

Do implicit motives and basic psychological needs interact to predict well-being and flow? Testing a universal hypothesis and a matching hypothesis

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Abstract Self-Determination Theory (Deci and Ryan in *Intrinsic motivation and self-determination in human behavior*. Plenum Press, New York, 1985) suggests that certain experiences, such as competence, are equally beneficial to everyone's well-being (universal hypothesis), whereas Motive Disposition Theory (McClelland in *Human motivation*. Scott, Foresman, Glenview, IL, 1985) predicts that some people, such as those with a high achievement motive, should benefit particularly from such experiences (matching hypothesis). Existing research on motives as moderators of the relationship between basic need satisfaction and positive outcomes supports both these seemingly inconsistent views. Focusing on the achievement motive, we sought to resolve this inconsistency by considering the specificity of the outcome variables. When predicting domain-specific well-being and flow, the achievement motive should interact with felt competence. However, when it comes to predicting general well-being and flow, felt competence should unfold its effects without being moderated by the achievement motive. Two studies confirmed these assumptions indicating that the universal and matching hypotheses are complementary rather than mutually exclusive.

Keywords Self-determination theory · Motive disposition theory · Basic psychological needs · Implicit motives · Flow experience · Subjective well-being

Introduction

Two influential theories of human needs – the Basic Psychological Need Theory, which is a sub-theory of Self-Determination Theory (SDT; Deci and Ryan 1985, 2000; Ryan and Deci 2002), and the approach dispositional motives in McClelland's (1985) research tradition, which will be referred to in the following as Motive Disposition Theory (MDT) – address similar phenomena, but have so far rarely been theoretically and empirically linked (for exceptions see Schüler and Brandstätter, in press; Schüler et al. 2010; Sheldon and Schüler 2011). Although both theories are about similar concepts, such as the desire to interact efficiently with one's environment, called *need for competence* in BNT and *achievement motive* in MDT, the desire to have harmonious relationships with others with whom one feels socially related, called *need for relatedness* in BNT and *affiliation motive* in MDT, and the desire to free oneself from the impact of others and external pressure, called *need for autonomy* in BNT and addressing an important component of the *power motive* according to MDT (see Sect. "General discussion" for details on similarities and differences between need for autonomy and the power motive), only a few studies exist which consider elements of both theories simultaneously. The limitation of relatively few extant studies is worsened by the fact that the studies revealed inconsistent results as to whether the main concepts of both theories, which are basic needs and motives, interact to predict well-being and flow. The present paper starts by briefly describing the main

assumptions of SDT and MDT that lead to contrary predictions regarding whether implicit motives and basic needs interact. These will later be called the matching and universal hypotheses, respectively. Then, previous empirical evidence supporting the two contrary predictions will be summarized. We will then shed new light on this inconsistent pattern of results by suggesting an explanation which we will test in two studies.

Basic psychological needs theory

SDT contains several mini-theories, reflecting historical, empirical, and conceptual trends. Basic Psychological Needs Theory (Deci and Ryan 1985, 2000; Ryan and Deci 2002) is one such mini-theory, which proposes that the satisfaction of three innate basic psychological needs account for an individual's intrinsic motivation, such as flow experience and well-being. The *need for competence* concerns succeeding at challenging tasks and experiencing effectance when attaining desired outcomes (White 1959). The *need for relatedness* concerns establishing a sense of communion with others which is accompanied by the experience of reciprocal care and concern for important others (Baumeister and Leary 1995). The *need for autonomy* refers to the experience of being the initiator or author of one's own behavior and is associated with feelings of choice and psychological freedom (deCharms 1968).

These basic needs are conceptualized as innate (rather than learned) requirements in the sense that their satisfaction is a universal nutriment necessary for optimal functioning, psychological growth and well-being. These requirements are said to exist regardless of individual differences such as gender, social class, and personality traits, and regardless of whether or not individuals consciously rate the needs as being important for them (Deci and Ryan 2000; Vansteenkiste et al. 2010). Thus, need satisfaction is said to be equally beneficial to all humans. Instead, what differs between people is the extent to which psychological needs are currently being met. SDT researchers therefore focus on environmental features that facilitate or hinder need satisfaction (Deci and Ryan 2000).

A broad body of research has confirmed the assumed relationship between satisfaction of the three basic needs and a variety of positive outcomes. Specifically, need satisfaction is associated with adaptive psychological functioning (Ryan 1995), well-being (Baard et al. 2004; for a summary see Ryan and Deci 2008; Sheldon 2004), health-behavior change (Williams et al. 2009), and intrinsic motivation (Illardi et al. 1993) and has even been shown to predict a longer life span (Kasser and Ryan 1999). The beneficial effects of need satisfaction on well-being have been found to be equally strong for women as well as for men (Ryan et al. 2005) and for individuals belonging to different cultures, for example

those raised within individualistic cultures (Reis et al. 2000) as compared to those raised in collectivistic cultures (Lynch et al. 2009; Sheldon et al. 2011; Vansteenkiste et al. 2006), all of which supports the assumption that the basic needs are equally essential for everyone.

Motive disposition theory

Another important approach to human needs is found in McClelland's (1985) work on motives. Because one crucial point in this conceptualization is that individuals differ in the strength of relatively stable motives, we will refer to this theory as the Motive Disposition Theory (MDT) (for the use of this term, see also Sheldon and Schüler 2011). MDT mainly focuses on three motives, which are assumed to energize and direct human behavior. The *achievement motive* is the desire to "perform better", to have successful interactions with the environment that meet and exceed high standards of excellence (McClelland et al. 1953). The *affiliation motive* is the desire to experience warm and friendly interpersonal relations with others (Atkinson et al. 1954; French and Chadwick 1956)¹. The *power motive* is the desire to have an impact on other individuals and to gain reputation and prestige (Winter 1973).

These motives are conceptualized as preferences for certain kinds of incentives which are learned in early childhood (e.g., McClelland et al. 1989; Murray 1938) based on the principles of operant and Pavlovian conditioning (McClelland et al. 1953). As a consequence of different learning experiences, individuals acquire differently strong and stable "capacities to experience the attainment of a certain type of incentive as rewarding" (Schultheiss and Hale 2007, p. 13). Individuals who have developed a strong achievement, affiliation or power motive strongly direct their future behavior toward cues which promise the attainment of achievement, affiliation, or power incentives, respectively, which have in the past been learned to be rewarding in the sense of being associated with positive emotions (McClelland 1985). Thus, the MDT research approach is mainly interested in measuring individual differences in motives and in their behavioral consequences (for summaries see Schultheiss 2008; Schultheiss and Pang 2007).

¹ McAdams (1980) distinguished between the intimacy motive and the affiliation motive. The former is characterized by the desire for experiences of warmth and closeness in close dyadic relationships (partner, best friend) (McAdams 1992), whereas the affiliation motive is the desire to feel liked and accepted and enjoy the companionship of other persons or groups of persons (close or less close). Due to a large phenomenological overlap (e.g., both concepts involve the chronic desire to spend harmonious time with other people) later versions of affiliation motivation have combined features of both concepts into a single concept (called affiliation/intimacy, for example, by Winter 1991).

The universal hypothesis and the matching hypothesis

The most important similarity between the two theories is the content of their main concepts. The basic need for competence and the achievement motive both have, at their hearth, the experience of competence. The need for social relatedness and the affiliation motive both deal with the experience of warm interpersonal relations. Broader phenomenological and conceptual differences exist for the power motive and the experience of autonomy (see also Schüler et al. 2010). Whereas the power motive is regarded as the desire for “power over other people”, that is the desire to influence others in order to feel strong (Lewin 1951; McClelland 1985; Winter 1973), the need for autonomy is conceptualized as the “power over oneself”, that is a sense of self-determination (e.g., Deci and Ryan 1985). In other words, although both motives deal with control, one references the control of others and the other self-control. Because of this ambiguity it seems unwarranted to treat the power motive as a dispositional counterpart of the need for autonomy (see also Sect. “General discussion”).

Coming back, however, to the similarities between the achievement motive and the need for competence as well as the affiliation motive and the need for relatedness, respectively, an important question has to be asked: Do the motive dispositions interact with basic need satisfaction to determine well-being and optimal motivation, such as the flow experience? That is, if a person has a strong achievement motive, does he have even more positive experiences when he feels competent than somebody with a weaker achievement motive? Or does everybody get the same boost from felt competence?

In fact, SDT and MDT lead to contrary predictions about whether motives and basic need satisfaction interact to predict subsequent positive experience. SDT assumes that basic needs are innate psychological requirements whose fulfillment is essential for the psychological growth, integrity, and well-being of any individual (Deci and Ryan 2000; see also Sheldon and Schüler 2011). In the following we will refer to the assumption that need satisfaction is equally beneficial for everybody as the “universal hypothesis”. Using the example of the achievement domain, SDT would assume that individuals with a high or low achievement motive do not differ in their positive reactions to the basic need for competence satisfaction.

In contrast, the MDT assumes that individuals with a strong motive have a higher capacity to experience corresponding incentives as being rewarding (Schultheiss 2008) than individuals with a low motive. From an MDT perspective, individuals with a strong achievement motive are presumed to have a higher tendency to benefit from feelings of competence satisfaction than individuals with a low

achievement motive. In the following we will refer to this assumption as the “matching hypothesis”. It says that need satisfaction is beneficial for everybody, but that it is more beneficial to individuals with a high corresponding motive.

Previous studies examining the motive need satisfaction interaction

The few previous studies that have examined the interaction between motives and basic need satisfaction (Hofer and Busch 2011; Schüler et al. 2010; Schüler and Brandstätter, in press; Sheldon and Schüler 2011) have not established whether the universal or the matching hypothesis is correct; evidence in support of both hypotheses has been found. Support for the matching hypothesis is for example provided by a correlative field study conducted by Schüler et al. (2010) in sports, which revealed that the expected positive effect of need for competence satisfaction upon flow experience was moderated by the achievement motive, in the sense that individuals with a high achievement motive experienced more flow when they felt competent than individuals with a low achievement motive. This basic need-motive interaction has in the meantime been replicated in further studies using different study designs. For example, the interaction between the achievement motive and basic need for competence satisfaction was replicated in an experiment in which felt competence was experimentally induced (Schüler and Brandstätter, in press, study 2). The interaction between motives and need satisfaction was also shown in the affiliation domain: In a correlational field study among the participants of fitness courses, individuals with a high affiliation motive experienced more flow when they felt socially related than individuals with a low affiliation motive, and their flow experience was also relatively more impaired when their need for relatedness was thwarted (Schüler and Brandstätter, in press, study 3). Hofer and Busch (2011) showed that motives interact with need satisfaction to predict domain-specific satisfaction. Thus, the achievement motive moderated the effects of felt competence on job satisfaction, whereas the affiliation motive influenced the effects of felt relatedness on relationship satisfaction.

However, when it comes to predicting general well-being, the pattern of results looks different. Sheldon and Schüler (2011) showed in a series of studies with undergraduate students that need for competence and relatedness satisfaction predicted participants’ well-being, and that this relationship was neither influenced by the participant’s corresponding explicit motive (studies 1–3) nor by the corresponding implicit motive (Study 4). In other words, when predicting general well-being, need satisfaction was equally beneficial for all people (see also Schüler, in prep.).

Summing up, previous research concerning motive dispositions and basic need-satisfaction, basic need satisfaction consistently predicts flow and well-being in all studies. However, the pattern of results is ambiguous concerning whether motive dispositions modulate these relations. It seems that implicit motives interact with the corresponding basic need satisfaction when predicting the flow experience (see Schüler and Brandstätter, in press; Schüler et al. 2010) and domain-specific satisfaction (Hofer and Busch 2011) (supporting the matching hypothesis), but not when predicting global subjective well-being (see Schüler, in prep; Sheldon and Schüler 2011) (supporting the universal hypothesis).

Present research

In order to shed new light on this issue, we took a closer look at the measures of the relevant concepts in the previous studies cited above. In doing so, a systematic difference became apparent which has not been considered before. In the studies analyzing whether the interaction of motives and basic need satisfaction predicts flow (Schüler and Brandstätter, in press; Schüler et al. 2010), the outcome variable referred to a specific behavioral domain. For example, participants were asked to indicate their flow experience while performing their sports (Schüler and Brandstätter, in press; Schüler et al. 2010).

In contrast, in Sheldon and Schüler's (2011) studies participants indicated their *general* well-being and did not refer to domain-specific experiences. Thus, the ambiguous results of previous studies might be attributable not to different outcome variables (flow and satisfaction vs. well-being), but to the specificity of their measurement (domain-specific vs. general).

We assume that domain-specific well-being and flow result from the following process: when a person with a high motive (e.g., achievement motive) engages in a corresponding domain (e.g., an achievement context, such as studying) and experiences the corresponding need satisfaction (e.g., competence), this will lead to a greater momentary well-being and flow experience than for a person with a low achievement motive. This is in accordance with MDT's assumption that the attainment of motive-corresponding incentives results in positive affect (McClelland 1985). The motive determines how a person regulates her momentary mood and derives satisfaction from of certain situations. As a concrete example, the achievement motive should be able to predict the effects of felt competence on momentary well-being and flow in a specific achievement context.

However, positive experiences (e.g., felt competence) in specific life domains (e.g., studying) do not necessarily make the person happier overall. We assume that general well-being and flow depend on many other types of

contexts and additionally on the sum and balance of the three basic needs across multiple contexts (Sheldon and Niemiec 2006). Thus succeeding in one motive (e.g., achievement) in one context (e.g., studying) may fail to generalize to predict general well-being and flow. This assumption is in accordance with Vallerand's (1997) hierarchical model of motivation, in which three hierarchical levels of generality of motivation (from the lowest to the highest level: situational, contextual, global motivation) are assumed. According to Vallerand, the sum of processes at the contextual level cumulates to determine global effects, with no one context determining global outcomes. In our studies, we compared contextual processes (e.g., experiences while studying, being at work) and global processes, expecting to find motive x corresponding need interactions at the contextual but not the global level.

Summing up, we hypothesized that all individuals benefit from need satisfaction to some degree (main effect) and that implicit motives come into the picture under certain circumstances. Considering the specificity of measurement (domain-specific vs. general) outlined above, we hypothesized that the matching hypothesis (assuming an interaction between the achievement motive and competence satisfaction) should be confirmed when predicting domain-specific flow and well-being, whereas the universal hypothesis (assuming just a main effect of competence satisfaction) should be true when predicting general flow and well-being.

Although we assume these assumptions to be true for all constellations of motives and their corresponding need satisfaction (e.g., achievement motive and need for competence, affiliation motive and need for relatedness), we decided to start our examination of the interaction between motives and need satisfaction by focusing on the achievement domain. The reason for this is that we are interested in flow experience as a dependent variable (in order to replicate the above-mentioned results of previous studies) and flow is strongly associated with mastery-related behavior in performance contexts (Csikszentmihalyi et al. 2005).

Furthermore, the theoretical conceptualizations of the power motive and the need for autonomy need to be further discussed and empirically evaluated before testing the interaction between the two concepts (see Sect. "General discussion").

Study 1 examined the interaction between the achievement motive and competence satisfaction at the workplace, whereas Study 2 analyzed the interaction in an academic learning setting.

Study 1

Again, we propose that Sheldon and Schüler (2011) and Schüler (in prep) did not find a significant motive-need

satisfaction interaction effect on well-being because the well-being measure was general rather than domain-specific. If this is so, then asking participants to imagine a concrete situation when rating their well-being should show the implicit motive's influence on the effects of need satisfaction on well-being. Thus in Study 1 we expected to confirm the matching hypothesis. Furthermore, in accordance with our previous findings (Schüler and Brandstätter, in press; Schüler et al. 2010) we also hypothesized that need for competence satisfaction would predict flow experience and well-being positively (main effect of need satisfaction).

Method study 1

Participants and procedure

Eighty-eight female and 77 male employees from five different occupational groups (e.g., services sector, building industry, financial sector) with a mean age of 36.6 ($SD = 10.8$) took part in the study. Participants of the occupational groups did not differ in any of the assessed variables. They indicated their interest in participating in the study after reading an advertisement in a popular newspaper and received a link to a first web survey via e-mail. The web survey measured the participants' achievement motive and asked after competence need satisfaction. A few weeks later participants received a second link to a web survey in which they were asked to think about a typical working day and refer the following statements to that day. Then the flow and well-being measures were administered. Participants were thanked for their participation and fully debriefed. The web survey was split into two parts because further variables, which are not part of this research question, were also assessed, and the two web surveys lasted about 30 min each.

Measures

Need for competence satisfaction Competence satisfaction was measured by asking participants to use a 5-point rating scale (1: I totally disagree 5: I totally agree) to respond to the items "I feel competent", "I often feel incompetent and incapable" (reversed) and "I feel very capable and effective". This measure was revealed to be reliable with a Cronbach's alpha of .88.

Implicit achievement motive The implicit achievement motive was measured using the achievement scale of the Multi-Motive Grid (MMG, Sokolowski et al. 2000). The MMG is a semi-projective measure designed to assess the implicit achievement, affiliation and power motives. The reliability and validity of the MMG has consistently

been proven (Gable et al. 2003; Kehr 2004; Langens and Schmalt 2002; Puca 2005; Puca et al. 2006; Schüler et al. 2008). For example, in support of its predictive validity, the MMG achievement motive score predicted performance (Puca and Schmalt 1999). Supporting its convergent validity, the achievement motive grid (which is a precursor of the MMG) was significantly correlated with the TAT achievement motive score (Schmalt 1999).

The MMG is further differentiated into a hope and a fear component for each motive (e.g., hope of success and fear of failure). The MMG presents 14 pictures showing everyday situations (e.g., persons taking an exam, rope climber) which are followed by statements describing feelings, thoughts and action tendencies (e.g., hope of success: feeling confident about succeeding at this task, feeling good about one's competency, fear of failure: thinking about lacking abilities for this task, wanting to postpone a difficult task for a while) which are adapted for each motive. Participants have to agree or disagree with each statement and the agreements are aggregated to form a sum score for each hope and fear component of each motive (range of possible score: 0–12). In accordance with Atkinson's (1964, see also Atkinson and Feather 1966) reasoning that hope of success as well as fear of failure both have to be considered in order to determine a resultant motivation tendency in achievement situations, we computed a difference score by subtracting the fear of failure score ($M = 3.46$, $SD = 2.42$, Cronbach's Alpha = .67) from the hope of success score ($M = 7.62$, $SD = 2.45$, Cronbach's Alpha = .70) (variables were z-transformed before subtraction). In the following we will refer to this score as the achievement score (ACH) (For similar overall measures of the achievement motive, see Puca 2005; Schüler 2007; and Schüler et al. 2010).

Domain-specific flow experience We used the flow short scale (FSS) by Rheinberg et al. (2003) and slightly modified the instructions. Participants were asked to imagine a typical working day vividly and to refer the following questions to that day. The flow short scale consists of 10 items representing different aspects of flow (e.g., I am totally absorbed by what I am doing; I do not recognize that time is going by, I feel that everything is under control). Participants rated whether they agree with each item using a 7-point rating scale (1: no agreement 7: full agreement). An average score of flow experience was computed (Cronbach $\alpha = .85$).

Domain-specific well-being We measured domain-specific well-being using the same instructions as used in the flow measure. After reading the instructions, participants filled in the Positive and Negative Affect Schedule (PANAS, Watson et al. 1988; German version by Krohne

et al. 1996) by rating 10 positive affect items (e.g., interested, excited, strong) and 10 negative affect items (e.g., distressed, nervous, afraid) on a 7-point rating scale (1: no agreement 7: full agreement). An average score for positive affect (Cronbach's alpha = .93) and negative affect (Cronbach's alpha = .85) was computed by averaging the corresponding items.

Results study 1

Preliminary analyses, descriptive statistics and correlations

Preliminary analyses revealed that men and women did not differ in any of the relevant variables and that sex did not influence the results reported below.

Correlational analyses showed that need for competence satisfaction (ComNeedSat) was positively correlated with the achievement motive, $r = .18$, $p < .05$, highly correlated with domain-specific flow experience, $r = .42$ ($p < .001$), with domain-specific positive affect, $r = .54$ ($p < .001$) and with domain-specific negative affect, $r = -.44$ ($p < .001$) (for details see Table 1). The achievement motive (ACH) was associated with participants' age, $r = .13$ ($p < .05$) and positive affect, $r = .26$ ($p < .01$). Furthermore, domain-specific positive and negative affect were negatively related ($r = -.46$, $p < .001$). The age of participants was significantly related to domain-specific

positive affect, $r = .25$ ($p < .01$) and negative affect, $r = -.18$ ($p < .05$).

Moderation analyses

A hierarchical regression analysis (using z-transformed predictors), with the achievement motive (ACH) and competence need satisfaction (ComNeedSat) entered in the first step and the ACH \times ComNeedSat interaction term entered in the second step, was conducted to predict domain-specific flow experience at the workplace. It revealed a significant main effect for ComNeedSat, $b = .50$, $se_b = .07$, $p < .001$. Furthermore, the ACH \times ComNeedSat interaction reached significance, $b = .22$, $se_b = .06$, $p < .01$ (for details see Table 2). This interaction is illustrated in Fig. 1 (using the procedure recommended by Cohen et al. 2003) and shows that individuals who felt high competence reported a stronger flow experience than individuals who felt low competence. However, this was particularly true of individuals with a high achievement motive. They benefited more (in terms of flow) from feeling competent, but also suffered more from feeling incompetent than individuals with a low achievement motive.

A supplementary post hoc analysis, as recommended by Aiken and West (1991, Johnson-Neyman technique), revealed that in accordance with our hypothesis the difference in flow between low and high ComNeedSat was significant for individuals with a high achievement motive

Table 1 Descriptive statistics and correlation coefficients of variables of study 1

		1	2	3	4	5	M	SD
1	ComNeedSat	1					3.94	.91
2	ACH	.18*	1				0.00	1.34
3	Specific flow	.42***	.12	1			4.69	.79
4	Specific positive affect	.54***	.26**	.62***	1		3.39	.86
5	Specific negative affect	.44***	.08	.33***	.46***	1	1.91	.67

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

Table 2 Hierarchical regression of domain specific flow experience on the achievement motive (ACH) and competence satisfaction at the workplace (ComNeedSat) (study 1)

Step	Variable	ΔR^2	df	ΔF	β^a
1	Main effects	.18	2, 162	18.03***	
	ACH				.03
	ComNeedSat				.50***
2	ACH \times ComNeedSat	.07	1, 161	15.23***	.28***
	Cumulative R^2	.25	3, 161	18.15***	

β^a is the standardized regression coefficient in the regression equation

*** $p < .001$

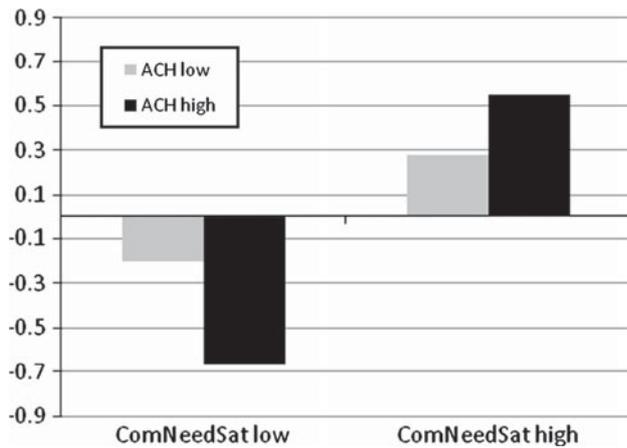


Fig. 1 Domain specific flow experience at the work place as a function of the implicit achievement motive (ACH) and need for competence satisfaction (ComNeedSat) (study 1)

(one SD above the mean), $b = .72$, $se_b = .10$, $p < .001$. The interaction was also significant, but less so, for individuals with a low achievement motive (one SD below the mean), $b = .28$, $se_b = .08$, $p < .01$.

Two further analyses regressing positive affect and negative affect, respectively, on ACH and ComNeedSat (Step 1) and the interaction of the two variables (Step 2) revealed a similar pattern of results (see Table 3; Fig. 2).

In the analysis predicting domain-specific positive affect, ComNeedSat ($b = .55$, $se_b = .07$, $p < .001$) and the ACH \times ComNeedSat interaction ($b = .12$, $se_b = .05$, $p < .05$) both accounted for a significant amount of variance. Controlling for participants' age did not change the pattern of results (see footnote 1). A post hoc analysis (again using Johnson-Neyman's technique) revealed that the difference between low and high ComNeedSat was significant for individuals with a high achievement motive, $b = .68$, $se_b = .10$, $p < .001$ and significant, but to a lesser degree, for individuals with a low achievement motive, $b = .43$, $se_b = .07$, $p < .001$.

In the analysis predicting domain-specific negative affect, ComNeedSat was found to be a significant predictor ($b = -.47$, $se_b = .07$, $p < .001$) and the ACH \times ComNeedSat interaction was marginally significant ($b = -.10$, $se_b = .06$, $p < .10$)². Supplementary analyses again showed that the difference between low and high ComNeedSat was highly significant for individuals with a high achievement motive, $b = -.58$, $se_b = .11$, $p < .001$. Also, individuals with a low achievement motive differed in their response to competence satisfaction, though to a lesser degree, $b = -.37$, $se_b = .08$, $p < .001$.

² When controlling for the participants' age, the main effect of competence satisfaction remained stable ($b = -.47$, $se_b = .07$, $p < .001$) and the ACH \times ComNeedSat was not significant ($b = -.09$, $se_b = .06$, $p = .11$).

Brief discussion study 1

As expected, need for competence satisfaction predicted the employees' domain-specific flow and well-being on an ordinary working day. Furthermore, the achievement motive significantly moderated this relationship, in that feelings of competence were more impactful for individuals with a high achievement motive. Such individuals experienced more domain-specific flow and well-being when their need for competence was satisfied than individuals with a low achievement motive and they also reported less flow and well-being when they did not feel competent than individuals with a low achievement motive. These results confirm previous findings by the authors (Schüler and Brandstätter, in press; Schüler et al. 2010) showing that basic needs interact with implicit motives to predict flow. Furthermore, in contrast to Schüler (in prep) and Sheldon and Schüler (2011), the interaction also predicted well-being. Asking participants about domain-specific well-being in a specific behavioral domain, as was done in this study, rather than asking them about their general well-being, as in previous research (Schüler, in prep; Sheldon and Schüler 2011), uncovers the interplay between need for competence satisfaction and the achievement motive.

One issue that warrants discussion is the use of the MMG (Sokolowski et al. 2000) as a measure of implicit motives. With its semi-projective character (presenting pictures combined with a constrained response format), it is methodologically speaking a mixture between projective measures, such as the TAT (Murray 1938; see also Picture Story Exercise, McClelland et al. 1989; Schultheiss and Pang 2007), and self-reports, such as the Personality Research Form (PRF, Jackson 1984). This might be the reason for the inconsistent results reported in terms of the convergent and discriminant validity of the MMG. Regarding discriminant validity, some authors have not found significant correlations between MMG and self-report measures (Langens and Schmalt 2008; Schüler 2010; Schüler et al. 2008; Sokolowski et al. 2000), whereas for example Kehr (2004) reported a significant correlation between MMG achievement and PRF achievement. Regarding convergent validity, as already mentioned above, the achievement motive score of a precursor of the MMG was significantly correlated with the achievement motive score of the TAT (Schmalt 1999), whereas other researchers have failed to replicate this association for the MMG (Brunstein and Heckhausen 2008).

However, the pattern of results is consistent with regard to construct validity. Previous studies have shown that the MMG motives *behave* like implicit motives, for example by predicting variables which are theoretically associated with implicit motives such as task enjoyment (Puca and Schmalt 1999), flow experience (Schüler

Table 3 Hierarchical regression of domain specific positive affect and negative affect on the achievement motive (ACH) and competence satisfaction at the workplace (ComNeedSat) (study 1)

Step	Variable	Positive affect				Negative affect			
		ΔR^2	df	ΔF	β^a	ΔR^2	df	ΔF	β^a
1	Main effects	.32	2, 162	38.15***		.19	2, 162	19.15***	
	ACH				.13				.03
	ComNeedSat				.56***				.47***
2	ACH x ComNeedSat	.02	1, 161	5.02*	.15*	.02	1, 161	2.98	.13
	Cumulative R^2	.34	3, 161	27.74***		.19	3, 161	13.92***	

β^a is the standardized regression coefficient in the regression equation

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

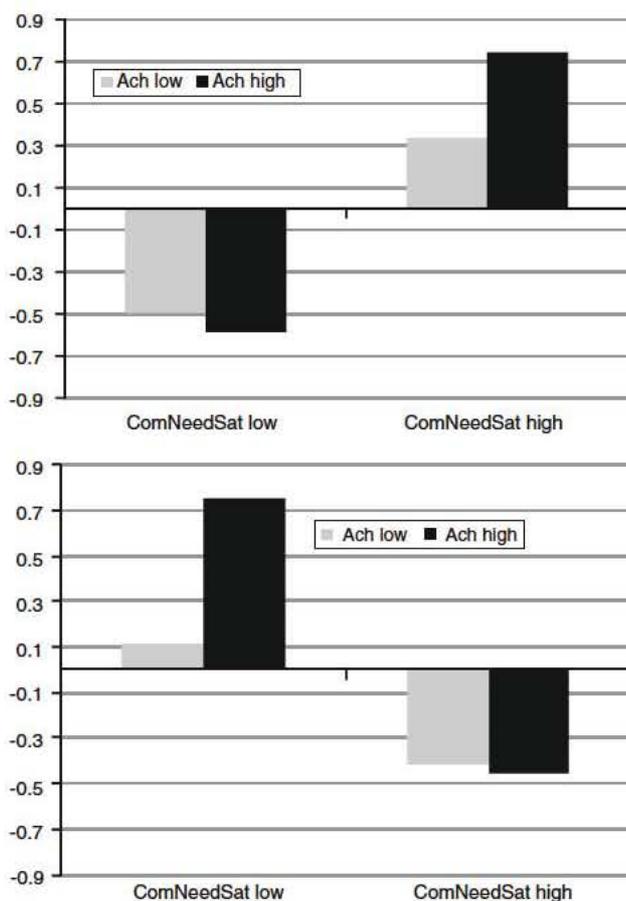


Fig. 2 Domain specific positive affect (*upper figure*) and negative affect (*lower figure*) at the workplace as a function of the implicit achievement motive (ACH) and need for competence satisfaction (ComNeedSat) (study 1)

2007), daydreaming (Langens and Schmalt 2002), spontaneous behavior trends (leadership success, Sokolowski and Kehr 1999; outcomes in social relationships, Gable 2006; Sokolowski et al. 2000) and sensitivity to emotional stimuli and motor behavior (Langens and Schmalt 2008).

Theoretical considerations which ascribe to the MMG three defining features of an implicit motive, according to Baumann et al. (2010), provide further support for the MMG as an implicit motive measure. Baumann et al. (2010) argue that the MMG motive measure is based on an extended network of need-related episodes (defining criterion 1), has an implicit component (criterion 2), and is based on a need-related affective interpretation of perceptual input (apperception) (criterion 3) (Baumann et al. 2010).

Having used a measure that obviously deals with the implicit motive (PSE, cf. McClelland et al. 1989; Schultheiss and Pang 2007) in the following study, we can compare whether the MMG produces a similar theoretically-based pattern of results to the PSE and thereby enhance the trustworthiness of the MMG as an implicit motive measure.

A further potential point of criticism is the use of a non-standardized, three-item measure of need for competence satisfaction. The high face validity and high reliability confirm that this measure is an appropriate competence assessment. However, future research might want to use an established basic need satisfaction scale in the work context to test the interaction effect (e.g., the work-related basic need satisfaction scale by Van den Broek et al. 2009).

Another limitation of study 1 is that it only tested half of our theorizing, by assessing domain-specific but not general well-being and flow. Although the assumed (non) effects of the interaction between motives and need satisfaction on general well-being have been shown in previous research (Schüler, in prep, Sheldon and Schüler 2011), a study is needed in which the interaction effects on domain-specific and general outcomes simultaneously can be examined.

Study 2

Study 2 extended Study 1 in five important points. First, we used a different measure to assess the implicit achievement motive (PSE), to increase confidence in the generalizability of the study results across different methods of measurement. Second, we also assessed the need for competence

using a more established measure. Third, and most importantly, we assessed flow and well-being using a domain-specific and general method in one and the same study. We thus tested the matching as well as the universal hypothesis, simultaneously. Fourth, we optimized the measure of domain-specific flow and well-being by using an imagination task (see Schultheiss and Brunstein 1999). Furthermore, we examined the research question by using a different study sample (students rather than employees) and thereby added support for the generalizability of the study results across different populations.

Method study 2

Participants and procedure

Undergraduate students (174 female, 28 male) with a mean age of 22.1 ($SD = 5.1$) participated in a two-part web survey in return for extra credit. In a first part they filled in the achievement motive measure, rated their basic need for competence satisfaction and indicated their general flow experience and well-being. In a second web survey 3 weeks later they were asked to imagine their flow and well-being in a specific situation while studying. The web surveys measured further variables which are not related to the present research question and which are theoretically expected to influence neither the measurement of the relevant concepts nor the reported results.

Measures

Basic need for competence satisfaction To assess basic need for competence satisfaction we used the six competence items of the Basic Need Satisfaction in General Scale (e.g., Gagné 2003; Kashdan et al. 2006). Participants rated their agreement with items such as “People I know tell me I am good at what I do” and “I have been able to learn interesting new skills recently” using a 7-point rating scale. The scale was reliable, with Cronbach’s $\alpha = .76$.

Implicit achievement motive The Picture Story Exercise (PSE, cf. McClelland et al. 1989; Schultheiss and Pang 2007) which has in the meantime been proven to be a valid test (Schultheiss et al. 2008), was used to assess the *implicit achievement motive*. In this exercise, participants write imaginative stories to pictures that are in turn scored by the experimenter using coding systems such as Winter’s scoring manual for motive imagery in running text (Winter 1994). Following a procedure suggested by Pang and Schultheiss (2005), six PSE pictures (boxer, women in laboratory, ship captain, couple by river, trapeze artists, nightclub scene) were presented for 15 s on the computer screen, after which participants wrote a story directly into the computer (for

more on this procedure see Schultheiss and Pang 2007). Individuals were instructed to write a complete imaginative story, with a beginning, middle and an end, about each of the following six pictures. Following a recommendation by Schultheiss and Pang (2007), participants were asked to try to portray who the people in the pictures are, what they are feeling, thinking, and wishing for and to say what led to the situation and how it will end. After 4 min of writing, a message was displayed on the screen asking individuals to please finish their story and press a key on the keyboard to move on to the next picture. Two experienced raters who were blind to the participants’ other data used Winter’s (1994) scoring system to code the achievement motive of all the stories independently of each other. They established an agreement of 95 and 97 % with materials prescored by Winter (1994) and achieved a sufficiently high inter-rater reliability, with an intraclass correlation coefficient of .80. Because the achievement motive score ($M = 6.26$, $SD = 2.92$) was associated with the number of words in the stories ($r = .36$, $p < .001$), the influence of verbal fluency had to be removed from the motive score. Therefore, the achievement motive score was residualized for word count.

General flow and well-being The general outcome variables were assessed using the Flow Short Scale (FSS, Rheinberg et al. 2003) and the PANAS (Watson et al. 1988) which were also used in Study 1. Participants were asked to indicate to what extent they felt the way described by the following statements during the last few weeks. Again, all scales were highly reliable (flow: .89, positive affect: .85, negative affect: .83).

Domain-specific flow and well-being In order to assess domain-specific flow and affect, the same statements were administered 3 weeks later in a second web survey. However, this time they were introduced by the following instructions: “Please think about a specific situation while studying (e.g., reading course material, preparing for an exam). Make a brief note of this situation in the following response field. Please vividly imagine this situation and answer the following statements regarding this mental picture”. Participants then filled in the same flow and affect measures as in the general measurement (FSS and PANAS). Cronbach’s Alpha for flow was .86, for positive affect .87 and for negative affect .80.

Results study 2

Preliminary analyses, descriptive statistics and correlations

Men and women did not differ in any of the relevant variables and sex did not influence the results reported

below. Table 4 shows descriptive statistics and correlations. As in Study 1, need for competence satisfaction was related to all outcome variables. Thus, it is positively correlated with the domain-specific and general forms of flow experience ($r = .36, p < .001, r = .36, p < .001$) and positive affect ($r = .38, p < .001, r = .47, p < .001$) and negatively correlated with domain-specific and general negative affect ($r = -.46, p < .001, r = -.39, p < .001$). Most of the outcome variables were significantly related. The achievement motive was not significantly related to need for competence satisfaction or to any of the outcome variables.

Moderation analyses

In order to test whether the interaction between the implicit achievement motive (ACH) and competence satisfaction (ComNeedSat) predicts *domain-specific* but not *general* flow and well-being, we conducted hierarchical regression analyses parallel to those reported in Study 1.

In accordance with our hypothesis, the regression of *domain-specific flow* (step 1: ACH, ComNeedSat, step 2: ACH \times ComNeedSat) revealed ComNeedSat ($b = .38, se_b = .07, p < .001$) and the interaction between implicit ACH and ComNeedSat ($b = .16, se_b = .07, p < .05$) to be significant flow predictors (see Table 5 for details of the analysis). The interaction pattern is illustrated in Fig. 3.

A supplementary analysis (post hoc analysis employing the Johnson-Neyman technique, Aiken and West 1991) revealed that the difference between low and high ComNeedSat was significant for individuals with a high achievement motive, $b = .53, se_b = .11, p < .001$ and to a lesser degree significant for individuals with a low achievement motive, $b = .22, se_b = .10, p < .05$.

In the regression of *general flow* on the predictor variables, we entered implicit ACH and ComNeedSat into the regression analysis as a first step and the implicit ACH \times ComNeedSat interaction as a second step. As expected, ComNeedSat ($b = .37, se_b = .07, p < .001$) predicted flow positively, whereas the interaction was not significant.

The results were very similar when predicting positive affect and negative affect using the same principle of data analyses (Table 6). In the analysis predicting *domain-specific positive affect*, ComNeedSat ($b = .40, se_b = .07, p < .001$) as well as the interaction between ACH and ComNeedSat ($b = .17, se_b = .08, p < .05$) emerged as significant predictors. As shown in Fig. 4 and confirmed by post hoc tests, individuals with a high implicit achievement motive benefited more from ComNeedSat in terms of higher positive affect and suffered more from its being thwarted ($b = .57, se_b = .10, p < .001$) than individuals with a low achievement motive, $b = .22, se_b = .09, p < .05$.

Table 4 Descriptive statistics and correlations among variables of study 2

	1	2	3	4	5	6	7	M	SD
1 ComNeedSat								4.98	1.00
2 ACH	.07							0.10	1.01
3 Specific flow	.36**	.07						4.98	0.73
4 General flow	.36**	.07	.65**					4.30	1.11
5 Specific positive affect	.38**	.11	.27**	.28**				3.24	0.68
6 General positive affect	.47**	.05	.430**	.40**	.46**			3.51	0.65
7 Specific negative affect	.46**	.13	.31**	.42**	.17*	.38**		2.01	0.61
8 General negative affect	.39**	.09	.28**	.27**	.30**	.33**	.58**	1.90	0.60

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

Table 5 Hierarchical regression of domain specific flow in academic learning setting on the achievement motive (ACH) and competence satisfaction (ComNeedSat) (study 2)

Step	Variable	ΔR^2	df	ΔF	β^a
1	Main effects	.14	2, 199	15.87***	
	ACH				.08
	ComNeedSat				.38***
2	ACH \times ComNeedSat	.02	1, 198	4.09*	.14*
	Cumulative R^2	.16	3, 201	12.11***	

β^a is the standardized regression coefficient in the regression equation

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

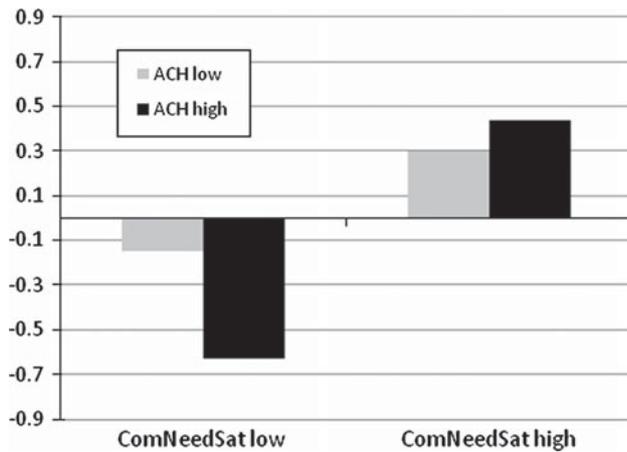


Fig. 3 Domain specific flow experience in academic learning settings as a function of the implicit achievement motive (ACH) and need for competence satisfaction (ComNeedSat) (study 2)

When predicting *general positive affect* only ComNeedSat ($b = .48$, $se_b = .06$, $p < .001$) was significant, but not the interaction term.

As predicted, *domain-specific negative affect* was predicted by ComNeedSat ($b = -.44$, $se_b = .06$, $p < .001$) and by the interaction between ACH and ComNeedSat ($b = .14$, $se_b = .07$, $p < .05$). Post hoc tests showed that the difference in negative affect was also significant for high and low achievement motivated individuals. However, contrary to our assumption, the difference between low and high ComNeedSat was stronger for individuals with a low achievement motive, $b = -.58$, $se_b = .09$, $p < .001$ than for individuals with a high achievement motive, $b = -.29$, $se_b = .10$, $p < .05$ (see also Fig. 4).

When predicting *general negative affect*, ComNeedSat ($b = -.37$, $se_b = .07$, $p < .001$) was significant but not the motive-need interaction.

Supplementary analyses

In trying to understand the unexpected interaction pattern for negative affect, we speculated that the different motive

measures used in Study 1 (in which the interaction pattern was in the expected direction) and Study 2 might provide an explanation. Whereas in Study 1 the resultant MMG achievement motive score was derived by subtracting fear of failure from hope of success, the PSE achievement score used in Study 2 considers both a hope component (scoring categories: e.g., adjectives that positively evaluates performances) as well as a fear component (scoring category: e.g., failure, doing badly). In order to get a motive measure which is comparable to the resultant motive score in Study 1, we subtracted the PSE fear category from the PSE hope categories and repeated all analyses using this PSE-resultant motivation score. The interaction terms when predicting flow and positive affect remained significant (flow: $b = .18$, $se_b = .07$, $p < .05$, positive affect: $b = .16$, $se_b = .07$, $p < .05$). In contrast, the analysis predicting negative affect did not reveal a significant interaction pattern anymore ($b = .10$, $se_b = .07$, *ns*).

Brief discussion study 2

Study 2 replicated the effects of Study 1 by showing that the need for competence satisfaction predicted domain-specific flow and affect and that these relationships are moderated by the achievement motive. In addition to Study 1 and in addition to previous studies, the domain-specific as well as the general forms of flow and well-being were assessed in one sample, so that the matching as well as the universal hypothesis could be examined simultaneously. As expected, the interaction between motives and need satisfaction predicted domain-specific, but not generally measured flow and well-being.

One result which warrants discussion is that one out of six significant interactions revealed an unexpected pattern. Whereas individuals with a high achievement motive benefited more from competence satisfaction in terms of positive affect (Study 1 and 2), flow (Study 1 and 2) and less negative affect (marginal effect, Study 1) than individuals with a low achievement motive, the pattern of

Table 6 Hierarchical regression of domain specific positive affect and negative affect on the achievement motive (ACH) and competence satisfaction in academic learning setting (ComNeedSat) (study 2)

Step	Variable	Positive affect				Negative affect			
		ΔR^2	df	ΔF	β^a	ΔR^2	df	ΔF	β^a
1	Main effects	.16	2, 199	18.23***		.22	2,199	27.67***	
	ACH				.09				.09
	ComNeedSat				.39***				.44***
2	ACH x ComNeedSat	.02	1, 198	5.30*	.15*	.02		3.94*	.12*
	Cumulative R^2	.18	3, 201	14.18***		.22		20.03***	

β^a is the standardized regression coefficient in the regression equation

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

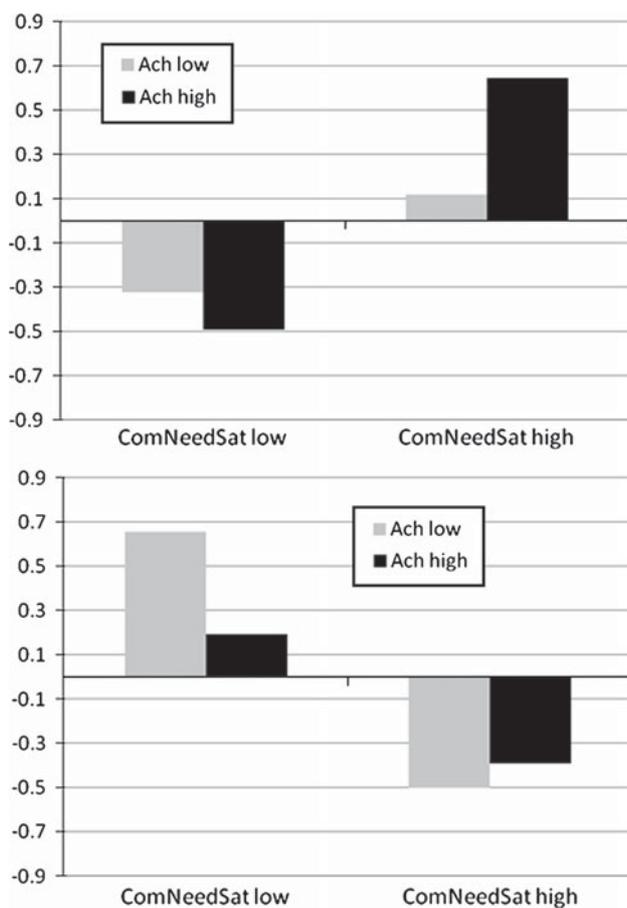


Fig. 4 Domain specific positive affect (*upper figure*) and negative affect (*lower figure*) in academic learning settings as a function of the implicit achievement motive (Ach) and perceived competence (ComNeedSat) (study 2)

result was reversed when predicting negative affect in Study 2. However, supplementary analyses using a motive score which is comparable to the motive score used in Study 1 (fear minus hope) showed that this unexpected interaction pattern disappeared. This supports the assumption that it is important to consider a resultant motivation (Atkinson 1964; Atkinson and Feather 1966) in which the fear and hope motives are considered simultaneously.

A research question that remains open and must be answered by future research is that of why the interaction of the achievement motive and competence satisfaction is stronger when predicting positive outcomes, such as flow and positive affect, than when predicting negative affect.

General discussion

The present research tested two contrary predictions derived from two concepts from theories of human needs that are semantically related but rarely theoretically linked.

The basic needs theory within Self-Determination Theory (SDT; Ryan and Deci 2002) suggests a universal hypothesis, saying that the effect of basic need satisfaction on flow and well-being is not influenced by individual differences in the preference for the satisfaction of particular needs, whereas the Motive Disposition Theory (MDT; McClelland 1985) assumes a matching hypothesis, saying that individuals with a strong motive react differently to corresponding need satisfaction than individuals with a low motive.

The present studies explain the ambiguous results of previous studies by considering the differentiation into domain-specific and general well-being and flow. Whereas well-being and flow assessed in a specific achievement domain were assumed to be predicted by the interaction of the achievement motive and satisfaction of the need for competence, general well-being and flow are multi-determined and thus should not be predicted by the interaction between a specific motive and need satisfaction.

Two studies with samples of employees (study 1) and undergraduate students (study 2) of different ages and educational backgrounds tested these hypotheses in the achievement domain. In accordance with our hypotheses, the results showed that basic need for competence satisfaction strongly predicted flow and well-being in both studies, confirming our assumption that competence satisfaction is important for all individuals. This finding is also in line with several previous studies convincingly demonstrating the positive consequences of need satisfaction (Deci and Ryan 2000; for a summary see Vansteenkiste et al. 2010). More importantly, and also in line with previous studies (e.g., Schüler et al. 2010; Schüler and Brandstätter, in press), the achievement motive moderated the positive effects of competence satisfaction. Individuals with a high achievement motive benefited more from competence satisfaction and suffered more from need frustration than individuals with a low motive score (for an exception see brief discussion of Study 2). Even more importantly, the present research showed, in addition, that the achievement motive moderates the effects of competence satisfaction when predicting domain-specific flow and well-being, but not general flow and well-being.

Next to the moderation effects, a further issue for discussion is the main effects. In contrast to need for competence satisfaction, which significantly predicted flow and well-being without exception (see main effects in hierarchical regression analyses), the achievement motive did not predict flow and well-being (no main effects in the hierarchical regression analyses): neither when measured using imagination nor when the assessment does not require imagination. This supports the essentiality of need satisfaction as proposed by SDT: There is no well-being and flow without need satisfaction. The results also indicate

that a person's achievement motive requires situational incentives, such as the chance to excel, associated with feelings of competence to predict flow and well-being. This empirically supports the MDT theorizing that motives depend on incentives in the sense that they become activated by them and thereby lead to behavior which is directed towards motive satisfaction (Heckhausen and Heckhausen 2010; Schneider and Schmalz 2000). The person-situation interaction is one of the most prominent theoretical concepts of motivation psychology (Heckhausen and Heckhausen 2010; Hull 1943; Lewin 1951; Murray 1938). Our results lend further support to the postulated person-situation interaction in way the achievement motive functions.

Our theorizing is based on a content overlap between the achievement motive and basic need for competence satisfaction (e.g., both deal with a positive evaluation of performance). However, motives and basic needs are different theoretical concepts with different research traditions and different research foci, and therefore have conceptual differences. For example, in motive disposition theory the implicit achievement motive is defined as a concern for meeting personal rather than normative standards of excellence (Brunstein and Maier 2005), whereas no such differentiation is made in self-determination theory. Further research is needed directly considering conceptual differences (for example by testing the interaction hypothesis in personal and social achievement norm settings) in order to specify the interaction between motives and basic needs.

Another issue which warrants discussion is the strong association between need for competence satisfaction and flow and positive and negative affect in both studies (correlation coefficients between $-.44$ and $.62$, all $ps < .001$). Considered critically, this overlap can be interpreted in two ways. First, as predicted by SDT (Deci and Ryan 1991; Ryan 1995), it can mean that need satisfaction is a strong predictor of well-being (or vice versa). Second, it can mean that the association between need satisfaction and well-being is due to individual differences in temperament, for example in negative emotionality which might also account for the interaction effect (underlying temperamental variable). Although the second interpretation cannot be empirically ruled out in the present study, previous research indicates that it is quite unlikely. For example, several studies have shown that experimentally induced need satisfaction accounts for variations in well-being (Sheldon and Filak 2008) and thus support the assumed cause-effect relationship. Other studies show that naturally occurring daily fluctuations in need satisfaction (which depend on the more or less need-satisfying character of daily activities) account for fluctuations in daily well-being even when controlling for trait-level individual differences

in self-determination, effectance and connectedness (Reis et al. 2000).

In order to obtain further evidence for the independence of the need satisfaction-motive interaction effects from differences in temperament, we used the MMG resultant affiliation and power motivation scores and scored the PSE stories for the affiliation and power motive, and tested whether these motives interact with need for competence satisfaction to predict domain-specific flow, positive and negative affect. If an underlying temperament variable (such as negative emotionality) accounts for the interaction between need satisfaction and well-being, then the interaction should be independent of the content of need satisfaction. The interaction effect would also occur with the affiliation and the power motive. In contrast, our hypothesis would be supported if the interaction effect is specific to the achievement motive and does not hold true for a motive which does not correspond to need for competence satisfaction (affiliation and power motive). In supplementary analyses we conducted hierarchical regression analyses as described in the result parts above for the dependent variables domain-specific flow and affect, in which we entered the affiliation motive and the power motive, respectively, need for competence satisfaction as a first step, and the motives-competence satisfaction interactions as a second step. In none of the analyses was the interaction effect significant. Thus, the alternative interpretation of an underlying temperamental variable is unlikely; however, further studies measuring and controlling for negative emotionality are needed in order to rule out this alternative altogether.

The present research aims to test the universal and the matching hypotheses by examining the outcome variables of the interaction between implicit motives and basic needs. However, the results of our studies are limited to the achievement domain (achievement motive and need for competence). Therefore, strictly speaking, the present research cannot answer the question of whether the interaction between motives and basic need satisfaction, as a function of the domain specificity of the outcome measure, also holds true for need for relatedness and the affiliation motive. An analysis of the need for autonomy and power motive interaction is also lacking so far. The reason for this is the two faces of the power motive conceptualization, which includes the desire to have an impact on others and to free oneself from the impact of others (Winter 1973). To make things even more complicated, the achievement motive also contains aspects of autonomy. Individuals with a high achievement motive are, for example, motivated if they feel independent from external standards but can determine for themselves which challenging tasks they choose and how to strive for them (Spangler 1992). To conclude, there are autonomy aspects in the power as well

as in the achievement motive. However, in the implicit motive measure currently used, the autonomy aspects are not very well represented (e.g., no category for autonomy in Winter's, 1992, scoring system).

It is the aim of future research to find and test a dispositional counterpart for the need for autonomy and to examine their interaction. A promising candidate is the origin concept put forward by deCharms (1992) which "is used to describe the extent to which some people (more than others) seek origin experiences in which they can change their environment through personal causation" (deCharms 1968/1983, p. 326). DeCharms and Plimpton's (1992) origin scoring system contains categories such as self-determined goal setting and personal causation which fit the core of Deci and Ryan's (1985, 2000) self-determination concept very well.

Another fruitful approach to assess the autonomy motive might be to adapt Ryan and Grolnick's (1986) measure of children's perception of autonomy in the classroom. Aiming to overcome the limitations of self-report measures of perceived classroom climate, the authors asked school children to write a narrative to a picture of a school classroom scene. The authors then evaluated the narratives with regard to aspects of autonomy (e.g., how much the writer was characterized by an internal locus of causality; perceived autonomy provided by the teacher; expressed aggression in the stories as a consequence of autonomy frustration). Although the research focus of Ryan and Grolnick (1986) was different from ours (e.g., the authors aimed to compare the projective measure with a self-report measure), the analyses showed results which are interesting for our research. The authors found that individuals strongly differ in how much autonomy they perceive when describing one and the same classroom scene. These different sensitivities towards themes of autonomy may reflect differences in an autonomy disposition – an assumption which is well-established for the classical motives (McClelland 1985).

Further newly-developed approaches that address aspects of autonomy are theoretical considerations on a "freedom motive" (Alsleben 2008; Alsleben and Kuhl 2010) which becomes measurable in the updated version of the Operant Motive Test (Kuhl and Scheffer 2012).

Another limitation of the present research concerns the methodological issue that we have so far focused on cross-sectional correlative field studies. Future longitudinal and experimental studies are needed to complement our research. Furthermore, in both studies we measured the achievement motive, need for competence satisfaction, flow and well-being in the same order. In order to rule out the possibility of priming effects that might occur by measuring one concept before another, future research should administer the measures in counterbalanced orders.

To conclude, we have learned at least three things from our data. First, that it is worth analyzing individual motive dispositions when analyzing the outcomes of basic need satisfaction. In doing so, a significant amount of further variance in optimal flow and well-being can be explained. Interventions such as changing environmental characteristics (e.g., specific task characteristics) in order to enable individuals to satisfy their basic needs could be tailored to the individuals' motives. For example, creating situations in which the experience of competence is enhanced (e.g., through regular feedback), is less beneficial in terms of well-being for individuals with a low achievement motive. Such individuals might have a high affiliation motive and therefore benefit more from a situation in which the experience of relatedness is enhanced (e.g., through self-disclosing activities).

A second conclusion is that it is extremely important to take a closer look at the measurement of variables. In our case, the consideration of domain-specific vs. general measurement of flow and well-being, which we did not consider to be highly relevant in previous research (Schüler and Brandstätter, in press; Schüler et al. 2010; Sheldon and Schüler 2011), resolved the ambiguity in the pattern of results of previous research.

Finally, we would like to draw the conclusion that although we agree in principle with Ockham's razor, which states that it is pointless to do with more that which can be done with less ("plurality must never be posited without necessity"), this principle cannot be applied to human needs and their consequences for optimal motivation and well-being. It seems that in order to explain the complex phenomenon of human needs and their effects, two sophisticated theories (SDT and MDT) are needed.

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