Analysis of Collective Action Regulation and Cooperation-Relevant Attitudes in Industrial Group Work

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Abstract

In this article, a conceptual framework of collective action regulation in industrial work groups will be presented which is based on action regulation theory and related approaches. We state that collective regulation requirements resulting from collective planning and decision-making autonomy of work groups will be positively associated with the group members' common task orientation, cooperative attitudes, work means and stores of knowledge (collective objectifications) developed and shared by the group members. Further, we report the results of a first test of the inter-rater reliability of a measurement method based on a condition-related observation interview that can be used to analyze and evaluate the structure of collective action regulation in industrial work groups considering psychological criteria for quality of work life. Findings of two cross-sectional field studies testing the hypothetical framework are reported. In total, 31 groups from three enterprises (automotive industry, engine manufacturing, tool manufacturing) in three German-speaking countries were analyzed using semi-standardized observation-interviews. Furthermore, 233 members from 28 of these groups in various production departments were interviewed applying standardized self-report scales. Results show that a high level of required planning and decision-making, together with joint thinking and communication, is positively associated with several cooperation-supporting attitudes as well as with the number of collective objectifications. Though, findings concerning a hypothesized relation between collective regulation requirements and common task orientation are inconsistent. High time pressure seems to act as a moderator.

Keywords

action theory – activity theory – socio-technical systems – cooperation – job analysis – self-managing work groups – attitudes

1 Introduction

One current response to group work is that in publications addressed to management, work designers, and corporate consultants, the main interest seems to lie in process-related support of cooperation (e.g., training and moderating of group processes), in order to enable or select cooperation-oriented workers (e.g., Salas, Cooke, & Rosen, 2008; Tannenbaum, Salas, & Cannon-Bowers, 1996). It is argued that this imbalance in application corresponds to an overemphasis in basic research concerning the development of group-dynamic constructs and methods (e.g., process losses, intergroup conflicts), as opposed to the development of a task-related methodology (cf. Scholl, 1997) which focuses upon the creation of cooperation-promoting organizational structures such as collective self-regulation or autonomy (Rasmussen & Jeppesen, 2006; Ulich, 2005) as a prerequisite to successful group work. The present article was developed on the background of the thesis that a neglect of structural aspects of group work with primary consideration of process and personality variables could lead to both problematic attempts of application in practice and theoretical deficiencies.

Concerning the former problem, it is doubtful, whether, for example, collective autonomy, common task orientation, cooperative attitudes or participatory behavior can be tapped sufficiently valid by means of only a few questionnaire items. In their research review, Paris, Salas, and Cannon-Bowers (2000, p. 1056) conclude that there is yet no „… sound, validated and systematic methodology" available for analyzing team tasks as a prerequisite to measure team performance (cf. also Brauner & Scholl, 2000; Salas et al., 2008).

In the following, concepts, measurement methods, and findings of two studies will be presented that emphasize the importance of „objective" orga-

nizational conditions, activity, and task characteristics for the promotion of cooperative attitudes and work behaviors. The objective of this article firstly is to present and to investigate a conceptual framework of collective action regulation empirically concerning its construct validity. In this connection we state that collective regulation requirements (complimentary to collective planning and decision-making autonomy of work groups) will be positively associated with the group members' common task orientation, cooperative attitudes, and work means and knowledge stores (collective objectifications) developed by the group members. We assume an interrelation between common task orientation and collective objectifications, additionally. Secondly, this article reports the results of a first test of the inter-rater reliability of a measurement method based on a condition-related observation interview that can be used to analyze and evaluate the structure of collective action regulation in work groups within the area of industrial manufacturing. As far as we know beside part B Cooperation and Communication of the Activity Evaluation System (TBS by Hacker, Fritsche, Richter & Iwanowa, 1994), which has another analytical focus, no further semi-standardized observation interviews based on action regulation theory concerning collective action regulation in industrial work groups do exist.

2 Theoretical Foundations: Concepts for the Analysis of Cooperative Work Activity from Compatible Action-psychological Approaches

2.1 Core definition of semi-autonomous group work in the socio-technical approach

In the 1950's and 1960's, psychologists and sociologists at the London Tavistock-Institute of Human Relations, in cooperation with industrial engineers and economists, developed the socio-technical foundations of the condition-related design concept of semi-autonomous group work (e.g., Emery, Thorsrud, & Trist, 1976; Herbst, 1962; self-managed or self-regulated teams are synonyms). At approximately the same time as action regulation theory arose, Susman (1976) developed a theoretical conceptualization of collective self-regulation in semi-autonomous work groups. The approach of action regulation theory within continental European work psychology concentrated mainly upon the analysis and evaluation of planning and decision-making autonomy that is reflected in mental structures of hierarchical-sequential action regulation within individually-executed work activities (see section 2.2).

Complimentary to the originators of action regulation theory (e.g., Cranach, Ochsenbein, & Valach, 1986; Hacker, 2003, 2005; Oesterreich, & Volpert, 1986; Volpert, 2003), Susman and further scholars of the socio-technical systems approach (see Ulich, 2005) integrated existing socio-technical concepts as well as concepts of goal-oriented behavior („directed action") in the tradition of Edward C. Tolman and Kurt Lewin in combination with systems theory constructs (see the encyclopedia edited by Trist, Emery, & Murray, 1997). On this basis, Susman worked out a very original contribution to the field of „regulatory decisions" in work groups and organizations, which shows many parallels to the fundamental assumptions of action regulation theory. Principles of the socio-technical approach, especially the concept of self-managing team work, are increasingly incorporated within contemporary Anglo-American industrial and organizational psychology (e.g., Cox, Pearce, & Perry, 2003; Majchrzak, 1998; Oldham & Hackman, 2010; Parker & Wall, 1998). Within this framework, (semi-) *autonomous* or *self-regulated group work* is a basic principle of work design that can be characterized as follows (based upon a review of contributions by representatives of the socio-technical approach; see Ulich and Weber, 1996):

- Several workers in a spatially and organizationally limited production unit assume shared responsibility and share a common task that is divided into interdependent subtasks.
- The members of this production unit, the work group, determine collectively (collective self-regulation), to a degree from medium to large, the coordination of the work sequences (decisions on finite production planning and control) and the allocation of jobs, tasks, and ressources within their production unit and the regulation of the input/output concerning other organizational units (boundary maintenance).
- Here, each member of the group can generally execute a variety of part-tasks (polyvalence, multifunctionality) and does so, depending on need (flexible job rotation).
- The work group is assigned structurally different *individually* executed work tasks, too. These are divided in such a way that every member has opportunity to perform challenging tasks, for example planning and control of manufacturing or maintenance of machinery and tools, as well as operational manufacturing tasks and quality assurance tasks.

2.2 Collective action regulation: a conceptual framework linking the socio-technical approach and action regulation theory

In a current view, the traditional socio-technical approach has experienced difficulties with the development of constructs explaining mental processes of planning and controlling the execution of work tasks

and with the creation of corresponding psychological methods of work analysis. On the other hand, theorists of action regulation developed various constructs for detailed analysis of such mental processes required within individually executed work tasks (see Hacker, 1994, 2005; Oesterreich & Volpert, 1986). Representatives of action regulation theory have defined action regulation as „mental processes of the shaping and control of actions, that is, mental processes of perception, evaluation, planning, balancing, decision-making behind the observable stream-of-behavior that shape its form. In other words: Mental processes which represent thinking and problem-solving and which proceed in close interaction with the actors' material and social environment" (Volpert, 1987, p. 5; translated from the German original by the authors). Such theoretical constructs, for example the construct of regulation requirements, are thoroughly operationalized in the Instrument for the Identification of Regulation Requirements in Work (VERA; Leitner et al., 1993; Oesterreich & Volpert, 1986). *Regulation requirements* refer to demands on planning, decision-making, and thinking within individually-executed work tasks. This construct overlaps – but not regarding the analysis method – with constructs like Task Autonomy (Hackman, 1987), Factual Autonomy (Spector & Fox, 2003), Job Control, Method Control, or Problem-solving Demand (Breaugh, 1985; Wall et al., 1995).

Additionally, Oesterreich and Resch (1985) developed a proposal for the analysis of work-related communication. *Work-related communication* takes place, when a work activity requires that a worker coordinates his / her individually executed work task verbally with one or serval other workers who also execute a work task, whereby the communication partners have equal rights in effect. According to the underlying model of action organization, acts of communication function as an instance which coordinates separated, hierarchical-sequentially organized substructures of goal-action programs (i.e., plans of work behavior) between two (or more) workers.

If systems of face-to-face group work are to be evaluated responsibly and even improved for those involved, an adequate psychological model of the mental and communication processes in collective action and of the conditions that support or hinder these processes is an essential prerequisite. Based on the aforementioned socio-technical and action regulation theory concepts as well as on activity theory studies (e.g., Leont'ev, 1978; Raeithel, 1996; Volpert, 2003), a conceptual framework can be formulated for *collective action regulation* (presented in detail in Weber, 1997)[1].

In this connection, shared regulatory decisions regarding coordination, allocation of resources, and boundary maintenance (sensu Susman, 1976) may be represented as the collective action structure of a respective workgroup (Figure 1). Here, the regulation of collective action in group work does *not* exclusively follow the action regulation model of coordinated yet *separately* executed individual tasks as proposed by Oesterreich and Resch (1985) which is symbolized by the triangles 1 and 2 (signifying individual structures of hierarchical-sequential action regulation[2]) and the wave-like arrows in between (acts of communication) at the bottom of Figure 1. Rather, in semi-autonomous work groups a *central task* exists that is shared by all group members involved, within which processes of planning and communication *intertwine* and take place collectively. The characteristics of collective action regulation are:

1 *Collective creation of a joint plan,* an evaluation of a situation, or a solution for a technical / organizational problem together in dialogue. The hereby utilized individual regulation processes (activation of knowledge, deliberation, weighing alternatives up, planning and decision-making, etc.), are communicated, made conscious for the whole group and are commented upon, corrected, modified or rejected mutually and, finally, are integrated in a common, hierarchical-sequentially organized, goal-action-program-structure (represented by the hierarchical net structure within the circle in the center of Figure 1).

2 *Conjunction of communicated and non-communicated individual planning processes:* Through the communicated contributions of other group members, a further group member gets an idea like a „missing link in a chain". This elicits individual considerations, resulting in a contribution of the respective group member, which in turn fits in as a „missing link" into the joint action program of the workgroup (symbolized by the complete hierarchical tree structure emanated from the circle midpoint in the center of Figure 1).

3 *Mutual exchange, building of a shared knowledge base, and organizational learning:* Distributed in-

[1] This conceptual proposal emerged from the research project Cooperation In Computer-Assisted Work which was carried out at the Work and Organizational Psychology Unit of the Swiss Federal Institute of Technology (ETH) Zurich in cooperation with Rainer Oesterreich and Walter Volpert (TU Berlin), funded by the ETH Center for Integrated Production Systems.

[2] Because of the anti-hierarchical meaning of this concept referring to the humanization of work-life (see the discussion reported by Volpert, 2003), some representatives of action-regulation theory like Cranach et al. (1986) and Hacker (2005) prefer the notion of heterarchical-sequential action regulation.

dividual knowledge and capabilities become mutually shared and are partly embodied in common objectifications (e.g., developed tools, data-bases etc., see below).

Resulting out of collective action regulation, evaluations of situations, production process plans, decisions on finite production planning, error diagnosis, and solutions for technical problems can emerge. The individual goal-program-structures are connected within a common *central task* (represented through the circle in the center of Figure 1). The central task of a group characterizes those regulation processes that are performed jointly by all (or many) of the group members. Collective regulatory functions of coordination, allocation, and boundary maintenance prepare and support the proper execution of individual work tasks like manufacturing, quality assurance, maintenance of the equipment, etc..

Processes of collective action regulation are manifested not only in mutually shared cognitive representations, but also in materializations. The following construct of Common Objectifications (Weber, 1997, 2000) is based on works in activity theory, particularly by Leont'ev (1978), Raeithel (1996), and Volpert (2003). The process of common objectification is understood as a process by which all (or several) members of a workgroup mutually transfer their individual knowledge, expertise, and experience into a material form. By doing this, they make their materialized knowledge and expertise available to other group members, thus it „... is a crucial step in making ideas accessible to others" (Fjeld et al., 2002, p. 154). Leont'ev (1978) calls this process the acquisition of accumulated societal action experience, however without referring to one of the most important mediators of experience, namely the work group in the enterprise.

Thus, common objectifications (Weber, 1997, p. 152) are defined as the group's own internally developed, produced, modified, or improved

- material means of work (tools, devices, models, components of machinery, etc.),
- visualizations of work equipment (e.g., photographs or video films),
- planning and work methods (heuristics for production planning and control, operator's guidelines for manufacturing systems, checklists for diagnosing machine troubles, etc.),

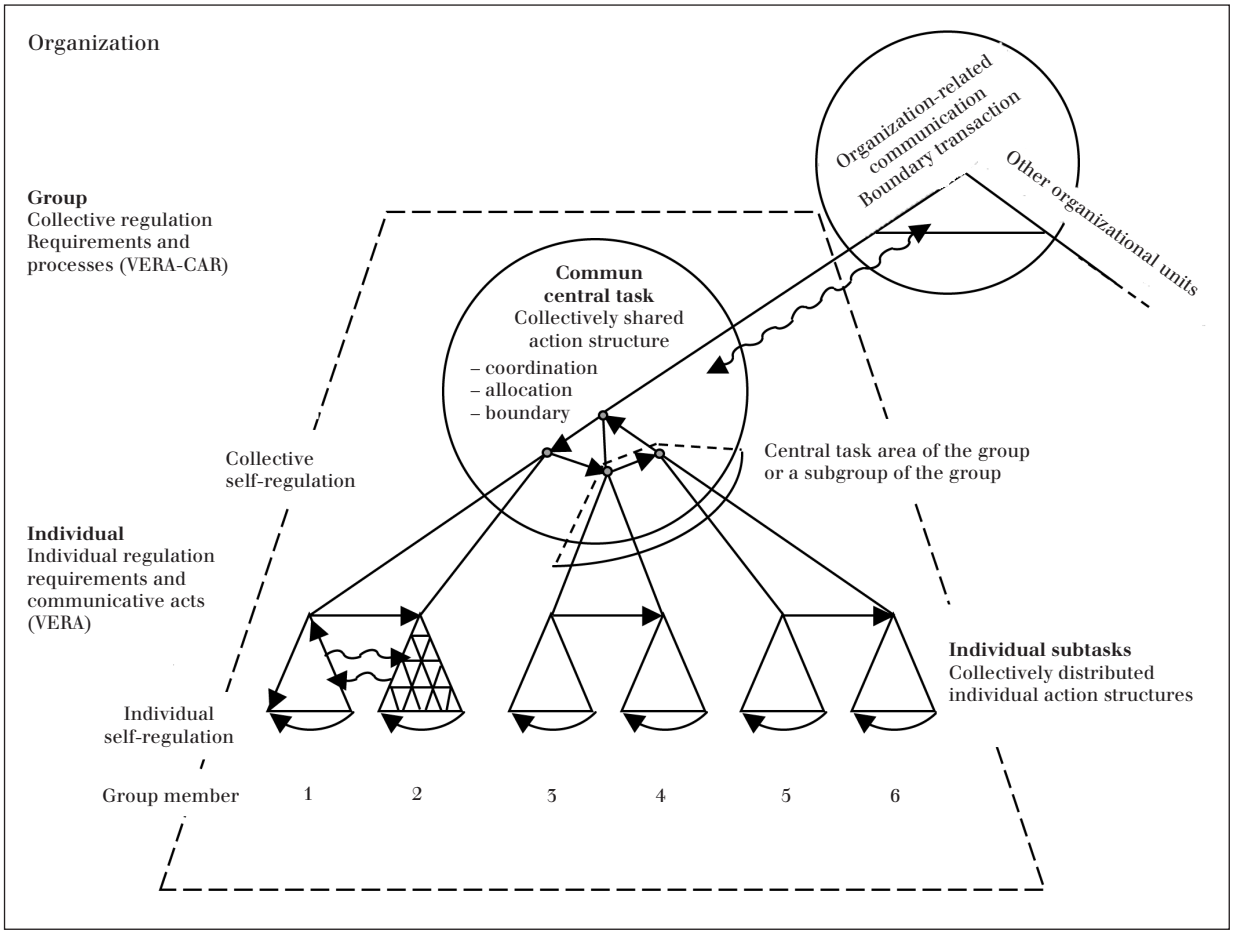

Figure 1: Collective action structure of a workgroup

- evaluation methods (for lead times, fault rate, production flexibility, e.g.),
- virtual means of work (e.g., software tools, programs or macros for manufacturing functions like those mentioned under planning and work or evaluation methods),
- knowledge stores (data banks, card files, data files, etc.),
- minutes, logs, and records (e.g., of group meetings, improvement suggestions, agreements),
- reference works (trouble-shooting manuals, e.g.), and
- media of communication (information boxes and other CSCW-components).

Raeithel (1996), whose work refers to Lev Vygotski as well as Sachse, Hacker, and Leinert (2004) who refer to Pjotr Galperin make clear that this materialization is not only of considerable meaning to individual acquisition *(Interiorization)*. Rather, materializations also serve as tools for thinking. Referring to the example of manual sketching as a form of materialized external description of a design solution, Sachse et al. (2004) found that materializations locate not only solutions within product development and construction work in a better way but also contribute to create problem-solving through a reflective procedure which „… creates an interaction between the visual and the conceptual mode of representation and thinking“ (Hacker et al., 2004, p. 4). Materializations as *externalizations* of individual thinking processes may, in the communicative process, be further elaborated.

It is assumed that the more complex a shared task and the required collective self-regulation processes (mirrored in form of a complex, collectively shared hierarchical-sequential structure of action regulation) are, the more probable it is that certain shared social representations (sensu Cranach et al., 1986) or shared mental models (Cannon-Bowers, Salas, Converse, & Castellan, 1993) of group members will gain *material* manifestation, such as in the form of external memory aids or mutually developed work means. Often, individual group members or sub-groups will, over a certain period of time, add their own individual contributions to these reservoirs of know-how and work methods. In this manner, the group's own shared products are created and can be utilized by all members of the group, and perhaps, by external cooperation partners as well. To a certain extent, each member can acquire and use the shared knowledge, work methods, tools of the group. At the same time, the individual expands the group's shared reservoir of knowledge and tools through his or her own exteriorization of the know-how in form of materialized contributions. For example, studies about mediated activities of design engineers (Sachse et al., 2004) suggest that such externalized knowledge components serve as communication, planning and memory aids to group members.

Finally, we want to allude to some related concepts stemming from social and organizational psychology. West's construct of Group Task Reflexivity (1996) encompasses shared and communicated mental processes corresponding to the first characteristic of collective action regulation (see above). „Reflexivity as a group-level construct is defined as ‚the extent to which group members overtly reflect upon, and communicate about the group`s objectives, strategies (e.g., decision-making) and processes (e.g., communication), and adapt them to current or anticipated circumstances‘ “ (Widmer, Schippers, & West, 2009, p.3). In some case studies (Ulich & Weber, 1996; Weber, 1997) it was shown that group task reflexitivity can also occur in manufacturing work groups if they possess a substantial degree of decision-making autonomy.

According to the third mentioned characteristic of collective action regulation, the theory of Shared Mental Models has to be mentioned. From the perspective of cognitive psychology, mental models enable people to describe, explain, and predict system behavior. Following, Cannon-Bowers et al. (1993, p. 228) have defined shared mental models „as knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task, and, in turn, to coordinate their actions and adapt their behavior to demands of the task and other team members“. Cannon-Bowers et al. (1993, p.229) demonstrate that experienced teams who have to act in complex situations (e.g. during emergencies) develop „shared situation“ models including common „definition of the problem, plans and strategies for solving the problem, interpretation of cues and information, and roles and responsibilities of participants“. The positive relation between shared mental models and team process and performance, including moderator effects, is empirically supported through several studies (Lim & Klein, 2006; Mathieu et al., 2005). Related to this, further knowledge-management approaches – e.g. Transactive Knowledge Systems (Brauner, 2003; Brauner & Scholl, 2000) and Experience-based Cooperation (Böhle & Bolte, 2002) as a social-interactive process of members in groups – are also of high significance for the collective action regulation model. Brauner and Scholl (2000, p. 118) describe an information processing approach to groups which „… embraces social cognition as a product of communication and interaction, and focuses directly on how the content of individual cognition is shared with other people“.

2.3 Common task orientation and cooperation-relevant attitudes in work groups: Person-related aspects of collective action regulation

If collective planning and decision autonomy as well as common objectifications should be positively associated with cooperative attitudes and behaviors in several studies, this would support a work-psychological conceptualization of group cohesiveness as suggested by representatives of the socio-technical systems approach (Emery et al., 1976; Alioth & Ulich, 1981) as well as proposed by activity theorists in the tradition of the Russian cultural-historical school (Leont'ev, 1978; Petrovsky, 1985; Raeithel, 1996; Volpert, 2003) and some social psychologists (Deutsch, 2003 and his followers). They all agree in the assumption that complex and interdependent collective work tasks will result in close collaboration which, in turn, will foster the development of cooperative work attitudes or, furthermore, will benefit the creation of common objectifications. This leads to a concept that can be utilized considering construct validation of the collective action regulation framework. According to these authors, Weber (1997) characterized Common Task Orientation by a pattern of experienced behaviors and attitudes shared by the members of a work group which is made up of the following components:

1. *Acceptance of a common task and common responsibility* describes the extent to which a work group shows readiness to take on mutual responsibility for the tasks and results of those tasks assigned to them within their work system. This includes a willingness of the individual group member to shoulder responsibility, even for the work of others in the group, and to take on unpleasant tasks or rectify others' mistakes.
2. *Mutual support and furtherance of others* refer to the readiness of the group members to support each other mutually, share their knowledge and skills, use production resources together, and spare each other mistakes and frustrations. In addition, these components also refer to a willingness to limit short-term needs to the benefit of long-term goals and to the ability to put oneself in a work partner's current situation and mood.
3. *Making useful contributions to a mutual product* indicates a need of the group members to feel that their own contribution is useful regarding the jointly produced product (or service) and to receive recognition for that contribution from other members. If such a product made up of interdependent subtasks exists, then there is an opportunity to experience collective efficacy (as described by Bandura, 2001; cf. also – following our approach – Moser, Schaffner, & Heinle, 2005).

Additionally, when validating the framework of collective action regulation, there is a related construct that can serve as a work-psychological complement of group cohesiveness. In social psychology, representatives of the Theory of Cooperation and Competition (Deutsch, 2003; Tjosvold, 1998) proposed two patterns of attitudes. A *cooperative* orientation comprises the readiness of interaction partners to combine their ideas and share their resources, without expecting an immediate service in return. Proceeds and returns are distributed according to an equality or a needs rule, and one's own behavior takes the interests of the others into account. Deutsch traces the cooperative orientation back to cooperative goal-interdependence.

Cooperative goal-interdependence is related to collective autonomy because both the former and the latter require collaboration and coordination among the actors to realize the respective goal(s). A *competitive* orientation is caused by competitive goal-interdependence and refers to an egoistic tendency to follow one's own interests ruthlessly, to engage in aggressive conflict, to emphasize authority and differences in status, and to mistrust one's partners in interaction.

2.4 Hypothetical framework of Collective Action Regulation

The aim of the framework depicted before is to present theoretical constructs with relevance for the analysis of industrial group work. Based on this, it is intended to present and validate an analysis instrument which reaches beyond the principal limitations of analysis depth that are characteristic for self-report scales with only few items per construct.

In section 2.2 we referred to activity theoretical considerations and studies suggesting that complex regulation requirements within collective work tasks enhance processes of mutual support by which group members transfer their individual knowledge and experience into a material form, thus, making their materialized expertise available to other group members.

Hypothesis 1: The level of collective planning and decision-making autonomy of a work group will be positively related to the extent to which their members collectively create or improve common objectifications, for example, shared tools and knowledge reservoirs.

As mentioned in section 2.3, there are many empirical studies which demonstrated (primarily) in educational settings that cooperation-promoting circumstances like task interdependence and collective autonomy tend to enhance cooperation-supporting orientations, while competitive conditions rather in-

crease selfish behavior (summaries in Deutsch, 2003; Johnson & Johnson, 2003; Tjosvold, 1998).

Hypothesis 2: Work groups with a higher level of collective planning and decision-making autonomy will differ from groups with lower collective autonomy by a higher level of common task orientation and related cooperation-relevant attitudes.

We also state that common objectifications can serve as material indicators for group cohesiveness. As presented, objectification is a central construct of activity theory (Leont'ev, 1978), which states an anthropological significance of human artefacts for the development of human culture, including patterns of interpersonal relations. This leads to Hypothesis 3.

Hypothesis 3: The higher the number of common objectifications in a work group, the higher the extent of common task orientation perceived by the group members and of indicators for cooperation-relevant attitudes will be.

As already mentioned, there is a multitude of process variables which may hamper collaboration and the development of cooperative behaviors and attitudes in work groups (cf. the review by Wegge, 2004). While it was not possible to consider such a multitude within our validation study, we referred to one hindrance of collective action regulation that gained significance in several studies referring to action regulation theory, namely, time pressure as a negative indicator of temporal resources (see Leitner et al., 1987; Frese & Zapf, 1994). Regarding social-psychological studies, McGrath and O'Connor (1996) suppose that aspects of temporal patterning may influence interpersonal relationships in work groups. Like other authors they conclude that multiple parameters of time, as „elasticity" and other temporal resources, may have an impact on the performance of work groups. Some further reviews indicated that high time pressure influences group decision-making (Neck & Moorhead, 1995) and social support at work (Lindström et al., 1994) or prosocial behavior in the everyday (Bierhoff, 2007) negatively. This leads to the assumption that time pressure can act as a moderator and may lessen the interrelation of collective autonomy with the readiness to create common objectifications (addition to Hypothesis 1) as well as with cooperation-relevant attitudes (addition to Hypothesis 2). Finally, a moderator effect of time pressure upon the association between cooperation-relevant attitudes and common objectifications is assumed (addition to Hypothesis 3).

3 Methods

For the validation of the collective action regulation framework and of the corresponding analysis instrument VERA-CAR (see section 3.2.1) two studies by Weber (1997) and Lampert (unpublished, 2004) were executed.

3.1 Study samples

This article is based on data obtained from studies with 28 work groups from three Enterprises. All work groups have been existing for about one to two years. In both studies care was taken to see that the observed groups included a broad spectrum of activities carried out in various areas of production.

Study 1: In study 1 data were collected from 17 work groups of two Enterprises. Enterprise 01 is a German automobile manufacturer, from which nine work groups from five separate production departments were analyzed. In this enterprise, as in most German automobile plants, basic concepts of „lean production" were implemented on a broad scale. Enterprise 02 is a big corporate unit of an engine manufacturer, located in the German-speaking part of Switzerland. Group work was also broadly introduced in this enterprise, whereby managerial strategy referred to the concept of semi-autonomous work groups. Eight group work systems were analyzed within the area of computer integrated manufacturing (CIM). The participants worked in various areas of computer-aided manufacturing (operators of advanced manufacturing systems and of CNC machine tools), at automobile finishing and assembly lines, and in indirect manufacturing areas. Most of the research participants had formerly worked under the leadership of supervisors, whereas the tasks did not fulfill collective regulation requirements. Data on collective autonomy of the groups were collected by using a semi-standardized observation interview technique (VERA-CAR, see section 3.2.1). Furthermore, common task orientation and cooperation-relevant attitudes were registered from 122 of the group members using a self-report questionnaire (88.5 % response rate). The average age of the participants was 36.9 years (SD = 10.7), 4.4 % of them were female. 60.6 % of the participants were skilled, 13.3% semi-skilled, and 26.1 % unskilled.

Study 2: In study 2 eleven work groups from one enterprise situated in a German-speaking country in the same Euro-region were examined. The enterprise belongs to an international corporation developing, manufacturing, and marketing products for the construction industry and building maintenance. Data were collected from group members in various areas of tool

and machine manufacturing in this enterprise. Before group work was introduced, each production-line in the plant and its employees were guided by a foreman. The collective autonomy of the work groups were analyzed using the semi-standardized observation-interview VERA-CAR. To assess interrater reliability of the latter, the level of collective autonomy concerning collective action regulation of each group was rated through two independent observers accompanying the group during their work for one day. Further, a self-report questionnaire was administered to 111 group members of the 11 work groups to analyze cooperation-relevant attitudes. 101 group members participated in the survey (91 % response rate). 82 % of them were male. Mean age was 39.6 years (range from 22 to 57 years).

3.2 Analysis of collective regulation requirements and autonomy – VERA-CAR-Instrument

Collective regulation requirements and autonomy in the work groups were analyzed using the *VERA-CAR instrument* (translated: „VERA for the Analysis of Collective Action Regulation in Industrial Work Groups“; German version in: Weber, 1997), which represents a work condition-related method based on observation interview technique. The *level of collective regulation requirements* (i.e., the level of planning and decision-making autonomy) is evaluated by trained investigators through targeted observation and interviews of sufficiently experienced workers carrying out regulatory functions (coordination, allocation, boundary maintenance) including group meetings. A structured manual provides the guidelines to the process of investigation at the workplace. The time that is required to gather the data for the analysis of collective action regulation which is seen as separate from the analysis of the individually executed tasks varies from about three hours (e.g., final assembly team in automobile production) to four days (e.g., maintenance team). Yet the real expenditure of time is usually higher because VERA-CAR always includes simultaneous analyses of regulation requirements of the individually executed work tasks in a group (average: six hours per task).

In a former article, Volpert et al. (1989) argued that there is exactly one mutually executed *central task* per work group that should be analyzed with regard to collective planning and decision-making. Central

Tabelle 1: Central task areas: overview (from Weber, 1997)

Central Task Area Nr.	*Typical Regulatory Decisions and Functions of Area*
(1) Participation in Production Planning and Control	Rough break-down, assignment and coordination of production orders, setting production target dates, control of material and information flow between the work system and other organizational units (boundary maintenance)
(2) Group-Internal Shop Floor Control / Job Scheduling	Capacity alignment, order scheduling (manufacturing lead time scheduling), machine load planning (coordination). Organization of production resources (allocation)
(3) Allocation of Personnel and Distribution of Tasks	Short- (allocation: e.g., task rotation, distribution of orders and work means, presence and absences from work) and long-term Planning (such as vacation planning), also under consideration of the individuals' well-being and specific needs
(4) Joint Execution of Manufacturing Functions	Executive team work on, for example, testing of systems and machines, production tests on new products, programming, interference diagnosis or repair
(5) Improvement Activities for Technical and Organizational Problems	Development of suggestions for solving technical, work-organizational, and superordinate organizational problems, as well as for quality assurance and longer-term planning of process and product innovations
(6) Planning of Personnel Development and Training	Planning of company-specific and external qualification courses and group-internal training activities under consideration of the needs of the individual and the enterprise
(7) Decisions of Internal Self-Governance	Setting decision criteria and rules, decision-making on, for example, the selection of the group spokesman, the recruiting of group members or the participation in setting performance requirements and the scheduling of work hours and breaks

tasks, however, may be subdivided analytically. Regulatory functions that are closely related in content and have the same goal, from a new theoretical point of view, form a *central task area.* In Table 1, seven types of potential central task areas are distinguished for industrial goods or parts production. The differentiation is based upon existing industrial management and work psychological studies (including study 1).

Collective regulation requirements form a central component of planning and decision-making autonomy: They encompass jointly performed planning and coordination of production tasks, allocation of personnel, and common production activities. Collective regulation requirements exist only where cooperating group members principally have equal rights to contribute suggestions, comments, ideas, objections. Applying the central section of VERA-CAR, the central task areas for which a respective work group is responsible are analyzed. The extent of collective regulation requirements of each central task area is assessed by an adaptation of the 10-step model of regulation requirements (Leitner et al., 1993). The higher collective regulation requirements a group has in different areas, the higher its task complexity is. The regulation levels are differentiated as follows: Level 5 = Design and setup of new work processes, Level 4 = Coordination of complex strategic decisions in different areas, Level 3 = Complex strategic decisions, Level 2 = Single decisions, Level 1 = Application of algorithmic rules.

For each level, both a complete and an additional restrictive step are defined. The restrictive step (abbreviated as „R“) applies where planning and decision processes are only partially demanded. According to research on work and personality, Level 5 is considered the most challenging and potentially most beneficial for personality development (Leitner et al., 1993). The lowest Level 1 characterizes work tasks creating no real decision-making demands. The 10-step model was operationalized in the form of an extensive, theory-based description within the manual of the observation interview (see details in Weber, 1997).

The corresponding VERA-CAR step is assigned to each of five central task areas. Additionally, the highest VERA-CAR step that is reached, as viewed over the central task areas (1) to (5), is called the *VERA-CAR Group Step.* The corresponding levels in each central task area are to be determined in case (a) for the whole group, (b) for each sub-group, (c) for rotating group members, or (d) for the group leader to gain a realistic picture of the distribution of collective regulation in the group. A personality-promoting effect may be assumed when many members take on regulatory functions from several areas of the central task at least every two months, whereby step 3R of strategic decision-making is reached (this is a criterion-oriented expert estimation), at least.

Reliability and Validity

The procedure for determining the steps of regulation requirements based on the VERA-CAR instrument was taken from the VERA for office work by Leitner et al. (1993) and modified for collective regulation requirements. Retest reliability of this VERA version is r = .84 ($p < .001$) which may be seen as very satisfactory. Because the core of the 10-step model was taken over, with regard to study 1 it is probable that the reliability of the VERA-CAR procedure is approximately the same. One objective of study 2 was to evaluate the reliability of VERA-CAR directly. Reliability was examined by means of independent replication analyses (sensu Oesterreich & Bortz, 1994) which is a specific form of retest reliability. Each work group was evaluated by two independent observers on different days. Results concerning the reliabilty of the *VERA-CAR-Group Step* by means of Cohen`s Weighted Kappa (Cohen, 1968) show a rather good overall Kappa value of $K_w = 0.77$ (N = 11 groups). For the empirical test of our conceptual framework of collective action regulation, we only used this measure as an index of collective panning and decision-making autonomy because the results of weighted Kappa concerning 3 of 4 *central task areas* were still unsatisfactory:

(2) Group-Internal Shop Floor Control / Job Scheduling: $K_w = .83$,
(3) Allocation of Personnel and Distribution of Tasks: $K_w = .18$,
(4) Joint Execution of Manufacturing Functions: $K_w = .43$,
(5) Improvement Activities for Technical and Organizational Problems: $K_w = .51$.

Collective regulation functions of central task area (1) Participation in Production Planning and Control couldn`t be observed. In several cases, the independent observers had difficulties to distinguish between the central task area (2) and (3) concerning the correct assignment of observed regulatory functions because job scheduling, allocation of personnel, and distribution of tasks were interdependent and, therefore, were performed simultaneously in many groups. The same was true for regulatory functions of the central task areas (4) and (5), because a considerable part of jointly executed manufacturing functions resulted in improvement activities. If the respective central task areas are combined the results of weighted Kappa demonstrate that inter-rater agreement improves considerably:

(2) Group-Internal Shop Floor Control / Job Scheduling and (3) Allocation of Personnel and Distribution of Tasks: $K_w = 0.64$,

(4) Joint Execution of Manufacturing Functions and
(5) Improvement Activities for Technical and Organizational Problems: $K_w = 0.75$.

Thus, the results of this first reliability study concerning the VERA-CAR instrument have proved satisfactory whereas reliability considering the differentiation of central task areas should be improved.

3.3 Analysis of common objectifications

VERA-CAR includes a theoretically-derived, qualitative classification scheme which falls back on categorical considerations outlined in section 2. The schema allows common objectifications to be identified in interviews according to nine categories (Weber, 1997, Appendix 1, p. 9ff.). Any objectifications found are recorded by the observer and classified according to various aspects. An object is evaluated as a common objectification in group territory only if it has at least been modified by a subgroup (minimum of three members) of the work group. Common objectifications can be created in simultaneous, joint activity or in successive actions that are based on each other. All common objectifications that are found are registered and added up. Then the sum of common objectifications is divided by the number of group members because it seems plausible that group size will also have an effect upon the number of objectifications produced. The VERA-CAR group step and the weighted number of common objectifications is tapped and assigned a step at the group-level.

3.4 Analysis of common task orientation and cooperation-relevant attitudes

The self-report data of common task orientation and cooperation-relevant attitudes were used for construct validation of the VERA-CAR. Following a suggestion by Goodman et al. (1987), many of the scales relate to a characterization of the total group from the perspective of the group members. In this way, a reduction of the mixed-level problem of data aggregation was intended. By the group-related formulation of the scale items (which are answered by individuals) we intended to make correlations between group mean values of cooperation-relevant attitudes or experiences and the weighted number of common objectifications more acceptable (cf. Hypothesis 3).

In study 1, the components of common task orientation and of cooperation-relevant attitudes were measured using the standardized Questionnaire for Group Work developed by Oswald and Weber (1995; see Table 2). The items include operationalized attitudes, on the one hand, and statements that yield information on the extent to which group members perceive that components of a common task orientation are realized in their group, on the other hand. Common Task Orientation was measured with the following five indicators: *Lack of collective responsibility* (6 items), *Individual denial of responsibility* (5 items), *Mutual support* (8 items), *Perceived efficacy* (4 items), and *Social recognition of contributions to the group* (4 items). Coopera-

Tabelle 2: Mean values, standard deviation and internal consistency (α) of the questionnaire scales (Study 1 and 2)

Scale	*Number of Items*	*M*	*SD*	*Cronbach's α*	*N*
Common task orientation:					
Lack of collective responsibility	6	2.17	0.81	0.76	256
Individual denial of responsibility	5	2.66	0.90	0.75	257
Mutual support	8	4.10	0.72	0.78	250
Perceived efficacy	4	4.08	0.72	0.64	255
Social recognition of contributions to the group	4	4.15	0.80	0.81	257
Collective responsibility	4	3.93	0.64	0.65	121
Team-member exchange quality	14	3.87	0.55	0.88	89
Cooperative vs.competitive orientation:					
Hierarchical thinking	6	1.71	0.73	0.78	256
Idiocentrism	5	2.18	0.88	0.72	256
Integrative Cooperation	8	3.74	0.50	0.66	101
Cooperative-interdependent work attitude	5	4.22	0.58	0.70	101
Other cooperation-relevant attitudes:					
Commitment	5	4.08	0.83	0.81	262
Evaluation of group meetings	3	4.14	0.85	0.65	262
Cost consciousness	4	3.74	0.79	0.60	257

Note: All Items are formulated in German language

tive Orientation was identified with the help of two negative indicators: *Hierarchical thinking* (6 items) and *Idiocentrism* (5 items, following Triandis et al., 1988). Additional cooperation-relevant attitudes were measured with three questionnaire scales: *Commitment to the group* (5 items), *Evaluation of group meetings* (3 items), and *Cost consciousness* (4 items).

In study 2, the *Collective Responsibility Scale* (4 items) from Kauffeld and Frieling (2001) and the *Team-Member Exchange Quality Scale* from Eby and Dobbins (1997; adapted by Lauche et al., 1999) were applied for the measurement of Common Task Orientation. Cooperative Orientation was measured with two positive indicators: Integrative cooperation (8 items) and Cooperative work attitude (5 items) which are based on a German scale from Lauche et al. (1999).
All scales were measured with 5-point Likert scales (from 1= no, not at all to 5= yes, indeed). The analysis of reliability indicates that the scales, despite their skew distribution of means, differentiate sufficiently among common task orientation and cooperation-relevant attitudes. Descriptive statistics and reliability coefficients (Cronbach's Alpha) of the indicator scales from both studies are described in Table 2. Almost all scales reached satisfying to very good internal consistency values (minimal α = .70 to maximum α = .88), five scales show lower but still sufficient consistency (α = .60 to .65).

3.5 Analysis of time pressure

Time pressure was measured using an observation interview procedure in *study 1* that was taken from the empirically proven semi-standardized work analysis method RHIA (Leitner et al., 1987) which is based on action regulation theory. The measure is refers to the proportion of time during which a worker may stop working without endangering the fulfillment of quantitative and qualitative production goals.

Because an extensive analysis of time pressure with the RHIA procedure was not realizable in *study 2,* the variable time pressure was measured more cursorily with a 5-point Likert scale of Rimann and Udris (1997). The items of the individual-level scale explore the extent to which group members perceive too high quantitative performance demands during their work. To reduce the mixed-level-problem of data aggregation, it was tested whether the respondents within each of the eleven groups did agree on their time pressure at work. Therefore, intraclass correlations were calculated (see Shrout & Fleiss, 1979). Findings show acceptable within-group interrater agreement in five groups (r = .52 to .66), very high intraclass correlation in further five groups (r = .86 to .95) and unacceptable intraclass correlation only in one group (r = .13) which was excluded of further data-analysis.

4 Results

The three-part hypothetical framework of common action regulation was presented in chapter 2. In the following, the results of a first, exploratory examination of the three hypotheses (on the basis of 17 work groups with a total of 120 to 122 members) that functions also as a first construct validation of the VERA-CAR measure will be outlined (study 1). Here, the second study (including 11 workgroups) focused on the testing of Hypothesis 2 as well as on inter-rater reliability analysis of VERA-CAR.

Hypothesis 1. It is stated that the overall level of collective planning and decision-making autonomy of a work group (operationalized by the VERA-CAR group step) is positively related to the common development, production, or improvement of objectifications (i.e., work means and tools, documented work methods, and knowledge stores).

The highly significant Pearson correlation[5] between VERA-CAR group step (sample size N = 17 work groups) and the number of objectifications per group (weighted by group size) of r = .70 ($p < .001$) corroborates this hypothesis. The more collective planning and decision autonomy a work group has, that is the more complex its collective hierarchical-sequential structure of action regulation is, the greater the number of its common objectifications.

The role of temporal resources led to the assumption that high time pressure may lessen the readiness to create common objectifications. The mean value of the group members' time pressure was calculated for each work group. While a negative (but not significant) correlation exists between VERA-CAR group step and average time pressure within the group (r = -.35, $p < .083$), the connection between collective planning and decision-making autonomy (VERA-CAR) and the weighted number of common objectifications remains nearly unchanged in the corresponding partial correlation (controlled for time pressure: r = .65, $p < .001$). Thus, no significant influence of this potential moderator variable is indicated.

Hypothesis 2. Here, it was investigated whether work groups with a higher level of collective planning and decision-making autonomy will differ from groups with lower autonomy by a higher level of common task orientation and other work-related cooperative attitudes and by a lower level of competitive orientation.

[5] Additionally, rank correlations were also calculated. They do not differ substantially and support the interrelations.

Tabelle 3: Results of MANOVAs and ANCOVAs examining the interrelations between collective autonomy, time pressure, and cooperation-relevant indicators (study 1)

	Mean values of cooperation-relevant orientations and perceptions of persons (work group members) in the particular autonomy class									
	Common task orientation					*Cooperative vs. Competitive orientation*		*Other cooperation-relevant orientations*		
Collective autonomy[a] (MANOVA):	Lack of collective responsibility	Individual denial of responsibility	Mutual support	Perceived group-related efficacy	Social recognition of contributions	Hierarchical thinking	Idiocentrism	Commitment to the group	Evaluation of group meetings	Cost consciousness
1	2.47[3]	3.01[4]	3.82[3]	3.97[4]	3.72[2,3]	1.94[4]	2.53[4]	3.76[3]	3.68[2,3]	3.69
2	2.11	2.78	4.13	3.88[4]	4.26[1]	1.74	2.30	4.19	4.18[1]	3.34[3,4]
3	2.01[1]	2.72	4.20[1]	4.15	4.25[1]	1.72	2.17	4.22[1]	4.52[1]	3.85[2]
4	2.20	2.36[1]	4.19	4.53[1,2]	4.11	1.31[1]	1.84[1]	4.20	4.13	4.01[2]
N (persons)	118	118	118	118	118	120	120	121	121	121
d.f.	3/114	3/114	3/114	3/114	3/114	3/116	3/116	3/117	3/117	3/117
Results of one-way MANOVAs										
F	2.114	2.078	1.942	3.625	2.980	2.813	2.744	2.284	5.962	3.612
p	.102	.107	.127	.015*	.034*	.042*	.046*	.083	.001***	.015*
Partial eta sq.	.053	.052	.049	.087	.073	.068	.066	.055	.133	.085
Results of ANCOVAs (covariate: Time Pressure)										
F	.563	.655	.753	1.790	1.952	3.610	1.014	1.212	1.762	1.559
p Autonomy	.640	.582	.523	.154	.126	.016*	.390	.309	.159	.204
Partial eta sq.	.016	.019	.021	.050	.054	.093	.028	.033	.047	.042
F	4.936	.777	5.593	2.784	5.012	4.282	.523	3.113	2.448	10.276
p Time Press.	.028*	.380	.020*	.098	.027*	.041*	.471	.081	.121	.002**
Partial eta sq.	.046	.007	.052	.026	.046	.039	.005	.029	.023	.088

Note. [1] = significant difference of means with regard to work groups in class 1; [2] = significant difference of means with regard to work groups in class 2; [3] = significant difference of means with regard to work groups in class 3; [4] = significant difference of means with regard to work groups in class 4 (Least significant differences test, *p < .05, ** p < .01).

[a]VERA-CAR-step of the group: n: persons per factor level (autonomy class) and analysis of variance:
Class 1 (step 1R, 1): 39 to 40 (from 5 work groups)
Class 2 (step 2R): 28 (from 3 work groups)
Class 3 (step 2): 34 to 36 (from 5 work groups)
Class 4 (step 3R, 3, 4): 18 (from 4 work groups)

Using a one-way multivariate analysis of variance (MANOVA) in *study 1,* the degree to which members from work groups with varying classes of collective autonomy show differences in the extent of cooperation-relevant attitudes and perceptions was tested. Table 3 summarizes the results for each dependent variable.

In order to achieve sufficient cell frequencies in the first study, the levels of the independent variable *Collective planning and decision autonomy* (operationalized by the VERA-CAR Group Step) had to be grouped in four variance-analytical classes (factors).

In study 2, the same classification was used ensuring comparability. Because no group could be assigned to class 1, the collective planning and decision autonomy in the second study had to be grouped in three variance-analytical classes. The obtained means per factor level, the number of cases, the results of the F-Test, and the results of the partial Eta squared are shown in the table rows.

Results for all of the dependent variables are reported in the table columns. The findings of *study 1* support the assumption of a positive association between the level of collective regulation requirements (i.e. class of collective autonomy) and the extent of common task orientation only partially. There are no statistically significant differences for the negative indicators *lack of collective responsibility* and *individual denial of responsibility*, nor for perceived *mutual support.* According to the considerations of Cohen (1988), referring to effect sizes that are realistic, there are significant differences with moderate effect sizes in the experience of *efficacy* in the group (η^2 = .087) and in the perception of group members that their *contributions to a mutual product* are *recognized* by their work group (η^2 = .073).

Moderate effects also exist between the class of collective decision-making autonomy and the two negative indicators of cooperative orientation. With increasing class of collective regulation requirements *hierarchical thinking* (η^2 = .068) and *idiocentrism* (η^2 = .066) statistically significantly decrease. Significant effects are also found for two of three further cooperation-relevant attitudes. Those group members assigned to higher classes of collective autonomy show a considerable tendency to evaluate their *group meetings* (η^2 = .133) more positively and seem to have more *cost consciousness* (η^2 = .085) than members of groups classified as having less autonomy. Surprisingly, the means do not differ significantly in the extent of the group members' *commitment* to their group. All in all, the distribution of means is more or less contingent to the predicted increase or decrease of collective autonomy because no significant differences of means appeared which rank contrary to Hypothesis 2.

Referring to reflections upon the role of temporal resources, it was investigated whether condition-related, individual *time pressure* would influence cooperation-relevant indicators. According to its character as an interval scale, time pressure was included as covariate in 10 covariance analyses (see the six lower rows of the summary Table 3). A significant effect of the covariate is shown for five of the 10 indicators for cooperation-relevant attitudes: *Lack of collective responsibility* (scale η^2 = .046), *mutual support* (η^2 = .052), *social recognition of contributions to the group* (η^2 = .046), *hierarchical thinking* (η^2 = .039), and *cost consciousness* (η^2 = .088). Considering the effect sizes, the level of objective collective planning and decision-making autonomy is a better predictor for the majority of cooperation-relevant attitudes and common task orientation than objective time pressure. As shown in the summary table rows referring to the analyses of covariance, five of the six significant relations between collective autonomy and cooperation-relevant indicators (with the exception of hierarchical thinking) do not reach the level of significance if time pressure is included in covariance analyses. All in all, this questions Hypothesis 2, partly. In the discussion it will be argued that this may be an artificial effect resulting from the interrelation between independent variable and covariate.

To test Hypothesis 2, two one-way multivariate analyses of variance were conducted in *study 2* (see Table 4) to assess influences of collective autonomy upon positive indicators of common task orientation (team-member exchange quality, collective responsibility) and cooperative orientation (integrative cooperation, cooperative work attitude).

The MANOVA demonstrated that employees who work in groups with different levels of collective planning and decision-making autonomy significantly differ in their *cooperative attitude* (6.4% explained variance) as well as in their common task orientation concerning *collective responsibility* (12.5% explained variance) and *team-member exchange quality* (12.1% explained variance). No significant differences (but a statistical tendency) were found between the classes of collective autonomy and *integrative cooperation* (p = 0.79).

LSD-post-hoc-tests show that employees in groups with a higher level of autonomy (VERA-CAR group step 3R, 3, or 4R) significantly declare a higher cooperative work attitude, collective responsibility, and team-member exchange quality than employees of groups with a moderate level of collective autonomy (VERA-CAR group step 2). Only the first class (VERA-CAR group step 2R) with the lowest level of autonomy did not show any significant differences concerning cooperation-relevant attitudes. The mean values on cooperative-relevant attitudes were (not significantly) higher than in class 2 but lower than in class 3. Consequently, the amount of cooperative work attitude,

Tabelle 4: Results of MANOVAs and ANCOVAs examining the interrelations between collective autonomy, time pressure, and cooperation-relevant indicators (study 2)

	Mean values of cooperation-relevant orientations and perceptions of work group members in the particular autonomy class			
	Common task orientation		*Cooperative orientation*	
Collective autonomy[a] (MANOVA):	Collective responsibility	Team-member exchange quality	Integrative cooperation	Cooperative work attitude
1	3.88	3.86	4.24	3.86
2	3.62[3]	3.56[3]	3.98[3]	3.56[3]
3	4.13[2]	4.01[2]	4.31[2]	3.80[2]
N (persons)	84	84	100	100
d.f.	2/81	2/81	2/97	2/97
Results of one-way MANOVAs				
F	5.783	5.587	2.601	3.341
p	.004**	.005**	.079	.040*
Partial eta sq.	.125	.121	.051	.064
Results of ANCOVAs (covariate: Time Pressure)				
F	5.758	5.745	.912	2.587
p Autonomy	.005**	.005**	.405	.081
Partial eta sq.	.126	.126	.019	.052
F	.290	.483	21.640	.418
p Time Press.	.592	.489	.000**	.519
Partial eta sq.	.004	.006	.186	.004

Note. [1] = significant difference of means with regard to work groups in class 1; [2] = significant difference of means with regard to work groups in class 2; [3] = significant difference of means with regard to work groups in class 3 (Last significant differences test, *p < .05, ** p < .01).

[a]VERA-CAR-step of the group: n: persons per factor level (autonomy class) and analysis of variance:
Class 1 (step 2R): 10 (from 2 work groups)
Class 2 (step 2): 28 (from 3 work groups)
Class 3 (step 3R, 3, 4): 61 to 62 (from 6 work groups)

collective responsibility and team-member exchange quality do not increase linearly with the increasing degree of collective autonomy. However, compared to the other two classes, the number of employees who had to be assigned to the first class is rather low as it can be seen at the bottom of Table 4. This could have biased the hypothesized effect.

As far as the role of temporal resources is concerned, it was assumed that there are additional negative interrelations with cooperation-relevant indicators beside the influence of collective autonomy. The results of two covariance analyses in Table 4 show that the covariate time pressure influences the associations between collective autonomy and integrative cooperation as well as between collective autonomy and cooperative work attitude, whereas no significant effect on collective responsibility and team-member exchange exists. All in all, Hypothesis 2 seems to be partially supported by the results of study 2. The three classes of groups with different levels of collective autonomy differ in two out of four cooperation–relevant indicators. A third indicator is affected by time pressure alone.

Hypothesis 3. The hypothesis states that common objectifications may be taken as material indicators for work psychological aspects of group cohesiveness. If so, positive relationships are expected between the number of common objectifications which a work group has created with positive indicators of common task orientation and of cooperation-relevant attitudes (and negative correlations with corresponding negative indicators). Accordingly, Pearson correlations were

calculated at the work group-level: The mean values of the 10 cooperation-relevant indicators were calculated for each work group. This was necessary because, out of theoretical reasons, a de-aggregation of the number of common objectifications would not have made much sense.

Hypothesis 3 is supported by the results shown in Table 5, mainly. The (weighted) number of common objectifications created or improved in work groups correlates significantly with three of the five indicators for common task orientation, namely, negatively with *individual denial of responsibility*, positively with *mutual support* and *social recognition of individual contributions to the group*, thereby having a medium to large effect size. There is a close relation to the cooperative orientation of groups: The more of their own objectifications found in the group, the lower a group demonstrates *hierarchical thinking* or *idiocentrism*. Furthermore, the more groups tend to create and improve common objectifications the more the corresponding group members are *committed to their group*, demonstrate *cost consciousness*, and *appreciate group meetings* (medium to strong effect sizes).

Additionally, the extent to which average time pressure (aggregated at the group-level), which correlated negatively with the number of common objectifications, diminishes those relations, was also tested. With time pressure partialled out, the correlations between the number of objectifications and six of the eight above mentioned cooperation-relevant indicators are maintained whereas the correlations with the indicator *social recognition of individual contributions* as well as with the *evaluation of group meetings* disappear. Taken these results altogether, Hypothesis 3 is supported, mainly.

5 Discussion and perspectives

With regard to the interpretation of the following results, it should be kept in mind that the sample size of N = 28 represents 28 groups with 256 members in total (of whom 221 answered the questionnaire) belonging to three industrial organizations. Moreover, the results are *not* artificially raised by common method variance because the interdependent variable was measured with a condition-related observation interview while most dependent variables were tapped with self-report

Tabelle 5: Pearson correlations and partial correlations between the number of common objectifications (weighted), common task orientation, and further cooperation-relevant indicators (N = 17 work groups, study 1)

	Common task orientation				
	Lack of coll. responsibility	Individual denial of responsibility	Mutual support	Perceived group-related efficacy	Social recognition of contributions
Number of objectifications	-.3372 (p < .093)	-.6973 p < .001	.6570 p < .01	.3620 (p < .077)	.4300 p < .05
Partialled out time pressure	-.2525 (p < .173)	-.6493 p < .01	.6062 p < .01	.3285 (p < .107)	.3636 (p < .083)
	Cooperative vs. competitive orientation				
	Hierarchical thinking	Idiocentrism			
Number of objectifications	-.4756 p < .05	-.4975 p < .05			
Partialled out time pressure	-.4550 p < .05	-.4456 p < .05			
	Other cooperation-relevant orientations				
	Commitment to the group	Evaluation of group meetings	Cost consciousness		
Number of objectifications	.5570 p < .01	.4086 p < .05	.6783 p < .001		
Partialled out time pressure	.5279 p < .05	.3421 (p < .097)	.6237 p < .01		

scales. In general, the empirical results lend support to the hypothetical framework and to the first validation of the VERA-CAR measure, but not in every assumption. The results of study 1 do indicate that common objectifications form a useful and promising link between the condition-related (quasi-objective) and person-related (subjective) analysis of industrial group work. The hypothesized association between collectively developed, produced, or improved work means on reservoirs of knowledge and the level of collective planning and decision autonomy is strong.

Though, collective planning and decision-making autonomy is only partly related to indicators for common task orientation. In study 1, analyses of variance demonstrate significant relations with moderate effect size in the predicted direction between the complexity of a group's collective autonomy (VERA-CAR group step) and two of five indicators. A closer connection exists with both negative indicators of cooperative orientation, as well as with two of three further cooperation-relevant indicators. The findings of study 2 indicate significant differences between the groups with different levels of collective autonomy (VERA-CAR group step) and three of four cooperation indicators, namely, both indicators of common task orientation (team-member exchange quality, collective responsibility) and one of two indicators of cooperative orientation (cooperative work attitude).

The covariance analyses yielded a significant influence of the covariate time pressure on five cooperation-relevant indicators in study 1. In order to interpret these results, the relation between factor and covariate was determined by means of a one-way ANOVA. Despite the fact that collective autonomy and time pressure are independent of each other in the conceptual-logical sense, both are strongly connected empirically ($\eta^2 = .433$). With increasing collective autonomy, there is a clear tendency to decreasing time pressure of the group members ($F = 32.321$; df 3/127). This strong connection suggests that the effect of collective autonomy on cooperation-relevant indicators (that was revealed in the MANOVA) „disappears" artificially in some of the covariance analyses as a side-effect of partialling out the influence of the groups' time pressure (as covariate). Considering the effect sizes, the level of collective planning and decision-making autonomy is a better predictor for the experience of efficacy, for social recognition of individual contributions, for hierarchical thinking, for idiocentrism, for evaluation of group meetings, and for cost consciousness than it is the case for the amount of time pressure. Though, the cross-sectional design does not allow to draw any conclusions on causal effects.

Additionally, as Table 3 shows, autonomy class 4 is under-filled in study 1. It is dominated by eight members of a work group with the highest level of autonomy in the whole sample. It was in this group that a conflict which had to do with the system of production bonus and with unfair behavior of one member occurred. Maybe, this has influenced some components of the group's common task orientation. Interestingly, the indicators of common task orientation were *not* suppressed by time pressure in study 2. This effect might indicate that the scales *collective responsibility* and *team-member-exchange quality* are better indicators to measure common task orientation than those used in study 1. Therefore, it would be desirable to tap the degree of common task orientation simultaneously on the basis of real, *observed* behavior, and thus to validate the construct.

Common objectifications are associated in the predicted direction with medium to strong effect size with three of five indicators of common task orientation in work groups and with both negative indicators of cooperative orientation. Finally, there is also a significant and close relationship to two of three further cooperation-relevant indicators as well as a medium-sized relation to the third. The majority of the correlations described are found to be significant even when average time pressure within the group is partialled out.

On the basis of these data, it is justifiable to pursue the conceptual proposal that common objectifications can be seen as „objective", materialized expressions of group cohesiveness. This should encourage further investigation into the role of common objectifications, also in regard to their importance for organizational learning (cf. the role of artifacts in the theory of Argyris & Schön, 1978). Taken altogether, the investigation supports the hypothesis that a high level of planning and decision autonomy as indicator of the complexity of the hierarchical-sequential structure of collective action regulation in industrial work groups is associated with the development or improvement of common work means and reservoirs of knowledge, on the one hand. This finding contributes to recent research within action regulation theory as well as to Michael West's approach of group task complexity and related approaches (see section 2.1). On the other hand, autonomy may also promote certain cooperative attitudes of the group members involved although this seems not to be the case for every indicator investigated (common task orientation, especially). Albeit heterogeneous findings considering the latter, the results justify further investigations of this collective action regulation.

Here, it should be reminded that high time pressure, which in this age of the so-called „globalization" is becoming the pathological „normal state" in many enterprises, not only has a negative effect upon work-related prosocial attitudes, but also upon the health of work group members (see several studies described by Ulich, 2005). From the wide-spread *perspective of*

effectiveness, workers' cooperation-relevant orientations serve as a means of personnel selection for group composition or as a means for the development of a general commitment to excellence in task performance (e.g., Salas et al., 2008; Tannenbaum et al., 1996). In a explicit *humanistic perspective*, the promotion of cooperative orientations is an independent, legitimate *goal* in supporting personality development through humane work design (see also Moldaschl & Weber, 1998). This potential goal-discrepancy shows that concepts of „effectiveness" in an applied science can be political rather than „technical-rational" as West remarked (1996).

The present studies are subject to several limitations. First, a multivariate longitudinal study with a larger sample size could clear the actual interrelations between collective autonomy, cooperation-relevant attitudes, common objectifications, and intervening variables. Because activity-related observation interviews demand much more expenditure of time than less precise methods (short self-report scales), this project would be expensive. Nevertheless, such a design would allow more depth of analysis, as some studies have demonstrated (e.g., Leitner & Resch, 2005). Quite probably, pre-occupational education and socialisation also influence the development of cooperative – and related – value orientations (cf. Deutsch, 2003; Johnson & Johnson, 2003) and this will have an impact – beside effects of collective autonomy – on task orientation and on readiness to engage in the production of common objectifications. Second, because restrictions imposed through the empirical field only a post hoc variance-analytical design was realizable. Considering time-pressure, because of underfilled classes and cells we had to fell back on ANCOVAs instead of two-way ANNOVAs provoking a mixed-level problem of data-analysis concerning Hypothesis 2.

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