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ORIGINAL PAPER

Seeking flow in the achievement domain: The achievement flow motive behind flow experience

Nicola Baumann · David Scheffer

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Abstract The authors propose a flow motive behind flow experience. It is defined as the intrinsic component of the achievement motive (i.e., need to seek and master difficulty), assessed with an operant motive test (OMT), and investigated with a multimethod approach. The achievement flow motive was stable over 2 years (Study 1) and positively correlated with the following variables: self-determination (Study 2), work-efficiency according to multisource feedbacks (Study 3), and flow experience during an outdoor assessment center (Study 4). In addition, the achievement flow motive was associated with the simultaneous presence of two sets of overt behaviors: *Seeing difficulty* (planning, analytical problem solving, and task focus) and *mastering difficulty* (high commitment, spreading optimism, and staying power). The direct relationship between achievement flow motive and flow experience was mediated by this behavioral pattern (Study 4). The achievement flow motive offers researchers a way to operationalize Csikszentmihalyi's concept of autotelic personality.

Keywords Flow · Autotelic personality · Implicit motives · Operant motive test (OMT) · Self-determination · State versus trait · Work efficiency · Affect · Personality systems interaction theory (PSI Theory)

N. Baumann (✉)
Differential Psychology, Personality Psychology and Diagnostics, Department I, University of Trier, 54286 Trier, Germany
e-mail: nicola.baumann@uni-trier.de

D. Scheffer
Nordakademie, Hochschule der Wirtschaft, Elmshorn, Germany
e-mail: scheffer@visual-research.de

Why do people enjoy solving difficult puzzles, running a marathon, or working on challenging projects? What helps them to get immersed in difficult tasks over long periods of time with the right thoughts and movements occurring of their own accord? Is there a stable motive disposition to seek for flow-arousing situations?

The present paper seeks to complement and extend previous work on flow by looking at the more stable causes of flow motivation: the need to seek and master challenges. More specifically, we assume that a strong tendency to experience flow across different tasks is driven by a stable motive disposition that can be assessed by operant measures. Research so far has demonstrated that personality traits are boundary conditions for the frequency of and ability for flow experiences (Csikszentmihalyi et al. 1993; Haworth et al. 1997; Keller and Bless 2008; Keller and Blomann 2008). We want to extend these approaches by looking at stable individual differences in the *need* to experience flow. In four studies we want to investigate the role of a flow motive behind flow experience and decompose underlying functional mechanisms. Our analysis will be confined to a flow motive in the achievement domain. In the following paragraphs, we will discuss classic work on flow in order to elaborate the aims of the present research, introduce an operant measure of a motive to seek flow in the achievement domain, and summarize our hypotheses.

Classic approaches to flow

Flow is a state of intrinsic motivation in which people get fully immersed in difficult tasks for the sake of the activity itself. It is characterized by a merging of action and awareness, sense of control, high concentration, loss of self-consciousness, and transformation of time (Csikszentmihalyi

1975, 1990, 2000; Csikszentmihalyi and Larson 1987; Csikszentmihalyi and LeFevre 1989; Nakamura and Csikszentmihalyi 2002). According to Csikszentmihalyi and colleagues, an important precondition for flow experience is a balance between the skills of an individual (person factor) and the challenge of a task (environment factor). If skills exceed challenges, people feel relaxed or bored. If challenges exceed skills, people feel aroused or anxious.

According to Csikszentmihalyi (1975, 1990, 2000), the challenge-skill balance is a sufficient precondition for flow. However, recent investigations of the balance hypothesis indicate that the relationship is moderated by individual differences (Haworth et al. 1997; Keller and Bless 2008; Keller and Blomann 2008; Schüler 2007). For example, individuals with low self-regulatory skills (Keller and Bless 2008) or a weak internal locus of control (Keller and Blomann 2008) do not experience flow even if task demands are dynamically adjusted to their skill level. These findings suggest that the perception and regulation of task demands (challenges) may be a person factor as well.[1] More importantly, the findings show that personality factors are boundary conditions for the ability to experience flow. We want to extend these findings by showing that not only the *ability* but also the *need* to experience flow varies between persons. To our knowledge, such stable individual differences have not been investigated in past flow research.

Although flow research is primarily concerned with flow as a motivational state, Csikszentmihalyi (1990) introduced the concept of an *autotelic personality*. Autotelic personalities tend to position themselves in situations which enable frequent experiences of flow states (Asakawa 2004).

> They have a greater ability "[…] to initiate, sustain, and enjoy such optimal experiences. [] The mark of the autotelic personality is the ability to manage a rewarding balance between the "play" of challenge finding and the "work" of skill building. […] Thus autotelic individuals should enjoy clear advantages in realizing the development of their talents to the fullest extent." (Csikszentmihalyi et al. 1993, p. 80).

In Csikszentmihalyi's approach, autotelic personalities are identified through outcomes such as quality of experience (e.g., flow and intrinsic interest in highly challenging activities) and talent development (e.g., commitment to the domain of talent). There is no clear measure of an autotelic personality that is not confounded with these outcomes. For example, Csikszentmihalyi et al. (1993) derived a description of autotelic personality patterns from traits that distinguish talented from average individuals: Autotelic (talented) personalities have traits conducive to concentration (e.g., achievement, endurance) as well as openness to experience (e.g., sentience, understanding). However, little is known about the role of such personality factors with respect to flow experiences. Presumably, they are boundary conditions of flow experience similar to self-regulatory skills and locus of control (cf. Keller and Blomann 2008).

More recently, Jackson and colleagues (Jackson and Eklund 2002; Jackson et al. 2008) developed a dispositional flow scale that assesses the frequency with which individuals experience the typical flow characteristics (loss of self-consciousness, transformation of time, sense of control, concentration on a task, etc.) within specified activities in general. Although the measures were originally developed and validated in physical activity settings they have been used in other performance-related domains as well (Jackson and Eklund 2004; Wang et al. 2009). This scale is another example for the trend that flow as a trait is assessed by frequency of flow experience. Need characteristics may have been implied in Csikszentmihalyi's concept of autotelic personality. However, they have not been assessed. Thus, operant measurement of an achievement flow motive offers a way to operationalize the autotelic personality. Identification of a stable need to seek flow in the achievement domain would be a unique contribution to flow research in which stable dispositions behind flow motivation have been neglected. Therefore, the first aim of the present paper is to demonstrate the stability of the achievement flow motive.

Csikszentmihalyi and Larson (1987) introduced the experience sampling method (ESM)—a technique developed for the purpose of obtaining self-reports of thoughts and feelings at random intervals during ongoing activities. The ESM is the gold standard in flow research because it allows researchers to assess flow across different tasks and situations. Therefore, a second aim of our studies is to link the present work with past flow research by showing the relationship of the achievement flow motive with flow experience using the ESM. Such a relationship has already been obtained by Baumann and Scheffer (2009). In their study, the correlation between achievement flow motive and flow experience was $r = .37$ ($p < .05$) across various tasks. In the present paper, we want to replicate and extend this finding by looking at mediating mechanisms in this relationship.

Csikszentmihalyi et al. (1993) proposed a dialectical principle inherent in autotelic experiences: the simultaneous presence of opposing processes conducive to both narrow concentration and openness to experience; the play of challenge finding and the work of skill building; differentiation and integration. However, these processes have

[1] Csikszentmihalyi used the label *challenge* instead of *demands* (i.e., task difficulty). This already implies a regulatory process within persons because demands can be perceived as a challenge or a threat depending on their match with skills. Thus, it would be more precise to talk about a demand-skill balance

rarely been assessed—at least beyond self-report—in studies to date. We propose that the achievement flow motive can be decomposed into two functional components: see(k)ing and mastering difficulty. Baumann and Scheffer (2009) have demonstrated that the achievement flow motive is associated with simultaneous presence of traits conducive to both seeing difficulty (e.g., introversion, avoidant adult attachment, independent/schizoid-like personality style) and mastering difficulty (e.g., mastery orientation). In the present paper, we want to assess these functional components in overt behavior. Our approach offers a way to operationalize Csikszentmihalyi's dialectical principle and to analyze functional mechanisms in flow beyond subjective experience.

Traditionally, flow experience has been associated with a loss of conscious self-reflections (Csikszentmihalyi 1990, 2000) which constitutes one of the defining characteristics in the assessment of flow states (Jackson and Eklund 2002; Rheinberg et al. 2003). At the same time, flow states are experienced as highly self-congruent and constitute one of the many positive outcomes of self-determination (Deci and Ryan 2000; Fortier and Kowal 2007). Therefore, a third aim of the present studies is to investigate the relationship between achievement flow motive and self-determination.

Finally, past research has consistently shown that flow is more often found in work than leisure activities (Csikszentmihalyi 1990). Therefore, a fourth aim of the present research is to test the effects of the achievement flow motive at work. On a macro-analytical level, flow experience has been associated with better use and long-term development of one's talent (Csikszentmihalyi et al. 1993). On a micro-analytical level, the achievement flow motive has been associated with volitional efficiency in a reaction time experiment (i.e., removal of Stroop interference; Baumann and Scheffer 2009). In the present studies, we want to investigate a meso-analytical level by examining the relationship between achievement flow motive and external ratings of efficiency in work settings. The sense of control inherent in flow experience may be the phenomenological correlate of actual competencies in mastering difficulty.

Achievement flow motive

The achievement flow motive is defined as the intrinsic component of the achievement motive. The core aspect of the general achievement motive is to deal actively with an internal or external standard of excellence by changing an object towards a quality standard, improving it with respect to certain criteria, learning something or meeting a requirement (Kuhl and Scheffer 1999; McClelland et al. 1953). The intrinsic component of the achievement motive is characterized by mastery- and approach-oriented strivings to meet internal standards of excellence (i.e., difficulty). These strivings are experienced as curiosity and interest in learning something. Thus, the achievement flow motive is the amalgam of the aroused need to master challenging tasks (seeing or seeking difficulty) and its mastery-approach implementation (mastering difficulty).

Motives are based on implicit cognitive-emotional networks of possible actions (derived from autobiographical memory) that can be performed to satisfy needs in a context-sensitive way across a variety of situations (Baumann et al. 2010; Heckhausen 1991; Kuhl 2001; McClelland 1980; Winter 1996). Because of the extended nature of the underlying networks, motives are implicit and have to be assessed by apperception (i.e., need-related interpretations of perceptual input) instead of self-report. For example, when confronted with ambiguous pictures, individuals with a strong achievement flow motive invent more stories in which a protagonist gets fully immersed in difficult tasks.

Questionnaires assessing intrinsic interest in achievement may already tap into self-concepts of the need to experience flow. In most situations, however, we would expect the same pattern of low or nonsignificant correlations typically observed between implicit and explicit motive measures (McClelland et al. 1989; Spangler 1992). A significant correlation between implicit and explicit measures requires good access to one's implicit needs that is easily distorted due to situational and personal constraints (Baumann et al. 2005; Kehr 2004; Schüler et al. 2008; Thrash and Elliot 2002). Nevertheless, Baumann and Scheffer (2009) observed significant correlations between the implicit achievement flow motive and flow experience across different tasks during an outdoor assessment center especially designed to allow for flow experience (Baumann and Scheffer 2009). Notice that reporting such concrete instances of flow does not require a valid concept of and access to one's underlying motives.

In the Operant Motive Test (OMT; Kuhl and Scheffer 1999; Kuhl et al. 2003), the two components of seeing and mastering difficulty are integrated into the assessment of the achievement flow motive. Using a modified TAT technique, participants are presented with 15 pictures like the ones depicted in Fig. 1. Participants are asked to invent a story and give their spontaneous associations to four questions (see Fig. 1). The first question to be answered in response to each OMT picture is likely to elicit need descriptors (e.g., involvement in challenging task) whereas the second and third questions are likely to elicit implementation descriptors (e.g., mastery approach).[2] The underlying

[2] The fourth question is often not considered for coding the OMT because it elicits happy endings out of the blue. Only if responses are coherently connected to and an integral part of the whole story, they can be used to define the implementation strategy.

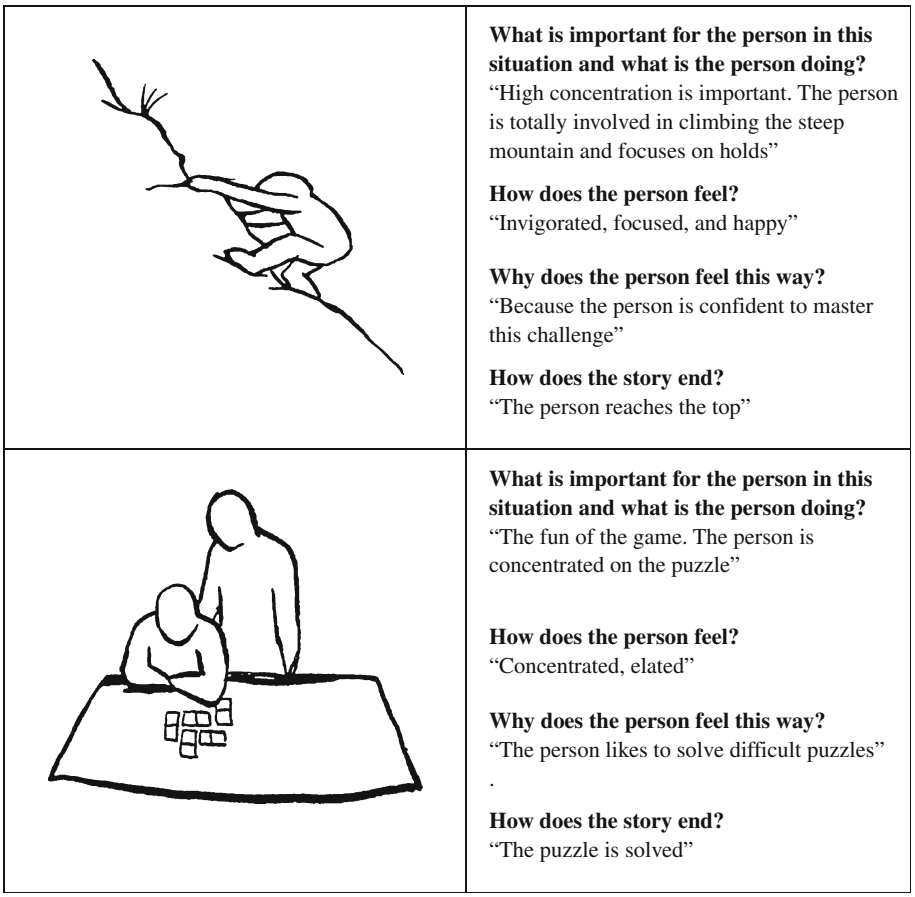

Fig. 1 Two measurement examples of the achievement flow motive

assumptions are based on research indicating that moods and affective processes are critical indicators for enactment-related determinants like mastery-approach or -avoidance, especially with regard to behavioral facilitation or inhibition (Baumann and Kuhl 2002; Gray 1987; Kazén and Kuhl 2005; Kuhl 2000; Kuhl and Kazén 1999). Only if participants show both types of answers, that is, indicate a need to get involved in challenging tasks and an implementation sequence characterized by positive affect and mastery approach, the score on achievement flow motive is given.

The OMT differentiates four approach components for each motive on the basis of crossing two affective sources of motivation (positive vs. negative) with self-determined versus incentive-focused forms of motivation. For the achievement motive, the two positive modes of approach motivation can be described as self-determined *flow* (being absorbed in a challenging task) and incentive-focused *standards of excellence* (doing something well, being proud, focused on results) whereas the two motivational modes driven by negative affect are self-determined *coping with failure* (perception of threat associated with active coping) and incentive-focused *pressure to achieve* (social standards, relief after success). In addition, the OMT consists of a classical avoidance component for each motive (e.g., *fear of failure*). The differentiation of four approach components allows researchers to test theoretically interesting differences in the type of self-regulation involved in needsatisfaction.

In addition to achievement, the OMT differentiates four approach components and one passive avoidance component for affiliation (*intimacy/affective sharing; sociability; coping with rejection; affiliation/familiarity; dependence*) and power (*guidance; status; self-assertion; direction/inhibited power; subordination/powerlessness*). Although the intrinsic components of affiliation (*intimacy/affective sharing*) and power (*guidance*) may indicate tendencies to seek and experience flow in social domains, they have different functional underpinnings compared to flow in the achievement domain (e.g., less difficulty orientation). Thus, for the purpose of the present studies, only the achievement flow motive was relevant.

Overview and hypotheses

Four studies were designed to investigate an achievement flow motive behind flow experience and to unravel some of the functional dynamics underlying flow motivation. In Study 1, we tested the stability of the achievement flow motive because stable dispositions have been neglected in

flow research. We predicted the achievement flow motive to be stable over a period of 2 years. In Study 2, we tested the assumption that the achievement flow motive is a self-determined (intrinsic) form of motivation. Self-determination was assessed by a complete absence of self-infiltration (i.e., misperception of external assignments as self-selected goals). We predicted participants high in achievement flow motive to show no self-infiltration. In Study 3, we tested the effects of achievement flow motive in work settings. We predicted achievement flow motive to be associated with more efficiency at work according to ratings from multiple sources (e.g., supervisors, colleagues).

Finally, Study 4 aimed at demonstrating the relationship between achievement flow motive and flow experience using a classical approach in flow research: the experience sampling method (ESM). In addition, behavioral manifestations of the need and implementation components (seeing and mastering difficulty, respectively) were assessed by two independent raters from participants' overt behavior during outdoor team tasks. The aim was to identify a mechanism by which the achievement flow motive is translated into flow experience. We predicted the achievement flow motive to become manifest in a behavioral pattern conducive to both components, seeing difficulty (e.g., planning, analytical problem solving) and mastering difficulty (e.g., high commitment, spreading optimism). In our mediation hypothesis, we predicted the simultaneous presence of seeing and mastering difficulty to mediate the direct relationship between achievement flow motive and flow experience.

Study 1

In Study 1, we investigated the stability of the operant motive measure (i.e., achievement flow motive) over a period of 2 years. Such stable dispositions have been neglected in flow research so far. Specifically, we predicted a significant test–retest correlation indicating a stable motive disposition to seek flow in the achievement domain.

Participants

Fifty-three psychology undergraduates (45 women and 8 men) voluntarily participated at time 1 and received course credit in return for their participation. Their mean age was 27.4 years (range 19–48 years). Twenty-seven participants (23 women and 4 men) were still available and willing to participate at time 2 (i.e., 51% of the original sample). Participants received a written feedback on their motive scores in return for their participation at time 2. Their mean age was 28.6 years (range 21–50 years). Participators ($M = .37$) did not significantly differ in achievement flow motive at time 1 from nonparticipators ($M = .50$), $t(51) = -.57$, $p > .55$. Furthermore, there were no significant age and gender differences between participators and nonparticipators. The mean retest interval was 25.2 months (SD = 2.6, range 20–27 months).

Materials

Operant motive test (OMT)

The OMT (Kuhl and Scheffer 1999) was administered to assess the implicit achievement motive.[3] Contents for coding the achievement flow motive are: Curiosity and interest, feedback through the activity itself, learning something (because it is interesting, exciting, or stimulating), concentration, being absorbed in a task, being challenged by the task, sense of control, managing something all by oneself, fun with a task, and variety. However, these statements of intense, creative, and structured interaction with a task are only coded as achievement flow motive if they are accompanied by positive emotions: Elated, invigorated, euphoric, happy, focused, interested, etc. In all of the present studies, interrater agreement was above .85 for the achievement flow motive coding of the pictures following the same procedure as outlined in Winter (1994) for the TAT. No correction for length of protocol was necessary because there is only one coding for each picture of the OMT. Extensive research on the OMT is reported in Scheffer (2005) and Scheffer et al. (2003) as well as in Baumann et al. (2005, 2010) and Kuhl et al. (2003).

The overall achievement motive (aggregated across the four approach components) demonstrates sufficient internal consistency (Cronbach's alpha) with an α of .70 when looking at the lower and upper quartile of the distribution (Scheffer et al. 2003). Among the evidence contributing to the validity of the OMT is a finding by Heckhausen and Tomasik (2002): Adolescents high in achievement motive (aggregated across the four approach components) are significantly more efficient in applying for an apprenticeship than adolescents low in achievement motive because their aspired positions match their level of qualification. Furthermore, Chasiotis and Hofer (2003) found the achievement flow motive (i.e., the intrinsic component of the achievement motive) to be significantly correlated with number of school years, level of education, and social economic status. Finally, the achievement flow motive was significantly associated with intrinsic study motivation among psychology undergraduates and flow experiences among participants of an outdoor assessment center (Baumann and Scheffer 2009).

[3] A comprehensive scoring manual for the OMT is available in German and in English from the authors

Action control scale (ACS)

The ACS (Kuhl 1994) was used to control for failure-related action orientation (AOF; ability to down-regulate negative affect) and decision-related action orientation (AOD; ability to self-generate positive affect). Example items are *"When I am told that my work has been completely unsatisfactory: (a) I don't let it bother me for too long, or (b) I feel paralyzed"* for AOF and *"When I have to solve a difficult problem: (a) I usually don't have a problem getting started on it, or (b) I have trouble sorting out things in my head so that I can get down to working on the problem"* for AOD. In both examples, option *a* reflects action orientation and option *b* state orientation. Scales consisted of 12 items, respectively. All action-oriented response alternatives are summed so that both scales range from 0 to 12, with lower scores indicating state orientation (i.e., lower action orientation) and higher scores indicating higher action orientation.

Procedure

The OMT was administered at the beginning of an experiment that was not related to the current topic. Among other questionnaires, the ACS was assessed. In a two-year follow-up, participants were contacted via e-mail and asked to fill out the OMT again. Lundy (1985) demonstrated that the stability of TAT scores can be improved when participants are instructed to write down the first story that comes to their mind regardless of a similar content in earlier test administrations. Therefore, participants were encouraged to write down their first associations to the OMT stimuli without paying attention to creativity and novelty.

Result and discussion

Descriptive information on the achievement flow motive is provided in Table 1. As listed in Table 2, achievement flow motive at time 1 was neither significantly correlated with any of the other components of the achievement motive (standards of excellence, coping with failure, pressure to achieve, fear of failure) nor with failure- and decision-related action orientation (AOF and AOD). Achievement flow motive at time 1 was highly significantly correlated with achievement flow motive at time 2, $r(27) = .73$, $p < .001$. Because of the skewed distribution of motive scores for achievement flow (see Table 1) we also calculated non-parametric correlations (Kendall's Tau). The correlation remained significant, $r(27) = .50$, $p < .007$. Thus, the effect was not driven by a few outliers. Findings are consistent with the assumption that the motive disposition to seek flow in the achievement domain is reasonably stable over a period of 2 years.

Table 1 Descriptive information and distribution of raw scores in % (*n* in parentheses) of the OMT achievement flow motive in each study

	N	*M*	SD	Score 0	Score 1	Score 2	Score 3	Score 4
Study 1, *t*1	53	.43	.82	68.5 (37)	22.2 (12)	3.7 (2)	1.9 (1)	1.9 (1)
Study 1, *t*2	27	.33	.62	74.1 (20)	18.5 (5)	7.4 (2)	–	–
Study 2	111	.12	.32	88.3 (98)	11.7 (13)	–	–	–
Study 3	51	.33	.65	74.5 (38)	19.6 (10)	3.9 (2)	2.0 (1)	–
Study 4	33	.42	.61	63.6 (21)	30.3 (10)	6.1 (2)	–	–

Table 2 Non-parametric correlations (Kendall's Tau) between variables in Study 1 at Time 1 (Lower Left; $N = 53$) and in Study 2 (Upper Rright; $N = 111$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	FSA_{Diff_unattr}
(1) OMT flow		−.12	−.08	−.27**	−.12	.05	−.02	.04	.08	−.32***
(2) OMT standards of excellence	.05		.00	−.24**	−.04	.02	.11	−.02	.08	.09
(3) OMT coping with failure	.11	−.28*		−.10	.00	−.08	−.03	.14	−.16	.00
(4) OMT pressure to achieve	−.15	−.18	−.19		−.05	−.00	−.12	.02	−.02	.01
(5) OMT fear of failure	−.20	−.28*	−.02	−.10		.05	.00	−.03	−.05	.05
(6) AOF (Self-Relaxation)	.17	−.12	.00	.05	.03		.19**	−.13*	.25***	−.00
(7) AOD (Self-Motivation)	−.01	−.17	−.18	.18	.05			−.05	.25***	−.08
(8) Threatening life events									−.27**	.02
(9) Explicit self-determination										.01

OMT Operant Motive Test, *AOF* Failure-Related Action Orientation, *AOD* Decision-Related Action Orientation, *FSA* False Self-Ascription difference score ($FSA_{assigned\_unattr} - FSA_{remaining\_unattr}$) indicating self-infiltration

* $p < .05$; ** $p < .01$; *** $p < .001$

Study 2

The achievement flow motive is conceived of as self-determined in contrast to an incentive-focused form of motivation (Baumann et al. 2010; Kuhl and Scheffer 1999; Kuhl et al. 2003). Study 2 was designed to further test this theoretical assumption by showing the relationship between achievement flow motive and self-determination. Self-determined individuals are assumed to have strong access to self-related information such as previous goal choices and a low risk of being invaded by social expectations (i.e., self-infiltration). We therefore used self-infiltration as an inverse measure of self-determination. Kuhl and Kazén (1994) introduced the tendency towards false self-ascriptions (FSA) of originally assigned activities (compared to a baseline of remaining activities) as a non-reactive measure of self-infiltration. This measure was developed further by Baumann and Kuhl (2003) and Kazén et al. (2003) who demonstrated that self-infiltration occurs in processing goals or ideas with low levels of attractiveness and not in processing ones with high levels of attractiveness because the latter are internalized through integration into the self (cf. Koestner et al. 1996; Sheldon et al. 2003; Sheldon and Kasser 1995).

In Study 2, we predicted the achievement flow motive to be associated with reduced self-infiltration. Individuals high in achievement flow motive were expected to make fewer false self-ascriptions of assigned compared to remaining activities with a low level of attractiveness whereas individuals low in achievement flow motive were expected to make more false self-ascriptions of assigned compared to remaining activities with a low level of attractiveness. Notice that the self-infiltration hypothesis concerns a difference score, that is, the comparison between two different sources of error (assigned vs. remaining) irrespective of the overall memory performance (i.e., the absolute number of false self-ascriptions). Furthermore, predictions are stated for activities with a low level of attractiveness only.

Participants

One hundred and eleven psychology undergraduates (92 women and 19 men) voluntarily participated in the experiment and received course credit in return for their participation. Their mean age was 21.7 years (range 18–46 years).

Materials

OMT, PANTER, and ACS

Achievement flow motive was assessed with the OMT (Kuhl and Scheffer 1999). The process-analytic neuroticism test for adults (PANTER; see Baumann and Kuhl 2003; Kazén et al. 2003) was used to assess self-infiltration. The ACS (Kuhl 1994) was used to assess failure- and decision-related action orientation (AOF and AOD; $\alpha = .74$ and $\alpha = .79$, respectively).

Volitional components inventory (VCI)

The VCI (Kuhl and Fuhrmann 1998) was used to assess stressful life events (i.e., threats) and subjective experiences of self-determination. Items were rated on a 4-point scale (0 = *not at all true of me*; 3 = *very strongly true of me*). In the present sample, internal consistencies were $\alpha = .87$ for the four-item threat scale (*"There have been many changes in my life, which I need to cope with"*) and $\alpha = .77$ for the four-item self-determination scale *"I feel that most of the time I really want to do the things I do"* and *"Most of the time I feel in tune with myself"*). In an unpublished study with 80 psychology undergraduates from the University of Rochester, New York, the VCI self-determination scale was significantly correlated with measures typically used in self-determination research such as autonomy orientation ($r = .44$, $p < .001$) in the General Causality Orientation Scale (GCOS; Deci and Ryan 1985) and self-determination ($r = .55$, $p < .001$) in the 10-item Self-Determination Scale (SDS; Sheldon et al. 1996).

Procedure

Participants were tested individually. They started by filling out the OMT, ACS, and VCI. Afterwards, the PANTER was administered via computer. In the cover-story, the PANTER was introduced as a simulation of a workday in an office. Participants were asked to take the role of the secretary while the experimenter took the role of the boss. The PANTER consisted of the following steps: (a) *Attractiveness Rating*: Participants rated the attractiveness of 48 simple office activities (e.g., sorting letters, sharpening pencils) on a 19-point scale, ranging from −9 (very unattractive) to +9 (very attractive). The program automatically split items according to the individual median of these ratings into items with a high and low level of attractiveness, representing the first within-participants factor. (b) *Self-Selection*: PANTER sequentially presented 4 lists containing 6 items with a low level of attractiveness and 4 lists containing 6 items with a high level of attractiveness. In a forced-choice situation, participants were asked to select, from each list, half of the activities they would be willing to carry out at the end of the experiment. The order of lists (ascending vs. descending in attractiveness) was balanced across participants. (c) *External Assignment*: Participants were informed that the experimenter (the boss) had previously selected half of the activities that she/he wanted them to carry out later on.

Assigned activities were marked with an asterisk (*). Participant had to read each item carefully and press a corresponding key ("assigned" vs. "not assigned"). External assignments were balanced across item attractiveness and self-selection.

The order of self-selection and external assignment were balanced between participants. The combination of self-selection and external assignment resulted in four categories indicating the actual source of items: (1) *both*, self-selected by participants and assigned by experimenter, (2) *self*, only self-selected by participants (3) *other*, only assigned by experimenter, and (4) *remaining*, neither self-selected nor assigned (baseline). Through presentation of homogeneous item lists for self-selection and built-in algorithms for external assignment, PANTER completely balanced the three factors of self-selection, external assignment, and item attractiveness within participants. Thus, there were six subjectively attractive and six subjectively unattractive activities in each of the four categories (both, self, other, remaining).

After working on an unrelated filler activity (e.g., Rey-Osterrieth Complex Figure Test; Rey 1959) for about 5 min, participants were introduced to unexpected memory tasks regarding the source of the activities: (d) *Self-Classification Task*: Participants were asked to decide whether or not they had previously self-selected the activities for later enactment. (e) *Other-Classification Task*: Participants were asked whether or not they had been assigned to do the activities by the experimenter. For each task, PANTER sequentially presented the 48 items in a new random order. The order of presentation of the classification tasks was balanced across participants. Finally, participants were debriefed concerning the purpose of the study. The experiment lasted about 60 min.

Results

Descriptives and correlations

Descriptive information is provided in Table 1. As listed in Table 2, achievement flow motive was negatively correlated with pressure to achieve ($r = -.27$). Correlations with the other components of the achievement motive were not significant. Achievement flow motive was not significantly correlated with action orientation (AOF, AOD), threatening life events, and explicit reports of self-determination. Consistent with expectations, the indirect measure of self-infiltration was significantly correlated with achievement flow motive ($r = -.32$): A higher achievement flow motive was associated with a lower tendency to falsely ascribe unattractive assignments as previously self-selected. Self-infiltration was not significantly correlated with any of the other variables (see Table 2).

False self-ascriptions (FSAs)

FSA rates were calculated as percentages of the total number of activities per cell. FSA rates were analyzed using an Achievement Flow Motive (absent vs. present) × Item Attractiveness (low vs. high; intraindividual median split) × Source (assigned vs. remaining) ANOVA, with the last two as within-participant factors. Results yielded a significant main effect of Item Attractiveness, $F(1, 109) = 38.90$, $p < .001$. Replicating previous findings (Baumann and Kuhl 2003; Kazén et al. 2003; Kuhl and Kazén 1994), items with a high level of attractiveness were misperceived as self-selected more often than items with a low level of attractiveness (high: 39.2 vs. low: 17.6). More important, there was a significant Achievement Flow Motive × Item Attractiveness × Source interaction, $F(1, 109) = 3.93$, $p < .05$ (see Table 3).

To further explore the nature of the higher order interaction, separate Achievement Flow Motive × Source ANOVAs were carried out for FSA rates of items with a low and high level of attractiveness, respectively. The central self-infiltration hypothesis concerned activities with a low level of attractiveness and no predictions were made for activities with a high level of attractiveness because the latter may be internalized through identification instead of introjection. Consistent with expectations, the Achievement Flow Motive × Source interaction was significant for items with low attractiveness, $F(1, 109) = 12.24$, $p < .001$. As listed in Table 3, participants without achievement flow motive had significantly higher FSA rates of assigned compared to remaining activities with low attractiveness, $t(97) = 2.13$, $p < .04$. In contrast, participants with achievement flow motive had significantly lower FSA rates of assigned compared to remaining activities with low attractiveness, $t(12) = -4.01$, $p < .002$. Because the difference score for items with low attractiveness is the central dependent variable, an independent *t*-Test was calculated. Consistent with expectations, participants with achievement flow motive had a significantly lower tendency towards self-infiltration ($FSA_{Diff\_unattr} = -16.7$) compared to participants without achievement flow motive ($FSA_{Diff\_unattr} = 4.6$), $t(109) = 3.50$, $p < .001$. The ANOVA of items with a high level of attractiveness yielded no significant main or interaction effects.

In previous research (Baumann and Kuhl 2003; Kazén et al. 2003), self-infiltration has been observed for state-oriented participants (i.e., those with low self-regulatory abilities) under stress. In the present study, the filler activity (i.e., Rey-Osterrieth Complex Figure Test) prior to the self-classification task may have induced stress. Furthermore, naturally occurring life stressors may have been present for some individuals. Therefore, we tested whether the ability to self-regulate negative affect (AOF) and the

Table 3 False self-ascription (FSA) rates (%) as a function of achievement flow motive, item attractiveness, and item source (Assigned vs. Remaining) in Study 2

	Low item attractiveness			High item attractiveness		
	Assigned	Remaining	Diff.[a]	Assigned	Remaining	Diff.
Without achievement flow						
Mean	19.3	14.7	4.6*	38.9	38.4	.5
SD	(20.9)	(18.4)	(21.3)	(22.8)	(26.0)	(26.9)
With achievement flow						
Mean	14.1	30.8	−16.7**	42.5	43.7	−1.2
SD	(24.3)	(25.2)	(15.1)	(28.5)	(22.2)	(29.4)

[a] The difference score for items with low levels of attractiveness is the central dependent variable. Self-infiltration is indicated by significantly higher FSA rates of items with a low level of attractiveness originally assigned by the experimenter compared to remaining items (baseline)

* $p < .05$; ** $p < .01$

amount of threatening life events played a role in the reported effect. The Achievement Flow Motive × Source interaction for items with low attractiveness remained significant when entering AOF and threats as covariates, $F(1, 107) = 12.02$, $p < .001$.[4]

To control for effects of explicit ratings of self-determination and the other components of the achievement motive on self-infiltration, a hierarchical regression analysis on FSA rates of assigned activities with low attractiveness was calculated with FSA rates of remaining activities with low attractiveness entered in step 1, explicit self-determination entered in step 2, and all five achievement components of the OMT entered in step 3. Only achievement flow motive yielded a significant effect, $\beta = -.23$, $t(1, 103) = -2.37$, $p < .02$. A similar analysis for items with a high level of attractiveness yielded no significant effects.

False other ascriptions (FOAs)

To test whether participants had a tendency towards false externalization (i.e., falsely ascribing self-selected items more often as assigned than remaining items), FOA rates were analyzed using an Achievement Flow Motive × Item Attractiveness × Source (self-selected vs. remaining) ANOVA, with the last two as within-participant factors. There were no significant main or interaction effects. An additional Achievement Flow Motive × Source (self-selected vs. remaining) ANOVA conducted on FOA rates of items with a low level of attractiveness yielded no significant effects. FSA and FOA rates were not significantly correlated—neither in the total sample nor in subgroups of items (low vs. high levels of attractiveness) or participants (without vs. with achievement flow motive).

Discussion

Results of Study 2 show that intrinsic achievement motive and self-infiltration are inversely related. Participants with an achievement flow motive were not invaded by the expectations of other influential persons (like the "boss") without noticing it. They even had a significantly reduced tendency to misperceive unattractive assignments as self-selected (compared to the baseline of remaining activities with low attractiveness). In contrast, participants who did not see any options for getting fully immersed in the OMT had a significant tendency towards self-infiltration. Findings are consistent with the assumption that the achievement flow motive may act as a buffer against self-infiltration. Conversely, one could argue that participants with low self-infiltration are better able to get into flow. Because of the correlational nature of the findings we cannot draw conclusions about the causal direction of the relationship.

Consistent with previous findings (Baumann and Kuhl 2003; Kazén et al. 2003; Kuhl and Kazén 1994), the effect occurs for activities with a low level of attractiveness only. Whereas false self-ascriptions of activities with a high level

[4] Consistent with previous self-infiltration findings, an ANCOVA for items with a low level of attractiveness (with norm-split AOF scores, median-split threat scores, and source as independent variables) yielded a significant AOF × Threats × Source interaction, $F(1, 107) = 4.31$, $p < .05$: State-oriented participants had an increased tendency towards false self-ascription (FSA) of unattractive assignments when threats were high ($FSA_{assigned\_unattr} = 20.37$ vs. $FSA_{remaining\_unattr} = 14.30$; $FSA_{Diff\_unattr} = 6.07$) compared to low ($FSA_{assigned\_unattr} = 12.43$ vs. $FSA_{remaining\_unattr} = 15.30$; $FSA_{Diff\_unattr} = -2.87$). In contrast, action-oriented participants had a reduced tendency towards false self-ascription of unattractive assignments when threats were high ($FSA_{assigned\_unattr} = 16.77$ vs. $FSA_{remaining\_unattr} = 19.35$, $FSA_{Diff\_unattr} = -2.58$) compared to low ($FSA_{assigned\_unattr} = 22.89$ vs. $FSA_{remaining\_unattr} = 17.20$, $FSA_{Diff\_unattr} = 5.69$). Nevertheless, achievement flow motive was negatively correlated with self-infiltration when controlling for these effects.

of attractiveness could indicate a healthy bias towards *identification* with positive goals (Deci et al. 1994; Deci and Ryan 2000; Sheldon et al. 2003), this process is unlikely for activities with a low level of attractiveness. When no rationale or meaning other than an external assignment is provided, activities with a low level of attractiveness lack the emotional support needed for the integration into the self-system. Thus, false self-ascriptions of these activities indicate a tendency towards *introjection* (self-infiltration) and not identification.

An alternative interpretation of our data could be that achievement flow motive was associated with more global processes such as working memory capacity (Luu et al. 1998) or the ability to distinguish reality from fantasy (Johnson and Raye 1981). However, the reduced FSA rates among participants with achievement flow motive were not accompanied by reduced FOA rates. Findings suggest that achievement flow motive is related specifically to low self-infiltration and not globally to poor source monitoring, which would also include a tendency towards externalization. Thus, achievement flow motive specifically enhances (or is enhanced by) access to self-related information, for example, emotional preferences and memory traces of whether an individual has made the commitment to perform one specific future activity among the many possible alternatives (Gollwitzer 1996; Heckhausen and Kuhl 1985; Kazén et al. 2003).

At first glance, our finding seems to run against the definition of flow as a state of reduced self-awareness. However, the definition of reduced self-awareness refers to conscious and analytical forms of self-focus associated with increased ruminative thoughts about the self (Watkins 2004; Watkins and Teasdale 2004). In contrast, our measure taps into access to one's emotional preferences, that is, an intuitive and experiential form of self-focus associated with disengaging attentional processes of self-referential elaboration (Watkins 2004; Watkins and Teasdale 2004). The findings that neither achievement flow motive nor self-infiltration were significantly correlated with an explicit self-determination scale but significantly correlated with each other supports the assumption that both measures were tapping into less conceptual and more implicit processes.

Study 3

According to Csikszentmihalyi (1990), flow is more often found in work behavior than in leisure activities. We therefore explored the validity of achievement flow motive in a work context. The assumption that flow can be detected in regular work is in accord with Holland's (1997) person-job fit model. He demonstrated that workers are intrinsically motivated in jobs which fit their personal interests and competencies. The concepts of flow and person-job fit are closely related because flow is dependent on optimal arousal which in turn is, to some extent, a function of an optimal person-job fit (Scheffer and Kuhl 2006). It is difficult to measure flow objectively in real life contexts because this would require close observation of individuals over extended time periods. Nevertheless, Csikszentmihalyi (1990) suggests that individuals experiencing flow should be highly efficient in their work.

Recently, the measurement of work efficiency has been influenced by the idea of multisource feedback (MSF; Fletcher and Baldry 1999). Because organizations have moved away from traditional hierarchical towards matrix structures and team- or project-based organization of work, the use of single source (i.e., supervisors) feedback or objective data are more frequently regarded as insufficient to appraise employee performance. MSF is based on at least three different sources. The evaluation of a target person from different perspectives is believed to increase the validity of performance ratings (Lawler 1967). We will use MSF as a criterion of flow in this study because MSF reflects work efficiency.

The achievement flow motive is expected to be positively correlated with work efficiency because confidence to master challenges does not arise from unrealistic positive thinking but from actual experiences of solving difficulties in the past. Thus, the mastery-oriented approach to difficulty inherent in the achievement flow motive indicates access to extended associate networks of action alternatives derived from autobiographical memory (i.e., extension memory; Kuhl 2000, 2001). Access to such a rich reservoir of action alternatives should be a real contributor to multiple constraint satisfaction and work efficiency. Furthermore, the *sense of control* component that is typically highlighted in the flow literature as a defining feature of the flow experience (Nakamura and Csikszentmihalyi 2002) may be the phenomenological correlate of access to extended associative networks.

Participants

Fifty-one trainees (19 women and 32 men) voluntarily participated in a career development program organized by the Nordakademie, one of the top-ranking business schools in Germany. Participants' age ranged from 22 to 32 years, with a mean age of 24.26 years.

Materials and procedure

The trainees were from various departments (such as business administration or industrial engineering), studying

half the time at the Nordakademie and working the other half at one of the partner companies. In a group session, all participants were instructed to ask for feedback from at least three sources. MSF data for all participants were collected within 4 weeks after the test session using Benchmarks, a 360 degree feedback instrument which was published by the Center for Creative Leadership (Lombardo and McCauley 1995). Four scales loading on one factor for work efficiency were selected from Benchmarks which seemed relevant for the purpose of this study: decisiveness, doing whatever it takes, customer orientation, and management of resources. Internal consistencies (Cronbach's alpha) of the Benchmark scales were all above .70 (medium .74; see Dalton et al. 1996).

After the MSF instruction, the Operant Motive Test was administered in the same group session. In this study, the OMT contained pictures of real life scenes that have been distorted by electronic filters. Interrater agreement on achievement flow motive was above .85, as was the case in the two prior studies.

Results and discussion

Descriptive information on the achievement flow motive is provided in Table 1. The pearson correlation between achievement flow motive and work efficiency was significant, $r(51) = .31$, $p < .03$. Participants high in achievement flow motive were more efficient in their work context according to multisource-feedbacks: They received higher ratings on decisiveness, doing whatever it takes, customer orientation, and efficient management of resources. As listed in Table 4, the relationship remained significant when using a non-parametric correlation (Kendall's Tau). Thus, the effect was not driven by a few outliers. To control for effects of the other components of the achievement motive on work efficiency, a regression analysis was calculated with all five components entered simultaneously in one step. Only achievement flow motive yielded a significant effect, $\beta = .31$, $t(1, 45) = 2.15$, $p < .04$.

Work efficiency could also be associated with decision-related action orientation (AOD), that is, with the ability to self-regulate positive affect. Controlling AOD was not possible because it was not assessed in Study 3. However, results from Studies 1 and 2 show that neither AOF nor AOD were significantly correlated with the achievement flow motive (see Table 2). Thus, it seems unlikely that the effects of the achievement flow motive were confounded with the effects of decision-related action orientation (i.e., self-motivation). The confidence to mastery difficulty inherent in the achievement flow motive seems to indicate good access to know-how that increases work efficiency. Findings support the ecological validity of the operant measure and suggest that achievement flow motive may be an informative variable for industrial and organizational psychology (Scheffer and Kuhl 2006).

Study 4

Study 4 was designed to demonstrate the workings of the achievement flow motive behind flow experience by using a classical method in flow research: the experience sampling method (Csikszentmihalyi and Larson 1987). In addition to self-ratings of flow experience during an outdoor assessment center, participants' overt behavior was rated by two independent raters. Behavior expectation scales (Smith and Kendall 1963) were used as a coding system for behavioral manifestations of the need component of seeing difficulty (e.g., planning, analytical problem solving) and the implementation component of mastering difficulty (e.g., high commitment, spreading optimism).

Previous findings show that individuals high in achievement flow motive have a latent potential for seeing and mastering difficulty as indicated by their specific configuration of personality traits (Baumann and Scheffer

Table 4 Non-parametric correlations (Kendall's Tau) between variables in Study 3 (Lower Left; $N = 51$) and in Study 4 (Upper Right; $N = 33$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Flow experience
(1) OMT flow		−.07	−.12	−.28	.13	−.02	.15	.37**
(2) OMT standards of excellence	.10		−.08	−.30	−.18	−.02	.05	−.07
(3) OMT coping with failure	.05	.20		−.03	−.01	−.01	−.02	−.22
(4) OMT pressure to achieve	−.01	−.03	.07		−.15	−.02	−.18	−.30*
(5) OMT fear of failure	−.19	−.48***	−.14	−.06		−.12	.09	.03
(6) Seeing difficulty							.25*	.16
(7) Mastering difficulty								.32**
Work efficiency (MSF)	.23*	.05	−.09	.02	−.14			

OMT Operant Motive Test, *MSF* Multi-Source-Feedbacks in Study 3

* $p < .05$; ** $p < .01$; *** $p < .001$

2009). In the present study, we wanted to extend these findings by looking at manifestations of autotelic patterns, in this case, a simultaneous presence of behaviors conducive to both an analytical focus on problems as well as an optimistic belief in mastery. According to our mediation hypothesis, we expected joint activation of both sets of behaviors to mediate the direct relationship between achievement flow motive and flow experience.

Participants

Thirty-three army officers (3 women and 30 men) voluntarily participated in a career development program in form of an outdoor assessment center organized by the Helmut-Schmidt-University, Hamburg and the Ellernhof. The mean age of participants was 23.6 years (range 21–27 years).

Materials

OMT and flow short scale (FKS)

The OMT (Kuhl and Scheffer 1999) was administered to assess the implicit achievement motive. The Flow Short Scale (FKS; Rheinberg et al. 2003; see also Rheinberg 2004) was used to assess all components of the flow state. The scale consists of 10 items. Example items are: "My thoughts/activities run fluidly and smoothly," "I am totally absorbed in what I am doing," "I have no difficulty concentrating." Items were rated on a 7-point scale from 1 (*completely disagree*) to 7 (*completely agree*). In the present study, internal consistency of the FKS ranged from .72 to .87 across seven test applications. Mean item scores (averaged across seven test applications) had an internal consistency of $\alpha = .82$. Mean individual flow scores were consistent across seven applications, $\alpha = .78$.

Behavior expectation scales (BES)

The scales were constructed according to Smith and Kendall (1963). Seeing difficulty was assessed by (a) decomposing and structuring tasks analytically, (b) generating hypotheses and plans to solve problems, and (c) restraint from task-irrelevant social exchange. Mastering difficulty was assessed by (a) commitment to tasks and instructions, (a) spreading optimism and motivating the team, and (c) staying power and good spirit in face of difficulties or negative feedback. Rating scales ranged from 1 to 4 with specific and elaborate behavioral descriptors at each scale point. The behavioral descriptors were defined by three independent teams consisting of experts of outdoor assessments. Participants' behaviors during each of the five team tasks were rated by two independent observers. The median of interrater agreement was $r = .71$. The behavioral indicators of seeing difficulty ($\alpha = .73$) and mastering difficulty ($\alpha = .67$) were consistent across five tasks.

Procedure

The developmental assessment center took place on three consecutive days. The total group was split into three (3×11 participants) so that each participant was involved for 1 day. At the beginning of each day (8 a.m.), participants filled out the OMT at the Helmut-Schmidt-University. After arriving at the Ellernhof, participants worked on five outdoor team tasks. *Building a bridge on a lake*: Teams of 5–6 participants had to use diverse prepared materials they found in the woods nearby. *Mohawk walk*: Participants had to help each other overcome obstacles while climbing on cables and beams approximately 2 feet above the ground. *Labyrinth in the dark*: Participants had to find their way together through a labyrinth in complete darkness, interrupted by problem-solving tasks given to them partly by intercom and partly by written messages they found on their way (they could be read by lighting some of the limited number of matches that were provided). *Giant ladder*: 5–6 participants had to help each other climb a "ladder" consisting of six massive beams approximately 6 feet apart from each other up to a height of about 30 feet. *Flying eagle:* At the end of the day, participants "sailed" down on a rope from about 25 feet above the ground. Participants were stopped seven times at random intervals to fill out the FKS. Two independent observers rated participants' behaviors during each of the five team tasks.

Results

Descriptives and correlations

Descriptive information on the achievement flow motive is provided in Table 1. Correlations between achievement flow motive and flow experience ranged from $r = .18$ ($p < .40$) to $r = .58$ ($p < .001$) across seven test applications. The non-parametric correlation between achievement flow motive and mean flow experience was significant (see Table 4).

Mediation model

The achievement flow motive was expected to go along with increased flow experience across tasks. This direct relationship was expected to be mediated by a joint activation of behaviors associated with seeing and mastering difficulty. To test the mediation model, a series of separate path analyses was conducted (Baron and Kenny 1986).

First, the direct path from achievement flow motive to flow experience was significant, $\beta = .46$, $t(31) = 2.85$, $p < .01$. Second, a regression analysis was conducted on the Seeing Difficulty × Mastering Difficulty interaction term as a dependent variable. Both variables were standardized before calculating their interaction term. Seeing difficulty and mastering difficulty were entered in step 1 (to control for their main effects) and achievement flow motive was entered in step 2. The achievement flow motive was significant, $\beta = .37$, $t(29) = 4.06$, $p < .01$, indicating that achievement flow motive was associated with a stronger cooccurrence of seeing and mastering difficulty.

Correlations further corroborate the relationship between achievement flow motive and the assumed behavioral pattern: Whereas the correlation between seeing and mastering difficulty was not significant for participants without achievement flow motive ($r = -.01$, ns), it was highly significant for participants with achievement flow motive ($r = .96$, $p < .001$). To rule out the possibility that effects were driven by joint *inhibition* (low/low combinations) instead of joint *activation* (high/high combinations) of seeing and mastering difficulty, both variables were median split and frequencies of the four possible combinations tested against chance level. As listed in Table 5, among participants without achievement flow motive, all combinations of behaviors occurred with equal frequency, χ^2 (1, $N = 21$) $= .40$, $p = .53$. In contrast, among participants with achievement flow motive, the high/high combination of seeing and mastering difficulty was significantly overrepresented, χ^2 (1, $N = 12$) $= 5.18$, $p < .05$.

Third, a regression analysis was conducted on flow experience with achievement flow motive entered in step 1, seeing difficulty and mastering difficulty entered in step 2, and the Seeing Difficulty × Mastering Difficulty interaction entered in step 3 (see Table 6). The Seeing Difficulty × Mastering Difficulty interaction was significant, $\beta = .69$, $t(28) = 2.41$, $p < .03$. We used unstandardized regression weights using a range of ±1 SD for both predictor variables to graph this interaction. As depicted in Fig. 2, flow experience was high when participants jointly focused (or alternated their focus) on seeing and mastering difficulty. In contrast, flow experience was low when participants activated seeing difficulty and mastering difficulty alone or not at all. Fourth, the direct relationship between achievement flow motive and flow experience was no longer significant when controlling for seeing difficulty, mastering difficulty, and their interaction term, $\beta = .13$, $t(28) = .73$, $p > .47$ (see step 3 in Table 6).

The mediation model is illustrated in Fig. 3. The Sobel test (Sobel 1982) of the indirect path was significant, $z = 2.03$, $p < .05$. Because of the skewed distribution of the achievement flow motive, we also used dichotomized scores (achievement flow motive not present = 0 vs. present = 1) that do not assume an interval scale. All of the reported findings remained significant. Thus, effects were not driven by a few outliers. Findings are consistent with the assumption that individuals high in achievement flow motive tend to jointly activate (or alternate between) a focus on difficulty and a focus on mastery. This behavioral pattern partially explains why individuals with a strong achievement flow motive often experience flow across different tasks.

Discussion

Consistent with previous findings (Baumann and Scheffer 2009), the achievement flow motive was significantly correlated with flow experiences during various outdoor team tasks. Although the outdoor assessment center was especially designed to allow for low to moderate degrees of flow in most individuals, those with a stronger need to experience flow were better able to actually experience flow during the various tasks. In addition, findings contribute to an understanding of how flow motivated individuals manage to get fully immersed in the tasks. The achievement flow motive became manifest in an overt behavioral pattern of seeing difficulty (planning, analytical problem solving, and task focus) and mastering difficulty (commitment, optimism, and staying power). Both sets of behaviors had sufficient internal consistency, interrater reliability, and consistency across tasks.

Notice that achievement flow motive was neither significantly associated with seeing difficulty nor with

Table 5 Frequency (in %) of seeing difficulty × mastering difficulty combinations as a function of achievement flow motive in Study 4 ($N = 33$)

	Without achievement flow motive		With achievement flow motive	
	Low mastery	High mastery	Low mastery	High mastery
Seeing difficulty: low	33.33	19.05	33.33	8.33
Seeing difficulty: high	23.81	23.81	8.33	50.00

Behavior expectation scales (BES) for seeing difficulty (e.g., planning, analytical problem solving) and mastering difficulty (e.g., high commitment, spreading optimism) were median split

Table 6 Summary of hierarchical regression analysis for variables predicting flow experience in Study 4 ($N = 33$)

	ΔR^2	β	t
Step 1	.21**		
Achievement flow motive (OMT)		.46**	2.85
Step 2	.18*		
Achievement flow motive (OMT)		.38*	2.54
Seeing difficulty		−.03	−.20
Mastering difficulty		.42*	2.68
Step 3	.11*		
Achievement flow motive (OMT)		.13	.73
Seeing difficulty		.38	1.66
Mastering difficulty		.66**	3.71
Seeing × mastering		.69*	2.41

* $p < .05$; ** $p < .01$

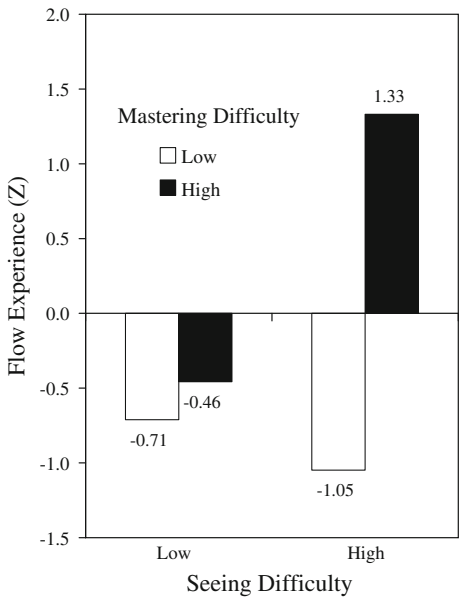

Fig. 2 Flow experience as a function of an overt behavioral pattern of seeing difficulty (e.g., planning, analytical problem solving, and task focus) and mastering difficulty (e.g., high commitment, spreading optimism, and staying power) during outdoor team tasks in Study 4

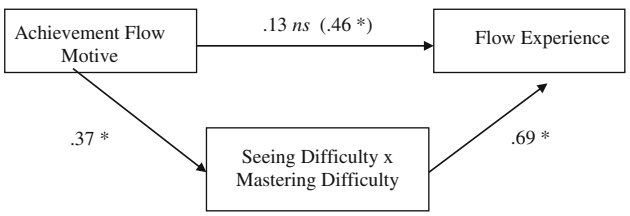

Fig. 3 The mediation model with an overt behavioral pattern of seeing difficulty (e.g., planning, analytical problem solving, and task focus) and mastering difficulty (e.g., high commitment, spreading optimism, and staying power) mediating the direct effect of achievement flow motive on flow experiences during outdoor team tasks in Study 4. Reported coefficients are standardized betas. *$p < .05$

mastering difficulty per se (see Table 4). There are many personality dispositions that may be more strongly associated with either one of these behaviors. However, achievement flow motive was significantly associated with the simultaneous presence of both sets of behaviors. Whereas seeing and mastering difficulty were completely uncorrelated for individuals without achievement flow motive, they were closely linked for those with achievement flow motive. Findings point to the importance of looking at interactions of systems (e.g., traits, behaviors, etc.) in addition to their main effects.

Similarly, mastery behaviors were significantly correlated with flow experience and explained 18% of the variance (in addition to the 21% explained by achievement flow motive). However, mastery behaviors did not significantly reduce the impact of achievement flow motive on flow experience. It was the interaction of seeing and mastering difficulty that explained an additional 11% of the variance in achievement flow motive and partially mediated the direct relationship between achievement flow motive and flow experience (see Table 6). The cooccurrence of analytical and motivating behaviors seems to be an interesting (flow-conducive) compound that is not fully explained by its elements.

General discussion

In the present research, we investigated the workings of an achievement flow motive behind flow experience. In a mix of field and lab studies, we demonstrated the stability and validity of a motive disposition to seek flow in the achievement domain. In all four studies, achievement flow motive was assessed by the operant motive test (OMT; Kuhl and Scheffer 1999). Consistent with expectations, our findings show that the achievement flow motive was stable over a period of 2 years (Study 1), associated with self-determination (Study 2) and efficiency at work (Study 3); in addition, we confirmed more experiences of the various aspects of flow during an outdoor assessment center (Study 4). In accordance with Csikszentmihalyi's (1990) idea of an autotelic personality, a motive disposition to seek flow in the achievement domain seems to enable individuals to create more self-determination, work efficiency, and experiences of being fully immersed across different tasks and situations. Conversely, individuals with high self-determination, high efficiency at work, and frequent experiences of flow may see more options for getting fully immersed in difficult tasks.

Findings contribute to the validity of the new measure and are consistent with the idea of an achievement flow motive behind flow experience. Thus, our measure connects research on flow to the literature on implicit motives.

Because flow is typically characterized by self-absorption and a loss of self-consciousness, it seems very difficult to introspect about underlying causes. Our operant motive measure can circumvent these difficulties and contribute to a better integration of distinct research areas. Thus, the achievement flow motive may offer researchers a way to operationalize Csikszentmihalyi's concept of an autotelic personality (Csikszentmihalyi 1975, 1990, 2000; Csikszentmihalyi et al. 1993). Furthermore, it may contribute to an investigation of the functional mechanisms underlying flow motivation.

The disposition to seek achievement flow was associated with a behavioral pattern indicative of seeing difficulty (planning, analytical problem solving, and task focus) and mastering difficulty (commitment, optimism, and staying power). Consistent with our mediation hypothesis, the combination of these behaviors mediated the direct relationship between achievement flow motive and flow experience in an outdoor assessment center. Planning and confrontation with difficulty have been theoretically associated with reductions in positive affect (Kazén and Kuhl 2005; Kuhl and Kazén 1999) whereas mastery has been identified as a self-regulatory strategy that may help to restore positive affect (Baldwin 2001; Harackiewicz et al. 2002; McGregor and Elliot 2002). Therefore, jointly activating or alternating between difficulty and mastery may involve affective change which, in turn, may promote flow experience (Baumann and Scheffer 2009). Neither reductions in positive affect due to a focus on difficulty nor self-regulatory attempts to restore positive affect have to be consciously experienced. Findings by Koole and Coenen (2007) and Koole and Jostmann (2004), for example, suggest that self-regulatory abilities can be operated intuitively.

Affective change has been proposed to play an important role in achievement motivation in general because an achievement-related episode typically starts with a phase of reduced positive affect (when a person is confronted with difficulty, challenge or frustration) which turns into positive affect when the person anticipates or obtains success (Kuhl 2001, p. 551; McClelland et al. 1953). To the extent that our behavioral measures are indeed associated with the presumed affective states, the present findings offer further support for the assumption that affective change may be more important to flow motivation in the achievement domain than positive affect per se (cf. Baumann and Scheffer 2009). Correspondingly, Oettingen et al. (2001) found that contrasting positive fantasies about the future with difficulties in reality increases the quality of goal commitment. To the contrary, when individuals only indulge in positive fantasies about the future or only reflect on difficulties, goal commitment is not adjusted to expectations of success.

The present findings are also compatible with dynamic theories of action control such as personality systems interactions (PSI) theory (Kuhl 2000, 2001; Kuhl and Koole 2004). Within the framework of PSI theory, achievement flow can be defined as an optimal coupling between intention memory and its output system (intuitive behavior control) through self-motivation (Baumann and Scheffer 2009). Intention memory is conceived of as a network of central executive functions involving active maintenance of an intention in working memory, planning, analytical problem solving, and inhibition of premature initiation of action in order to allow mental simulation of possible solutions to a problem. Overt behaviors such as *"generating hypotheses and plans"* may indicate an activation of intention memory that tends to decouple intentions from action. According to PSI theory, it takes positive affect to recouple intention memory with its output system (Kazén and Kuhl 2005; Kuhl and Kazén 1999).

Overt behaviors such as *"spreading optimism"* may indicate the ability of individuals high in achievement flow motive to self-generate positive affect. The findings of Study 2 are consistent with the assumption that individuals high in achievement flow motive have good access to their experiential self which is a strong source of positive affect and intuitive affect regulation (e.g., Greenwald and Banaji 1995; Koole and Coenen 2007; Koole and Jostmann 2004; Sedikides and Strube 1997). Positive affect has often been associated with behavioral facilitation and the enactment of automatic action tendencies. However, in conjunction with a focus on difficulty (i.e., activation of intention memory), positive affect may also lead to a volitional facilitation, that is, a smooth transition of intentions into action that is subjectively experienced as flow.[5]

Limitations and future perspectives

The present research is still preliminary and thus leaves a host of questions open for future research. First, our motive measure assessed the tendency to seek flow in the achievement domain. Future studies could investigate the stable causes of flow motivation involved in the social domains of affiliation and power. Mutually coordinating one's own activities with other people and experiencing flow, for instance, while dancing, conversing, or playing games with children may rely more strongly on intuitive

[5] We believe that negative affect does not play a role in flow experience for individuals with an achievement flow motive. However, the absence of negative affect may be an additional prerequisite for individuals high in fear of failure. They experience flow only under very relaxed conditions, for example, when tasks are so easy that success is guaranteed or when tasks are so difficult that a failure cannot be attributed to inability (Schüler 2007).

patterns of behavior control (cf. Papoušek and Papoušek 1987) that are easily disturbed by reflective behavior, analytical problem solving, and reductions in positive affect (Kuhl 2001).

Second, affective states were only indirectly inferred from participants' overt behavior. Future work would profit from more direct measures of affect in order to examine the role of affective change in achievement flow. Third, participants were provided with tasks that are able to elicit moderate flow levels in most people. Thus, participants' behavior was not completely spontaneous. Future studies should investigate if individuals high in achievement flow motive tend to create flow experiences in the absence of such externally provided opportunities.

Finally, our measure of achievement flow motive has a very skewed distribution. Across studies, only 26% of people on average seem to have a need to get fully immersed in difficult tasks. It would be informative to test whether the sensitivity of the OMT can be increased by adding pictures that stronger stimulate the achievement flow motive. Alternatively, it seems reasonable to assume that the achievement flow motive is not distributed proportionally in the population. If autotelic personalities really integrate opposing (or at least independent) talents (Csikszentmihalyi et al. 1993; Baumann and Scheffer 2009) the high/high combination makes up approximately 25% of the population.

Conclusion

The present research sheds more light on the personal underpinnings of flow. Individuals do not only experience flow if they encounter optimal task conditions. In addition, individuals differ in the need to actively seek and create their own flow experiences. The present findings show that frequent flow experiences may be driven by a stable achievement flow motive. Thus, when you see a person getting fully immersed in solving difficult puzzles or training for a marathon, you may explain this behavior by a motive disposition to seek and master challenges. The achievement flow motive may promote a set of specific behaviors such as analyzing problems (seeing difficulty) and spreading optimism (mastering difficulty). In turn, being able to focus on both aspects or shift between difficulty and mastery may promote flow experiences.

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