secondary fit is also supported by further psychological processes and structures. These processes and structures are both intrapersonal (e.g., basic psychological need satisfaction of group members, cf. Sheldon & Bettencourt, 2002; social identity of group members, cf. Tajfel & Turner, 1979) and interpersonal in nature. With regard to the latter, in particular, *we assume that the central interpersonal structure that influences fit is relationship quality* (***proposition 4f***). Heider (1958) describes interpersonal relations with triadic systems. Triadic systems consist of (1) an individual (person; P), (2) one additional individual or a group of individuals (other(s); O), and (3) an object (X) which can also be one or more persons. In such a system, there are three relations: (1) P views himself/herself as having a certain relation to O (e.g., liking), (2) P views himself/herself as having a certain relation towards X (e.g., positive attitude towards coordination of behavior), and (3) P views that O has/have a certain relation towards the defined X (e.g., positive attitude towards coordination of behavior). People strive for consistency in these relations. Consistency is given when all three relations are positive (e.g., P likes O, P has a positive attitude towards coordination of behavior, and P views O as having as positive attitude towards coordination of behavior) or when one relation is positive (e.g., P has a positive attitude towards coordination of behavior) and two are negative (e.g., P dislikes O, P views O as having a negative attitude towards coordination of behavior). In terms of group flow, we assume that primary fit is more likely when all three relations are positive or when both P and O have a negative relation to X but a positive relation to one another. This, in turn, implies that the relationship quality (e.g., trust) between group members needs to be positive.

Discussion and future directions

The purpose of this paper was to propose a theory that comprehensively describes and explains the phenomenon of group flow by integrating and extending existing theoretical approaches. Our approach, the IGFT, describes group flow as consisting of balanced group action. This balance consists of fit (structure) and its continuous perfect maintenance (dynamics). Balance occurs due to coordination processes among group members, which are assumed to be facilitated by positive relationship quality. The IGFT can be evaluated from both a systematical and an empirical viewpoint.

Systematics

In terms of systematics, the Integrative Group Flow Theory meets the goodness criterion of *comprehensiveness* because it combines and extends the existing approaches. First, by reducing the number of existing approaches and making group flow comprehensible within one consistent piece of work. Second, the IGFT is in principle task-unspecific and context-unspecific (i.e., it can be applied and adapted to different group tasks that require coordination and to different contexts). In terms of group tasks, it is possible to relate the IGFT to any interactive or proactive-reactive group task. With regard to contexts, it is possible, for example, to consider the IFGT also for particular contexts (e.g., a sociotechnical work context which not only includes humans but also technology).

Furthermore, the IFGT meets the criterion of *parsimony*. First, it reduces overall complexity by describing and explaining group flow within one consistent theoretical approach. Second, IGFT contributes to a common terminology that builds on established psychological constructs in order to facilitate scientific exchange. As a consequence, not all specific terms could be adopted identically from existing theories.

Additionally, the IGFT fulfils the criterion of *openness* because it is compatible with other theories. First, IGFT is compatible with all existing group flow theories. This also applies to the various assumptions of existing approaches to linking individual flow and group flow. For example, on the one

641 hand, IGFT could be used to test whether individual flow in all individual group members – as a potential
642 representation of primary fit – is a necessary prerequisite for group flow (cf. van den Hout et al., 2018).
643 On the other hand, IGFT also permits Sawyer's (2003, 2006, 2007) assumption that group flow facilitates
644 individual flow: In IGFT it is described that experiencing secondary fit can lead to positive effects on the
645 part of the individual (cf., e.g., Sheldon & Bettencourt, 2002). Although the two different assumptions
646 have not yet been quantitatively tested by either van den Hout et al. (2018, 2019) or Sawyer (2003,
647 2006, 2007), IGFT is, thus, at least open to both, both of which have merit and are plausible. Second,
648 IGFT is compatible with theories that describe and explain other phenomena of group dynamics. This
649 means that the IGFT does not contradict other theories and that it can even be linked to other theories
650 (e.g., to theories of group development, for an overview, see Chidambaram & Bostrom, 1997; Balance
651 Theory, Heider, 1958; Social Identity Theory, Tajfel & Turner, 1979; Self-Determination Theory, Deci &
652 Ryan, 2000).

653 Moreover, the IGFT also meets the *specific recommendations* by Kozlowski and Klein (Kozlowski
654 & Klein, 2000) *for the development of theories for higher-level phenomena*: First, the IGFT takes into
655 account both levels (i.e., the individual and the group level); second, it specifies the relevant components
656 of group action (group system, group task, group environment) and the group system's properties
657 (group behavior, group state of mind, group skills) that are based on individual properties (behavior,
658 state of mind, skills) as elemental content (sensu Kozlowski & Klein, 2000); third, it specifies how the
659 higher and the lower level are linked regarding the psychological properties (primary and secondary fit);
660 fourth, it defines dynamic processes (interpersonal coordination) and structures (relationship quality)
661 which establish the link of the higher and lower level regarding the psychological properties and, hereby,
662 the emergent phenomenon of group flow.

Empiricism

With regard to empiricism, the IGFT already partly meets the goodness criterion of empirical validation because its assumptions fit the results of the few empirical studies on group flow. The results of the existing studies already confirm that behavior (e.g., movement; Gloor et al., 2013), state of mind (e.g., cognitions such as efficacy beliefs; Salanova et al., 2014) or motivational constructs such as interest (Culbertson et al., 2015) relating to state of mind, and skills (Kaye & Bryce, 2012) are psychological constructs which explain group flow (ad proposition 2). Furthermore, results show that primary fit and secondary fit exist during group flow. Regarding primary fit, this is indicated by synchronized movements of group members during group flow (Gloor et al., 2013) and a high positive correlation between group flow and emotional synchrony (Zumeta et al., 2015). In terms of secondary fit, this is indicated by a group-level balance of challenges and skills being present together with facets of a group state of mind (Keith et al., 2021). Moreover, there is strong evidence that group flow is dynamic (e.g. Armstrong, 2008; ad proposition 4). Interpersonal coordination appears to be a central process to influence the dynamics (ad proposition 4d) as suggested by the importance of effective communication (Kaye, 2016), knowledge of others' skills (Kaye, 2016) and empathy for each group member's contributions to group action (Hart & Di Blasi, 2015) for group flow. Finally, relationship quality (trust (Armstrong, 2008), social support (Gaggioli et al., 2015) and group identification (Zumeta et al., 2015)) was already found to influence group flow (ad proposition 4f). Additional empirical support comes from research on behavioral synchronization. For instance, the findings show that there are social antecedents of behavioral synchrony (Hoehl et al., 2021; Lakens et al., 2016) and that an overall group behavior strengthens perception of cohesion among the group members (Gordon et al., 2020). Nevertheless, it should be considered that group flow is more than just behavioral synchronization and that behavioral

synchronization is not a necessary behavioral component of group flow depending on the situational group task.

However, future studies should *experimentally test all propositions* of the IGFT. In particular, future studies should test all of the propositions for which there is no empirical evidence, yet. In addition, the specific function of individual flow for group flow should be examined (see the different assumptions of van den Hout et al. (2018) and Sawyer (2003, 2006, 2007)). Subsequently, moderators of the emergence of group flow should be examined. For example, group size could be considered as a potential moderator, since it can be assumed that positive relationship quality and interpersonal coordination is easier to develop in smaller groups (Amir et al., 2018; Lowry et al., 2006) which thus facilitates the occurrence of group flow.

According to Sawyer (2006), all empirical investigations of group flow require methods that investigate dynamics among group members. In terms of data collection, an objective, reliable and valid group flow questionnaire should be developed that overcomes deficiencies of existing instruments. This questionnaire could be integrated into the Experience Sampling Method (ESM, Csikszentmihalyi & Csikszentmihalyi, 1988; e.g., realized with software applications on mobile devices, Kaye et al., 2018) to dynamically assess group flow. Also, observation methods should be created. In addition, objective measures such of behavior (Gloor et al., 2022), communication (Peifer et al., 2021) or physiological parameters (Czeszumski et al., 2022; Shehata et al., 2021) should be considered as a complement to or external criterion for questionnaires and qualitative observation methods. Subsequently, an experimental paradigm should be developed which allows for testing the propositions by manipulating variables of the structure model of the IGFT. Such a paradigm could build upon existing arrangements of laboratory dyad and group experiments (e.g., Boss & Kleinert, 2020; Gordon et al., 2020). With regard to data analysis, it should be considered that data between group members are interrelated. This

requires special analytical methods (e.g., the Actor-Partner Interdependence Model (Kenny, 1995; for an overview, see Campbell & Stanton, 2015) for dyadic group experiments) that takes into account between-groups variables, within-groups variables and interactions of within- and between-groups variables.

Conclusion

Given the goodness criteria, the IGFT already partly does and can be expected to fulfil the three functions of scientific theories: With regard to (a) epistemology, the IGFT can systematize knowledge about group flow. In terms of (b) praxeology, the IGFT can be expected to guide practical work. For instance, it would be possible to deduce interventions that aim to foster group flow in different areas of application (e.g., work, sport, music). Given that the IGFT specifies central interpersonal processes (coordination) and structures (relationship quality) that influence group flow, theory-based interventions aiming to improve the processes and structures can be assumed to influence group flow (for an overview of potential interventions, see Lacerenza et al., 2018). These interventions could be conducted with individual group members in general, specific group members such as leaders or an entire group. Finally, with regard to (c) communication, the IGFT can be expected to serve the exchange and proliferation of knowledge and action principles between scientists which is highly required for group flow (cf. Pels et al., 2018).

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Table 1

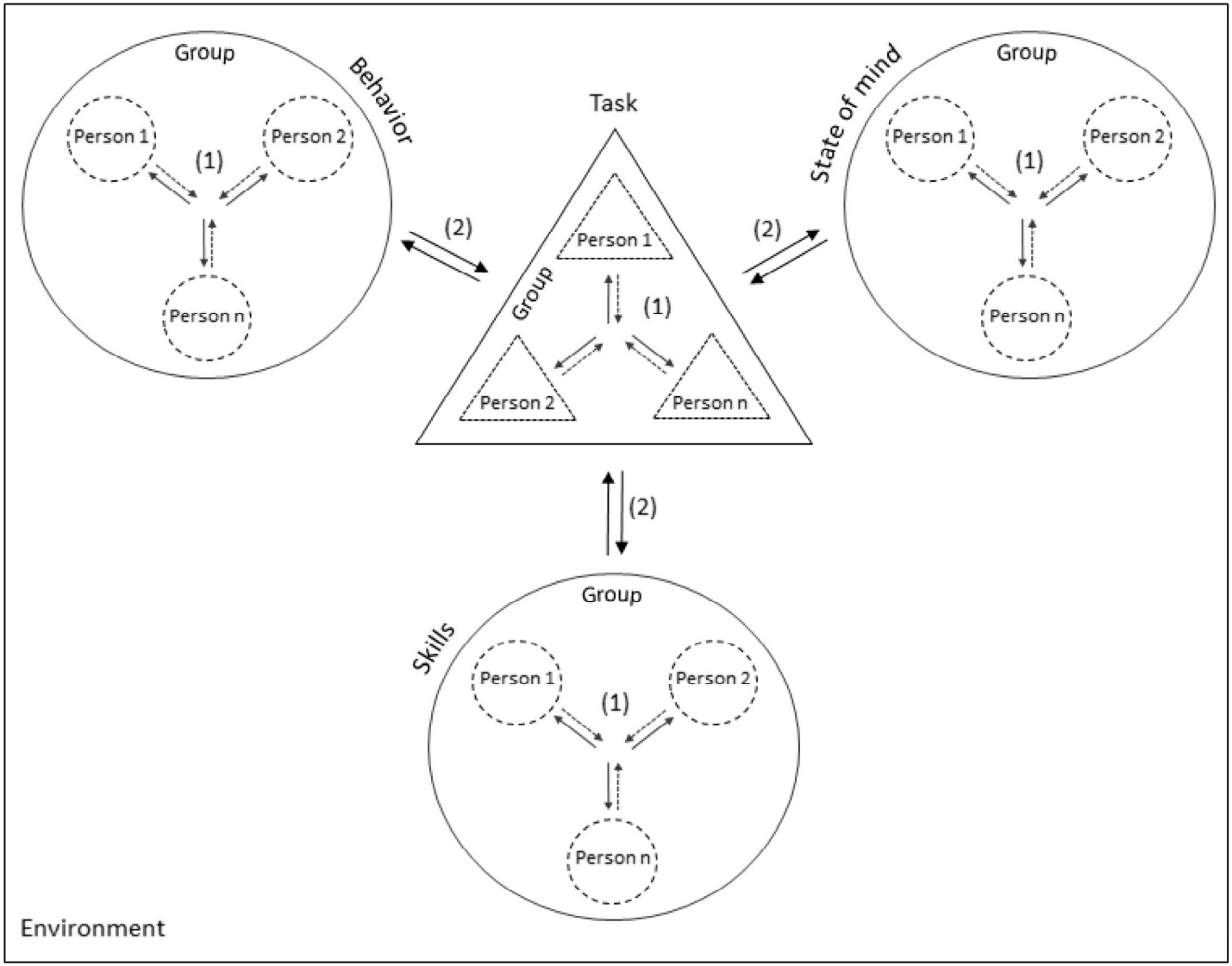
List of all Propositions of the IGFT

#	*Area*	*Statement*
1	Basic tenets	Group flow consists of balanced group action.
1a	Basic tenets	Group flow (as balanced group action) involves structure (fit) and dynamics (continuous maintenance of the fit).
2	Structure	The foundation of the structure of group flow are (1) the group system, (2) the group task and (3) the group environment as situational components of group action.
3	Structure	During group flow, the relationships between the group system, the group task and the group environment consist of a fit (primary and secondary fit).
3a	Structure	For each of the three system functions (i.e., (a) behavior, (b) state of mind, and (c) skills) and for the task, there is a fit between every individual group member on the one hand and the other group members on the other hand in the given environment (primary fit).
3b	Structure	The entirety of fit relations between every individual group member on the one hand and the other group members on the other hand (i.e., primary fit) creates a specific systemic emergence on the group level (i.e., group behavior, group state of mind, group skills).
3c	Structure	There is a fit between the three group system functions (i.e., (a) group behavior, (b) group state of mind and (c) group skills) on the one hand, and the given group task in the given group environment on the other hand (secondary fit).
3d	Structure	Primary fit is the mechanistic foundation of secondary fit.
4	Dynamics	Group flow is dynamic (i.e., primary and secondary fit change over time).
4a	Dynamics	Group action can generally vary on a continuum between two extremes from fit to non-fit.
4b	Dynamics	During group flow, group action permanently undergoes changes to maintain the (primary and secondary) fit as the situation of action changes.
4c	Dynamics	The components of a situation (i.e., the group system, the group task, the group environment) and their change influence the dynamics of group flow.
4d	Dynamics	Interpersonal coordination is the central regulatory process of group action that influences the dynamics of group flow.
4e	Dynamics	Primary and secondary fit mutually stabilize each other and, thereby, further regulate the dynamics of group flow.
4f	Dynamics	Relationship quality between group members supports the mutual stabilization of primary and secondary fit.

Note. All propositions on the same level systematically build on each other (higher level: no indented numbers; lower level: indented numbers). The propositions of the lower level (indented numbers with small letters) specify the respective higher level to which they are subordinated.

Figure 1

Model of the Structure of Group Flow according to the IGFT



Note.
(1) = primary fit.
(2) = secondary fit.
The figure includes the three action theoretical components of group action: the acting group system (with two levels (individual level and group level) and three functions (behavior, state of mind, skills)); the task of group action; the environment of group action.

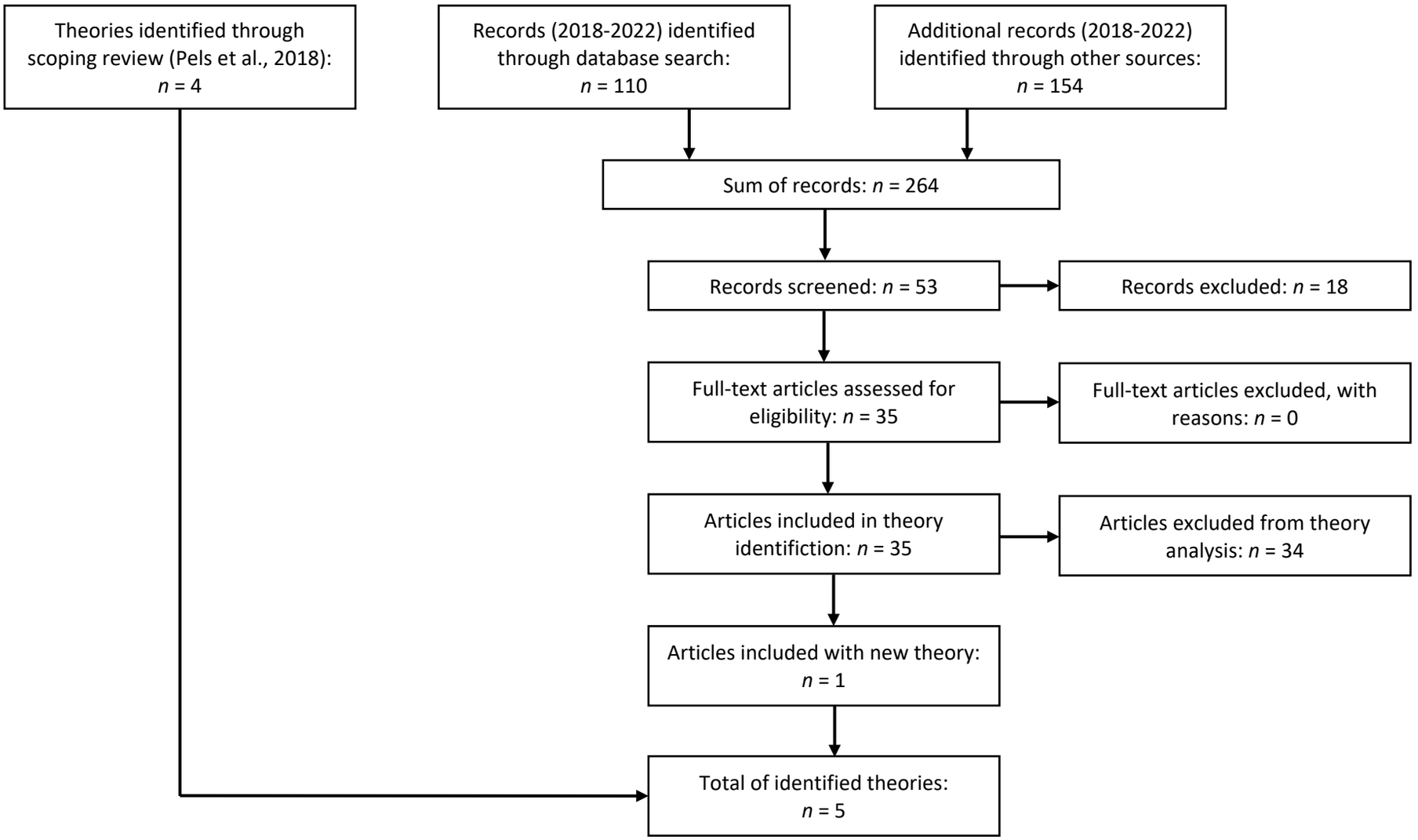
Supplement 1

Literature search strategy to identify existing group flow theories

The literature search strategy to identify existing group flow theories was threefold: *First, the four theories that were identified in the existing scoping review on group flow* (Pels et al., 2018) by means of a systematic literature search were included. *Second, a literature search was conducted for the period 2018 (year of publication of the scoping review) to May 2022 to identify additional theories*. This literature search used the same search strategy as Pels et al. (2018): Data bases used were PsycINFO, PsycARTICLES, and PSYNDEX (they were browsed simultaneously to directly exclude duplicates); the search terms and their combination when entering them in the search field TX ("All Text") was ("*team flow" OR "flow in a team" OR "flow in team*" OR "team* in a flow" OR "team* in flow*" OR "*group flow" OR "flow in a group" OR "flow in group*" OR "group* in a flow" OR "group* in flow" OR "interpersonal flow" OR "social flow" OR "collective flow" OR "shared flow") while excluding findings on blood flow and animal studies (added with the formula NOT (blood OR animal) by entering it into the search box TI ("Title")). All results were restricted to peer-reviewed articles using the appropriate limiter in the databases. Third, and finally, a manual search was conducted to detect papers citing the identified theories (in order to identify further or modified theories in these papers) and to scan reference lists of authors who typically publish in the field group flow. Based on Pels et al. (2018), eligibility criteria for manuscripts were (1) peer-reviewed publication, (2) publication in English, (3) publication explicitly dealing with group flow, and (4) presentation of a group flow theory. *In summary, these three steps identified five existing group flow theories* (see Figure below).

Figure

Results of the Literature Search



Supplement 2

Overview of the Central Content of the Existing Theories Describing the Characteristics, Development and Consequences of Group Flow.

GF theory	GF characteristics	GF development	GF consequences
Group Flow Concept (Sawyer, 2003, 2006, 2007)	synchrony in group members' behavior, collective groupmind	conditions of group flow: (1) clear group goal, (2) close listening, (3) complete concentration on the task, (4) being in control of one's action and environment, (5) blending egos, (6) equal participation, (7) familiarity, (8) constant and clear communication, (9) keeping it moving forward, (10) a potential for failure.	GF helps the individual to get into IF
Networked Flow Model (Gaggioli et al., 2011)	a collective state of mind, peak experience, group performing at its top level of ability	developmental phases of group flow: (1) meeting, (2) reducing the distance, (3) liminality-parallel action, (4) networked flow, (5) networked flow – creation of an artifact, (6) networked flow – application of the artifact in a social network	
Multi-level Model of Flow in Sociotechnical Systems (Duff et al., 2014)	Group is innovative, harmonious and productive; things in group are in balance and flowing	determinants of group flow: group identity, high challenge of the group task	
Channel Model of Team Flow (Kiili et al., 2010)		condition of group flow: balance of group's challenges and group's skills	
Conceptualization of Team Flow (van den Hout et al., 2018; van den Hout et al., 2019)	characteristics of group flow: (1) sense of unity, (2) sense of joint progress, (3) mutual trust, (4) holistic focus	prerequisites of group flow: (1) collective ambition, (2) common goal, (3) aligned personal goals, (4) high skill integration, (5) open communication, (6) safe environment, (7) mutual commitment	high performance and positive mood of every individual and the group

Note. GF = group flow. IF = individual flow.