DYNAMIC PERFORMANCE

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ABSTRACT

This chapter reviews research on dynamic job performance. It summarizes the empirical literature and presents conceptual and theoretical approaches of conceptualizing performance change and performance fluctuations over time. It addresses longer-term performance changes, describes predictors (e.g., ability, personality) and outcomes of individual differences in these changes, and incorporates a life-span perspective. It discusses vicious and positive cycles with performance and its outcomes reinforcing one another. It presents a within-person approach that focuses on short-term performance variability within persons and describes action-related and self-regulation process models of dynamic performance.
The chapter closes with a taxonomy of dynamic performance processes and a research agenda for the future.

INTRODUCTION

Performance is a core concept within industrial and organizational psychology. Various theories in this domain aim at predicting high job performance, and human resource management endeavors center around the goal of improving performance in work organizations.

A "convenient" assumption of selection research and other areas of industrial and organizational psychology has been that performance is rather stable. This assumption is convenient: If predictors of performance and the criterion of performance do not show stability, it is difficult to predict later performance from earlier attributes. Such an assumption is not only convenient, but also partially true because meta-analyses showed that of attributes, behaviors and performance are rather stable across time (Ouellette & Wood, 1998). However, this assumption is only half-true because stability across time clearly never even approaches 1.0 (even after correcting for attenuation). Depending upon the circumstances, stability across time is sometimes high and sometimes low (Sturman, Cheramie, & Cashen, 2005). A person's performance levels may increase due to learning processes and practice and may decrease due to transient (e.g., fatigue) and more enduring (e.g., aging) processes. In addition, performance may also fluctuate within persons within short time intervals. If such fluctuations were random they might not justify much attention; however, if they are more systematic, it will be important to identify factors that predict a particularly high performance level within a person.

To develop a comprehensive theory of performance, it is necessary to address the stable and the dynamic aspects of performance. Given the emphasis on selection issues in I/O Psychology, the stable part of performance has usually been emphasized. In this chapter, we approach the topic of performance from a dynamic point of view and thus, we see our approach to be compensatory to the usual approach taken in I/O psychology. The dynamics of performance is particular evident in the following areas of performance: Learning and forgetting, temporal vigor and fatigue, engagement and burnout – to give just a few examples.

These various temporal processes may actually feed upon each other – they then lead to positive or negative cycles or they may be leveling off or even have a curvilinear effect over time. Dynamic performance effects may also unfold differentially across time, for example, the effect of job redesign may take a certain time to lead to changes. Performance effects may appear at a later period and not directly after the implementation of a new job design (e.g., Wall & Clegg, 1981). Other predictor changes may have an immediate effect on performance, such as reinforcement (Luthans, Paul, & Baker, 1981). Finally, there may be fluctuations of performance around a mean across time.

One major research approach that addresses changes in performance is the area of training and education. Training or education leads to changing levels of knowledge and skills (Lipsey & Wilson, 1993); however, although interesting approaches have been proposed on learning and change of performance (Kozlowski et al., 2001) and on conceptualizing how self-regulatory processes stimulated in training interventions bring about performance change and adaptation (Bell & Kozlowski, 2008; Smith, Ford, & Kozlowski, 1997), instructional interventions are not the focus of this article. Similarly, during recent years studies has increased our understanding about how people adapt to changes at their workplace or changes in the tasks they have to perform (Lang & Bliese, 2009; LePine, 2003; LePine, Cloquitt, & Erez, 2000). In the present chapter, we look at the dynamics of performance in the sense of changes that do not take place as a direct result of outside interventions (such as training or job, changes in the task or in organizational design), but that take place as a result of time or time on task (time x task interactions), as well as changing task structures over time because of self-regulatory processes. However, we should hasten to add that time per se is not the important variable – rather there are processes within time that produce the effects of dynamic performance. “Although we analyzed the effects of time on validity, we do not imply that time per se was the causal factor in the observed validity decrements. Those things that occur

while individuals are learning and performing jobs and during skill acquisition are the assumed causal agents." (Hulin, Henry, & Noon, 1990, p. 336).

This chapter focuses on the dynamics of individual performance. Performance dynamism occurs also at other levels within organizations, for example, at the team level or the organizational level (for research in these areas, cf. Chen, Wallace, & Thomas, 2005; Kozlowski, Gully, McHugh, Salas, & Cannon-Bowers, 1996; Kozlowski, Gully, Nason, & Smith, 1999; Le Pine et al., 2000; Marks, Mathieu, & Zaccaro, 2001).

We start our chapter with definitions of performance and of dynamic performance. In the second section, we briefly describe the relevance of the topic. The sections that follow are devoted to the (1) long-term performance trajectories, (2) performance cycles, (3) short-term performance variability within persons, and (4) dynamism within performance action phases. We conclude with an overall discussion which provides an integrative theoretical overview of the dynamic performance and suggests avenues for future research.

DEFINITIONS AND CONCEPTUALIZATIONS

Definition of job performance

Job performance is a broad concept comprising multiple dimensions. On a basic level, job performance comprises a process aspect (i.e., *behavior*) and an *outcome* aspect (Campbell, McCloy, Oppler, & Sager, 1993; Motowidlo, 2003; Roe, 1999). The process aspect refers to multiple, discrete behaviors that people *do* at work (Campbell, 1990). It focuses on the action itself – as opposed to the results or outcomes of this action. It limits itself to behaviors that contribute to the goals of the organization and that are under the control of the acting person (Campbell et al., 1993).The outcome aspect refers to the *results* of behavior and comprises states or conditions that are only partially under people's control.

While at the conceptual level, many researchers agree to focus on the behavioral aspect of performance (Campbell et al., 1993; Motowidlo, Borman, & Schmit, 1997),

empirical research often operationalizes performance from a results-oriented perspective (Sturman, 2007), particularly when examining performance changes over time (e.g., Ployhart & Hakel, 1998). The behavioral and outcome aspect are related but they are conceptually and empirically distinct: While the performance process aims to achieve positive performance outcomes, the performance outcomes (i.e., results) are usually influenced by other processes than only a person's performance behavior (e.g., situational and organizational constraints, market conditions, random processes). This observation implies that studies that only examine performance outcomes (instead of the performance processes) are seriously underestimating and misspecifying the effect of predictors of process performance. However, we have to acknowledge that performance outcomes matter more to most business organizations and are often more readily measured than performance processes.

There is broad consensus in the literature that the performance process comprises aspects of task and contextual performance (Borman & Motowidlo, 1993; Hoffman, Blair, Meriac, & Woehr, 2007; Rotundo & Sackett, 2002). Task performance refers to activities that directly transform materials or information into goods or services and to activities that directly support the organization's core activities (e.g., by delivery activities or planning and coordination) (Motowidlo, 2003). Contextual performance refers to discretionary behaviors that add to organizational effectiveness by improving the functioning of the social and organizational context of work.

Recently, additional differentiations were suggested: The two most important ones are: adaptive and proactive performance (Griffin, Neal, & Parker, 2007). The core of the adaptive performance concept is that people cope with and support organizational change (Griffin et al., 2007; Pulakos, Arad, Donovan, & Plamondon, 2000). The proactive performance concept (Grant & Ashford, 2008) refers to behaviors that initiate change, are self-starting and future oriented (Frese & Fay, 2001; Griffin et al., 2007). It implies personal initiative (Frese, Kring, Soose, & Zempel, 1996; Thompson, 2005), taking charge (McAllister, Kamdar, Morrison, &

Turban, 2007; Morrison & Phelps, 1999), voice (LePine & Van Dyne, 2001), active feedback seeking (Ashford & Tsui, 1991) and some forms of engagement (Macey & Schneider, 2008). Table 1 describes the four dimensions of performance, defines them and cites some representative authors.

Insert Table 1 about here

The majority of studies that examined dynamic performance focused on task performance; but there are a few studies that also looked at the dynamic nature of performance in the areas of contextual (Ilies, Scott, & Judge, 2006) and proactive performance (Frese, Garst, & Fay, 2007; Seibert, Crant, & Kraimer, 1999).

Definitions and Conceptualizations of Dynamic Performance

Performance is considered to be dynamic if it changes over time without outside and directed interventions; changes over time can imply changes in mean values, changes in correlations between performance dimensions, and lack of stability of job performance over time (Deadrick, Bennett, & Russell, 1997; Hanges, Schneider, & Niles, 1990). According to Sturman (2007), lack of stability refers to the behavioral aspect of performance, not to the results or utility of performance. One implication of this specification is that individuals' rank order of performance scores change over time. Change may refer to intra-individual change and to interindividual differences in intra-individual change (Hofmann, Jacobs, & Baratta, 1993).

Performance dynamism can refer to both long-term and short-term changes in individual performance. Reb and Cropanzano (2007) characterized the long-term changes as performance trends. Such long-term changes result – among others - from changes in knowledge, skills, and experience. In organizational settings these trends may cover periods

of months or even years (Deadrick et al., 1997; Ployhart & Hakel, 1998), in laboratory research such trends occur over periods of some hours (Ackerman, 1988). From such performance trends, short-term performance fluctuations can be differentiated, reflecting performance variations around a constant mean (Reb & Cropanzano, 2007). These variations are not random but may be influenced by momentary affective states (Beal, Weiss, Barros, & MacDermid, 2005). In this chapter, we address both the long- and short-term changes in performance.

RELEVANCE OF PERFORMANCE DYNAMISM

Looking at job performance from a dynamic perspective is important for a number of reasons. Firstly, to arrive at a better understanding of job performance at the conceptual level, research attention must be paid to the dynamic aspects of performance. Although there was a lively debate during the past four or five decades about whether performance is dynamic or static (for an overview see Sturman, 2007), nowadays researchers largely agree that performance and performance criteria change over time. Thus, performance must not be seen as a stable, but highly dynamic concept. Secondly, taking a dynamic approach to performance enables researchers to make predictions about performance trajectories over time. Such an approach enhances our predictive knowledge about how performance increases (or decreases) over time and about the pattern of such performance changes (linear, cubic, etc). In addition, we can develop more realistic concepts about when a performance plateau is reached and can identify individual characteristics and situational features that predict performance changes over time (e.g., who will show stronger increases in performance early in his or her career?).

Thirdly, taking a dynamic approach to performance, makes it possible to combine research on performance with research on life long development, thus, integrating knowledge about performance changes across the life time into work and organizational psychology (Kanfer & Ackerman, 2004a; Schalk et al., 2009 in press).

Fourthly, acknowledging the dynamics of performance makes it possible to examine fluctuations of performance around a person-specific mean level (Reb & Cropanzano, 2007). We are then able to develop indicators about the degree of these performance fluctuations (e.g., within a week, a month or a year) and whether they are still in a "normal" range or not.

Fifthly, the dynamic perspective of performance is also relevant for practical issues such as personnel selection. Traditionally, selection procedures assume that the rank order of individuals tested for selection purposes does not change over time. However, as research on dynamic performance has shown, rank orders are not completely invariant over time (e.g., (Hofmann, Jacobs, & Gerras, 1992). Thus, the utility of such traditional selection approaches that assume an unchanged rank order of individuals' performance over time cannot remain unquestioned. To improve selection procedures, research may identify factors that predict inter-individual differences in performance trajectories (i.e., individual differences in performance change over time; cf., Ployhart & Hakel, 1998).

LONG-TERM DYNAMIC PERFORMANCE TRAJECTORIES

Evidence for performance dynamism

Early research on dynamic performance originated from a discussion of the stability of performance and whether performance ratings are reliable over time (Barrick & Alexander, 1987; Ghiselli & Haire, 1960; Humphreys, 1960). An example for this type of study is that performance scores at various points in time follow a simplex pattern, characterized by a decrease in size of correlations as the time lag between the performance measurements increases (Humphreys, 1960). Despite this evidence that performance measures are not completely stable over time, it remained unclear from this early research whether changes in performance measures are attributable to true changes in performance or to unreliability of the measures. Sturman, Cheramie, and Cashen (2005) addressed these issues in a meta-analysis and examined the extent of job performance changes over time. Specifically, they aimed at

separating stability (extent to which the true score does not change over time) from temporal consistency (extent to which observed performance measures correlate over time) and test-retest reliability (degree of convergence between the observed and the true score). This meta-analysis based on 22 independent samples with an overall sample size of 4,294 individuals made use of a total of 309 correlations with time lags ranging between one week (Rothe, 1970) and 72 months (Hanges et al., 1990). Overall, this meta-analysis showed that temporal consistency decreased as time between measurement points increased and that objective performance measures (as opposed to subjective measures) and greater job complexity were associated with lower test-retest reliability, with job complexity moderating the effects of time. A breakdown of the results for specific subgroups of measures and time lags revealed that average stability of performance ranged between 0.44 (objective measure, low complexity, 3-year time lag) and 0.96 (subjective measure, high complexity, 0.5-year time lag). Average temporal consistency ranged between 0.14 (objective measure, high complexity, 3-year time lag) and 0.69 (subjective measure, low complexity, 0.5-year time lag). Average test-retest reliability ranged between 0.50 (objective measure, high complexity) and 0.83 (subjective measure, low complexity). Overall, these findings demonstrate that performance is far from being stable over time, but nevertheless seems to have a stable "component" as the stability coefficients decreased but did not approach zero. Interestingly, stability tended to be lower in highly complex jobs, a fact that can be attributed to a greater change in specific job requirements over time and an increased difficulty to assess performance when jobs are more complex.

Evidence for interindividual differences in performance trajectories

Sturman et al. (2005) showed that performance is not stable over time. An additional issue of a dynamic view of performance relates to the fact that performance instability may not be uniform for all individuals and individuals may differ in their changes over time. For

example, after starting a new job, some people increase their performance rather quickly, whereas others need more time. Several studies have examined predictors of interindividual differences in performance trajectories and whether performance trends are systematic.

Hofmann and his coworkers (Hofmann et al., 1992; Hofmann et al., 1993) addressed the questions whether individuals differ in their performance trajectories over time and whether different patterns of performance trajectories can be detected. The first study (Hofmann et al., 1992) analyzed performance data from two groups of professional baseball players (128 batters and 76 pitchers) over a 10-year period; it found a quadratic trend for mean per performance in one of the groups, and a quadratic and cubic trend in the other groups. Moreover, baseball players differed in their performance trajectories over time; subgroups with positive versus negative linear trends could be clearly differentiated.

In the second study, 12 subsequent quarters of insurance sales were examined; Hofmann et al. (1993) found that individuals differed in their performance trajectories, that is the change in performance over time was not uniform across individuals. More specifically, 69 % of the variance of linear growth parameter and 30 % of the variance of the quadratic growth parameter were systematic, indicating that linear and quadratic parameters differed between individuals; however, there were no differences between individuals for a cubic parameter. Hofmann et al. suggested that differences in individual skills, knowledge or goal orientations might influence differences in performance trajectories.

Hofmann et al.'s findings were confirmed by a number of subsequent studies demonstrating systematic differences in people's performance trends (Day, Sin, & Chen, 2004; Deadrick et al., 1997; Ployhart & Hakel, 1998). Some of these studies demonstrated that interindividual differences do not only exist in the linear growth parameter (i.e., slope) of performance trajectories but also in higher-order parameters of the performance curve such as quadratic (Ployhart & Hakel, 1998; Thoresen, Bradley, Bliese, & Thoreson, 2004; Zickar & Slaughter, 1999) and cubic (Ployhart & Hakel, 1998; Thoresen et al., 2004) parameters.

Quadratic trends imply that the increase in performance decreases over time (i.e., "flattens out"); cubic trends refer to more complex patterns that often can only be interpreted in the light of the specific research setting and the specific time frame (cf., Thoreson et al., 2004).

Taken together, there is rather consistent evidence that individuals differ in performance trends (cf. also, Zyphur, Bradley, Landis, & Thoresen, 2008), with the most obvious differences in the linear trends. Conclusions that differences in quadratic or cubic trends are less relevant might be premature because these higher-order trends have been analyzed only in a few studies.

Studies conducted since the mid nineties addressed the question whether predictors of these individual differences in performance trajectories can be identified. Deadrick et al. (1997) examined performance trajectories of sewing machine operators over a relatively short period of 24 weeks. The authors identified job experience and abilities as predictors of the linear growth parameter. Specifically, job experience was negatively related to the linear growth parameter indicating that workers with previous experience in the specific domain improved more slowly than workers with no previous experience. Cognitive ability predicted a fast increase in performance. Interestingly, only 5 percent of the variance in the linear performance trend was explained by the predictors included in this analysis.

While Deadrick et al. (1997) examined performance changes within a relatively small time span, most of the other studies on performance trajectories looked at longer time intervals. Ployhart and Hakel (1998) analyzed gross sales commissions of salespeople over a period of eight quarters and examined individual difference variables (past salary and future expected earning, persuasion, empathy) as predictors of mean performance levels and growth parameters. Latent growth curve modeling demonstrated that past salary and future expected earning predicted interindividual performance differences at the first measurement occasion. Self-reported persuasion and self-reported empathy were related to the linear growth parameter, indicating that those who think of themselves as persuasive and empathetic

increase their sales performance at a faster pace than those who rate themselves lower in these dimensions. The predictors were not related to a quadratic growth parameter (i.e., acceleration in performance over time).

Thoresen et al. (2004) also examined predictors of sales performance and sales performance trajectories and extended Ployhart and Hakel's (1998) research by including Big Five personality variables as potential moderators and by differentiating between two job stages. More specifically, Thoresen and his co-authors built on the work of Murphy (1989) and distinguished between maintenance and transitional job stages. When people are in a maintenance stage, they have learned well to perform all major job tasks and are no longer facing situations characterized by novel or unpredictable demands. When people are in a transitional stage, they are confronted with undefined methods of operation, they must learn new skills and make decisions about topics that are unfamiliar to them (Murphy, 1989). In other words, during transitional stages, employees do not yet have routines available for accomplishing their tasks (Frese & Zapf, 1994). For the maintenance sample, the authors found the following: There was a significant linear and cubic trend indicating an overall increase in performance over time with a large increase in performance from Quarter 1 to Quarter 2, relative stability from Quarter 2 to Quarter 3, and another increase from Quarter 3 to Quarter 4. Also, job tenure and conscientiousness were significantly related to mean levels of performance; extraversion was a marginally significant predictor of performance. Additionally, in this maintenance sample, there were no significant interactions between Big 5 personality variables and the linear and quadratic trends in the performance trajectories, suggesting that broad personality constructs did not matter much with respect to performance increase and acceleration over time during the maintenance stage. However, there was a significant interaction between conscientiousness and the cubic trend of sales performance indicating that higher-order patterns of performance trajectories may depend on conscientiousness in the sample that had already developed a certain number of routines.

For the transitional sample, analyses revealed: There was a strong positive linear trend and a significant negative quadratic trend (but no cubic trend) indicating a strong general increase in performance and a plateauing of this increase over time. Also, agreeableness and openness to experience were significantly related to mean performance also when job tenure was controlled for. Moreover, agreeableness was positively and emotional stability was negatively related to the linear growth parameter. This unexpected finding with respect to emotional stability might indicate that employees low on emotional stability react more strongly to disturbances and unforeseen changes, which in turn might help to increase performance. Openness to experience was negatively related to the quadratic growth parameter indicating that persons high on openness were less likely to show plateauing of their performance level over the study period.

Overall, this study showed that personality factors as predictors of performance growth trajectories differ between maintenance and transitional job stages. Personality seems to matter for changes in the transitional stage, but not for changes in the maintenance stage. Thus, this study demonstrated that it can be very important to differentiate between various job stages when examining long-term performance trajectories (Thoreson et al., 2004).

Other studies examined performance trajectories in more specific samples such as film directors and sport professionals. Using performance data from film directors, Zickar and Slaughter (1999) aimed at predicting individual differences in performance trajectories. In this study, performance was operationalized by the critics ratings of the films made by the directors. The number of films a director produced per year throughout his or her career predicted the linear and the quadratic trends of critics ratings. Directors who produced many films per year showed an improvement in critics ratings over their careers and had an accelerating performance trajectory.

Day et al. (2004) studied performance trajectories of players of the US National Hockey League over the course of nine seasons. Overall, the authors observed a negative

linear trend. Performance trajectories differed between persons, whereas position within the team and age were important factors. For example, offensive and older players had a flatter performance trajectory than defensive and younger players.

While the studies presented so far concentrated on individual performance, Chen (2005) explicitly linked individual performance trajectories to team-level processes. More specifically, he analyzed performance change of knowledge workers after they joined a project team. Performance was assessed via peer and team leader ratings. As predictors of newcomers' performance change, empowerment, team expectations, and initial team performance were examined. Analysis showed that initial team performance predicted change in newcomers' performance over a period of six weeks. Although empowerment and team expectations predicted newcomers' initial performance levels, there were no significant predictors for performance change. This study is noteworthy as it included situational variables (e.g., team performance) as potential predictors of performance change. In combination with the other studies, it suggests that not only individual-difference variables, but also environmental variables play a major role for explaining differences in performance trajectories.

Dynamic changes of performance predictors over the life span

Life-long developmental psychology has shown that the two most important predictors of performance – cognitive ability and conscientiousness - change across the life span. Particularly the fluid intelligence part of cognitive ability is reduced over time, while crystallized intelligence does not decrease (Baltes, Staudinger, & Lindenberger, 1999; Verhaeghen & Salthouse, 1997). The biological process of a sharp reduction of all parts of intelligence comes at a very high age (when most people are retired from work; Baltes et al., 1999). However, there is a certain degree of plasticity even in the decrement of intelligence over the life span (Baltes et al., 1999). Work psychology also produced evidence that the

reduction of cognitive ability is dependent upon the complexity of work done; employees in highly complex jobs show few signs of reduction of cognitive ability with age in contrast to employees in less complex jobs (Kohn & Schooler, 1978; Schallberger, 1988; Schleicher, 1973; Schooler, Mulatu, & Oates, 1999). This effect of complexity of work is more pronounced in older than in younger workers (Schooler et al., 1999).

Decrements in cognitive ability do not translate immediately into decrements in performance. As a matter of fact, meta-analyses show that there is a zero relationship between age and core task performance (Ng & Feldman, 2008). A more differentiated analysis shows even some positive effects of age on reduced absenteeism, reduced tardiness, some forms of organizational citizenship behavior and small positive effects on safety behavior; counterproductive behavior and work place aggression are reduced with age (Ng & Feldman, 2008). The fact that age has no substantial effect on core job performance - in spite of decreased fluid intelligence as a function of age - can be explained by the complex nature of the performance dynamics. First, some of the jobs may require little fluid intelligence even though crystalline intelligence requirements may be high (e.g., managers) (Kanfer & Ackerman, 2004). Thus, there may be little reason to expect performance decrements in such jobs over time. Second, there are compensatory mechanisms. People at work may compensate memory loss by writing things down, optimize their approaches to the tasks (effort, time allocation, etc.), and select (if possible) those tasks that they are good at (or reduce the number of tasks) – all this suggests a SOC (selection – optimization – compensation) approach to performance (Baltes, 1997; Zacher & Frese, 2009). Selection (select those activities and goals that are central), optimization (e.g., seizing the right moment, investing resources, honing skills, knowledge, and attention for those activities that were selected), and compensation (maintaining good performance in spite of loss by making good use of alternative means) are functional, particularly at old age. A good example is a quote on Rubinstein by Baltes (1997, p. 371):

> "When the concert pianist Arthur Rubinstein, as an 80-year-old, was asked in a television interview how he managed to maintain such a high level of expert piano playing, he hinted at the coordination of three strategies. First, Rubinstein said that he played fewer pieces (selection); second, he indicated that he now practiced these pieces more often (optimization); and third, he suggested that to counteract his loss in mechanical speed, he now used a kind of impression management, such as introducing slower play before fast segments, so to make the latter appear faster (compensation)."

Third, workers may be able to compensate memory losses with increased levels of conscientiousness. There is evidence that older workers become more conscientious across the life span (Roberts, Walton, & Viechtbauer, 2006). Conscientious older workers use SOC approaches (Baltes, 1997) to keep up good performance (Bajor & Baltes, 2003). Thus, good predictors of performance (such as conscientiousness) tend to change over time. It is useful to think of motivational effects of these various changes as mediating mechanisms of performance change over time (Kanfer & Ackerman, 2004).

Consequences of individual differences in performance trajectories

Most studies that examined individual differences in performance growth parameters focused on predictors of these differences. In addition, a few studies examined possible outcomes of such differences in performance trajectories (Harrison, Virick, & William, 1996; Sturman & Trevor, 2001).

Sturman and Trevor (2001) analyzed the performance trends of 1,413 employees of a financial services organization: Hierarchical linear modeling revealed that persons who stayed in the organization during the 8-month study period showed a positive performance trend over time; however, persons who left the organization during the study period, had not increased their performance. When current performance level was controlled, longer-term negative performance trends in the past predicted turnover. Moreover, longer-term performance trends in the past interacted with current performance in predicting turnover: employees with low current performance levels showed an increased tendency to voluntary turnover when their

performance trend in the past was negative, but not when their performance trend in the past was positive; for employees with high current performance, past performance trends did not matter with respect to voluntary turnover.

This study is informative as it demonstrates that performance trends over time can result in outcomes that are highly relevant for organizations and individuals alike. Moreover, Sturman and Trevor (2001) showed how important it is to examine performance trends for practical and theoretical purposes. The evidence on non-dynamic models of turnover may point to conclusions that are only related to the current performance levels to be predictors of turnover (Williams & Livingstone, 1994) and not to past trajectories of performance. However it makes sense from a practical point of view that current performance level is not the only predictor turnover but that one looks at one's development in much more detail to decide whether to leave. Similarly, managers may observe their subordinates' performance trajectories when they ask someone to leave.

It would be an interesting avenue for future research to examine performance trends related to other variables such as job attitudes or to motivational constructs including self-efficacy. For example, research within a control theory framework suggests that not just a person's current performance level and progress towards a goal, but also the velocity of goal attainment predict affective outcomes (Lawrence, Carver, & Scheier, 2002). Similarly, longer-term performance trends that reflect these velocity aspects might be relevant for job satisfaction and similar constructs.

Theoretical Models

In addition to answering the empirical questions whether performance is dynamic over time and to identify predictors of specific performance trajectories, researchers aim at explaining why performance is dynamic. Among the most prominent theoretical models that try to account to performance dynamism are the changing-subject and the changing-task

model (Alvares & Hulin, 1972; Henry & Hulin, 1987), the skill acquisition model (Ackerman, 1987, 1988), and the employment stage model (Murphy, 1989). It has been argued that models from other disciplines such as Learning Curve Theory might be applied to develop a model of individual dynamic performance (Sturman, 2007).

Changing-subject and changing-task model

The changing-subject model (changing-person model as described by Keil and Cortina, 2001) proposed that individual characteristics relevant for performance change over time as the individual gets more experience with the task. One specific formulation of this approach referred to changing levels of abilities (Adams, 1957). Later, it was argued that it might be more appropriate to specify changes in skills because skills are conceptualized to be more changeable than abilities (Keil & Cortina, 2001). Sturman (2007) argued that also motivation and job knowledge may change over time and could therefore be incorporated in changing-subject models. It is important to note, that this model assumes that the causes of performance change over time, but that the contribution of these causes to performance may remain stable. The changing-task model states that the contribution of specific abilities to performance changes over time, but the individual's level of these abilities remains stable. The relative contribution of specific abilities may change over time because of job changes, assignment of new roles and tasks and because of revised organizational requirements such as changes in technology (Sturman, 2007). Keil and Cortina (2001) have argued that these two models should be seen as complementary rather than competing.

We agree with Keil and Cortina (2001) that these two models can be integrated – as a matter of fact we think that there are sometimes interactions of changes in individuals and the task environment. Moreover, Industrial and Organizational Psychology has tended to underestimate the plasticity of traits and abilities across the life span. Abilities (e.g., cognitive abilities) and personality traits change, as shown above. Moreover, there are likely

interactions of these changes with task environments. We suggest that it is useful to think of traits, abilities, and skills as being changeable over time and as these changing traits, abilities, and skills may interact with the task structure to produce changes in performance. There may be differential rates of change – with some factors changing very slowly even as a result of direct interventions (slow changing traits) and some other changing more quickly (e.g., skills). The rate of change of predictors needs to be determined empirically and should not be assumed to be either all or nothing (Nesselroade, 1991; Srivastava, John, Gosling, & Potter, 2003).

Skill acquisition model and self-regulation

Several theoretical models have suggested different stages of skill acquisition – all of them assuming a stage in which conscious attention to the relevant parameters play an important role, a stage in which various parts of the skills are integrated, and a stage in which the skill becomes routinized (Ackerman & Cianciolo, 2000; Anderson, 1982; Frese & Zapf, 1994; Hacker, 1998). Ackerman's (1987, 1988) skill acquisition model is particularly relevant for performance dynamism. This model differentiates between three stages of skill acquisition; each stage is associated with a certain type of abilities which predicts performance during this phase. Ackerman proposed that during a first phase of skill acquisition (cognitive phase) when the demands on the cognitive-attentional system are high, general mental ability is crucial for performance. During the second phase (associative phase) when the stimulus-response connections are refined, perceptual speed abilities are most relevant. Perceptual speed abilities refer to the "speed of consistent encoding and comparing symbols" (Ackerman, 1988, p. 290). During the third and final phase (autonomous phase) when tasks can be completed without full attention, psychomotor ability is most important for performance. Psychomotor ability describes the speed of responding to stimuli that involve no or only little cognitive processing demands. Thus, during the continuous process of skill

acquisition the importance of general mental ability is high at the beginning and then decreases over time. Perceptual speed ability is low at the beginning, increases over time, and decreases again as task completion becomes more automatized. Finally, psychomotor ability is low at the beginning and increases over time.

Ackerman (1988) further argued that the skill acquisition process is dependent on the complexity and consistency of the task. *Complexity* refers to memory load, number of response choices, amount of information provided to the learner and other aspects of the cognitive demands of the task. More complex tasks require more attention, reduce the accuracy of task performance, and increase the amount of time needed to complete a trial. *Task consistency* refers to invariant rules for information processing, invariant components of processing and invariant sequences of information processing components (Ackerman, 1987). It therefore determines the degree of which automaticity of task completion can be achieved during skill acquisition. Consistent tasks can become automatic, fast, effortless within rather short periods of time whereas inconsistent tasks can not be processed with automaticity and therefore, remain largely resource dependent. Task consistency has an effect on the relevance of the various abilities over time. During the first phase, general mental ability is highly important, irrespective of task consistency. Consistent tasks become dependent on perceptual speed ability and psychomotor ability as practice increases; inconsistent tasks, however, remain largely dependent on general mental abilities because attention is needed for successful task completion.

Ackerman and co-workers tested the core propositions of the theory in a series of experiments with various types of tasks. Overall, data provided support for the assumptions (Ackerman, 1988). However, although skill acquisition was assessed over hundred trials of practice, the experiments nevertheless spanned only a relatively short period of time and therefore the generalizability to real-life work situations have been questioned (Keil & Cortina, 2001). Farrell and McDaniel (2001) aimed at testing the Ackerman (1988) model for

real jobs. They relied on cross-sectional data from the GATB database and examined the correlations between the different types of ability and supervisor performance ratings by different levels of job experience (ranging between 6 months and 12 years). Graphic plots of correlations over time suggest that for highly consistent jobs, the correlations between cognitive ability and performance decreased over time, whereas they remained rather stable for inconsistent jobs. The correlations between psychomotor ability and performance substantially increased over time for consistent jobs, but increased only slowly for inconsistent jobs. With respect to perceptual speed ability the findings were less clear and did not challenge the superior importance of cognitive ability. Overall, this study provides partial support for the Ackerman model; possibly, the use of cross-sectional data may not be fully suitable for testing changes within individuals over time (Sturman, 2007).

Keil and Cortina (2001) tested the Ackerman (1987, 1988) model by using 1,157 correlations from 49 independent studies. Keil and Cortina categorized the predictors used in the original studies as predictors representing cognitive ability, perceptual speed ability, and psychomotor ability. Tasks were categorized either as consistent or inconsistent. Moreover, they differentiated between studies covering a short time span (one day or less) and studies covering a longer time span (up to five years and even longer). Regression analyses predicting performance from the linear, quadratic and cubic time component showed that overall the ability-performance correlations decreased over time, irrespective of type of ability and type of task. In addition, there was rather strong evidence for curvilinear, particular cubic trends (with a decrease in the correlation between ability and performance in early time periods, a plateauing during intermediate time periods, and a further decrease in late time periods). Keil and Cortina interpreted such a cubic pattern as an Eureka effect that refers to an insight that causes sudden "jumps" in performance. They concluded that empirical data do not match very well with the specific patterns proposed for different abilities and different type of tasks; they

suggested that the relationships between abilities and performance over time might be even more complex than modeled in Ackerman's approach.

Murphy (1989) developed a dynamic model of job performance that overlaps to some degree with Ackerman's work (1987, 1988), but puts more emphasis on job performance (as opposed to task performance). Murphy suggested two specific stages, a transition stage and a maintenance stage. During *transition stages* (for example, after entering a new job or when major changes of the job occur), job duties, procedures and methods of operation are new or unknown to the employee. The employee must learn new skills and make decisions in domains he or she is not familiar with. During such transition stages, job performance depends largely on cognitive ability. During *maintenance stages*, job tasks are well learned and can be performed with little effort by relying on well-learned procedures. Therefore, inter-individual differences in cognitive ability are only of minor importance for predicting differences in job performance. Murphy suggested that personality and motivational factors become more important during maintenance stages. The length of the transitional stage differs between various types of jobs (e.g., it is rather short in traditional assembly line jobs and can last months or even years in more complex jobs) and is also influenced by individual and situational characteristics. Transition stages are not unique phases when entering a new job or when major organizational changes occur; in many jobs they may happen from time to time when some changes at the workplace happen.

Other approaches

Sturman (2007) suggested that Learning Curve Theory used in operations research could be applied to model dynamic performance over time. This modeling approach states that when a task is repeatedly executed over time, task performance improves and that this improvement can be represented by specific mathematical models. Although Learning Curve Theory has been developed to predict organizational productivity, it might be useful for

specifying also the shape of individual performance over time. Sturman discussed necessary steps to be undertaken before Learning Curve Theory can be fully applied to the prediction of individual performance changes over time. These steps include the development of the appropriate functional form for modeling performance over time, the extension to non-routine tasks and including the effects of management efforts to increase performance.

Conclusion

Overall, the models of dynamic performance described in this section offer some explanation about how performance develops over time and which individual characteristics predict such performance trends. Empirical research is encouraging for these theoretical models (e.g., Farrell & McDaniel, 2001; Keil & Cortina, 2001); however, the discussion about how to theoretically explain performance trends over time is far from being resolved. Future research will certainly need to rely more on longitudinal designs, try to capture performance in real jobs (as opposed to task performance in comparatively short-term experiments), and be more specific about the type of tasks (or combinations of tasks) performance within these jobs.

VICIOUS AND POSITIVE CYCLES

We have examined predictors of performance trajectories. However, performance may also have an effect on predictors. The literature often assumes that only the predictor of performance affects performance and that there is no further effect of performance on these predictors. However, theoretically, hypotheses can be developed in both directions. If high performance has positive effects and low performance negative effects on these predictors, then positive (virtuous) or negative (vicious) cycles will appear. An example would be that positive emotions have an effect on performance and that performance leads to more positive emotions, e.g., job satisfaction (Judge, Thoresen, Bono, & Patton, 2001).

The theoretical starting point for such cycles is reciprocal determinism (Bandura, 1983). Reciprocal determinism implies that "people are both, producers and products of social systems" (Bandura, 1997, p. 6). People have an influence on the surrounding social systems (e.g., the work group, the organization, the supervisor, the division of labor and work place) which, in turn, has an influence on how they behave. Performance cycles should appear whenever performance changes those conditions that have an influence on performance. This is particularly so for psychological constructs, which are instrumental in changing conditions. Thus, active forms of performance are more likely to lead to such changes in conditions which, in turn, change the active form of performance. A good example is the effect of self-efficacy on performance and vice versa the effect of performance on self-efficacy (Lindsley, Brass, & Thomas, 1995; Shea & Howell, 2000).

A variant of the self-efficacy-performance cycle is the high performance cycle described by Latham and Locke (2007). High and specific goals plus self-efficacy lead - via the mediators direction, effort, persistence, task specific strategies - to high performance, rewards, and satisfaction which, in turn, lead to higher commitment to the organization and to an increased willingness to accept challenges which in turn influence goal setting.

A somewhat similar cycle has also been shown for personal initiative – personal initiative means that people are self-starting (goals are developed and pursued without external pressure, role requirements, or instruction), pro-active (prepared for future negative or positive events), and are persistent in overcoming barriers and problems (Frese & Fay, 2001). One set of studies examined longitudinally the effects of job resources on work engagement (composed of vigor, dedication, absorption), of work engagement on personal initiative and of personal initiative on work engagement, and of work engagement on job resources (Hakanen, Perhoniemi, & Toppinen-Tanner, 2008). Most studies have only examined the effect of work engagement on personal initiative – this aspect has been found in several studies, both, with daily survey (Sonnentag , 2003) as well as with a longitudinal

study design (Lisbona, Palací, Salanova, & Frese, 2009) that was similar to study of Hakanen et al. (2008). The overall results imply that job resources increase the level of work engagement and that there are reciprocal influences of work engagement and personal initiative.

A second cycle approach examined the interplay between work characteristics – mainly the resources of control and complexity – and personal initiative (Frese, Garst, & Fay, 2007). People are supposed to show personal initiative when they can influence conditions at work (control) and when they have the required competencies (resulting from complexity). Thus, control and complexity at work should increase personal initiative. In turn, personal initiative should also lead to increasing control and complexity, because people with high personal initiative may generate some added control and complexity in their given jobs: The tasks of a job are not completely fixed, once and for all, because of emergent elements in a job (Ilgen & Hollenbeck, 1991). For example, if a person develops initiatives to improve productivity, his or her job is changed and control and complexity are increased; superiors may give high personal initiative employees more responsibilities which translates into more complex and controllable work tasks. A second mechanism involves job change. People high in personal initiative are likely to look for and make use of opportunities for getting more challenging jobs and for increasing their career success. These predictions were borne out by the data in a longitudinal study with four measurement points (Frese et al., 2007) – this process is mediated by control aspiration (desire to exercise control), perceived opportunity for control (expectation to have control), and self-efficacy (belief in own competence).

The performance cycles may have virtuous or vicious forms. Whenever conditions are low (e.g., control and complexity) they lead to lower active performance. In turn, a low degree of active performance may lead to lower positive conditions. An example may be a study of small business owners: Lack of planning contributed to lower success levels (or higher failure rates) of these small businesses. Lack of success also led to a lower degree of

planning (Van Gelderen, Frese, & Thurik, 2000). Theoretically, this kind of process can be explained with the threat-rigidity cycle which was conceptualized to exist on the individual, group, and organizational levels (Staw, Sandelands, & Dutton, 1981): A threatening situation leads to more rigidity in the behavior; however, a higher degree of rigidity also leads to a higher performance, because rigidity reduces good information seeking and increases being reactive to the situation and not attempting to actively influence the situation. Such a reactive approach leads to low performance and is not a very effective strategy to deal with major problems at work (Van Gelderen et al., 2000).

A positive cycle was also shown by van Gelderen et al. (2000) that good action planning by business owners leads to higher firm performance, but that higher firm performance leads to better (and more) planning. This result has been confirmed in a study in Africa (Krauss, Frese, & Friedrich, 2009, in preparation).

Two of the more controversial hypotheses on cycles are the hypotheses by Lindsley et al. (1995) that spirals lead to a deviation amplification and to an ever increasing (or decreasing) performance. A deviation-amplifying loop exists because "a deviation in one variable (decrease in self-efficacy) leads to a similar deviation in another variable (lower performance), which, in turn, continues to amplify. Thus, the cyclic nature of the self-efficacy-performance relationship can result in a downward (decreasing self-efficacy and performance) or upward (increasing self-efficacy and performance) spiral." (Lindsley et al., 1995, pp. 645f). There are two issues here: Firstly, as Shea and Howell (2000, p. 791) point out, that the self-efficacy-performance cycle is probably not a never ending positive cycle upwards, because “the pattern of changes in self-efficacy and performance from trial-to-trial contained self-corrections, suggesting that the efficacy-performance relationship does not necessarily proceed in a monotonic, deviation-amplifying spiral.” Thus, there are self-correcting, self-regulating processes that lead to asymptotes rather than to never ending positive or negative cycles. Secondly, as of yet, there are no good data that suggest a variance

increase across time. For example, the study on the cycle of control and complexity at work and personal initiative did not show any increase in variance of performance (and in the predictors) over time (Frese et al., 2007). An action theory analysis may help to understand why this is so (Frese & Zapf, 1994): Performance is not only determined by goals, action models of the task and the task environment, action plans, and feedback but high (and low) performance has an influence on these goals, action models, action plans, and feedback. When there is high performance, people achieve their goals in the action area A. As a result, they turn to other goals (often higher goals, Bandura, 1997) or to goals that are not in the same area. Thus, people may turn to an action area B. Once people turn to the other action area, they reduce attention to action area A; therefore, there is less learning in action area A and, the action plans may become less adaptive to the situation, because attention to feedback is reduced. This may lead to a performance plateau and may actually even reduce performance in action area A over time (Vancouver, 1997). The opposite effect appears when there is low performance, but high or medium aspirations: In this case, attention to achieving the goals in action area A is increased, including the development of better plans and better models of the environment and one's task structure, and better feedback processing. All these changes lead to higher performance which may be stopped when the goal of good (or adequate) performance is reached (and not higher aspirations appear).

Another mechanism that limits upward and downward spirals is caused by over- and underconfidence. Overconfidence may be the result of high performance (Lindsley et al., 1995) but it may lead to risky strategies that reduce performance again (Bandura & Locke, 2003; Vancouver & Kendall, 2006). Similarly, under-confidence is the result of low performance and may lead people to take extra care in preparing for an action (Sonnentag & Volmer, 2009), leading to higher performance. Of course, in any case, there must be a high aspiration level or strong incentives for high performance so that there is striving for high performance.

This section has been on the cycles only; however, it is also possible that dynamic processes lead to some kind of equilibrium or some pendulum movement. For example, if high performance has negative effects on the predictors of performance and if low performance has positive effects on these predictors, some equilibrium or possibly a pendulum movement will appear (Vancouver, 1997). An example would be that job satisfaction leads to higher performance, but performance reduces job satisfaction because too much motivated effort is necessary to keep up high performance, which may have detrimental effects on job satisfaction.

Thus, there is some evidence that cycles or spirals exist. These spirals are probably higher whenever active forms of performance are measured. It is more likely that conditions are changed, when active forms of performance are measured, one of the prerequisites is that both the conditions change active performance, and active performance changes the conditions.

SHORT TERM PERFORMANCE VARIABILITY WITHIN PERSIONS

Another important aspect of dynamic performance refers to performance variations around a constant mean (Reb & Cropanzano, 2007). An individual's performance does not only change over longer periods of time, but also fluctuates within certain time intervals. Empirical studies have addressed these fluctuations of individual performance not only with respect to task performance (Fisher & Noble, 2004; Stewart & Nandkeolyar, 2006; Trougakos, Beal, Green, & Weiss, 2008), but also with respect to contextual performance dimensions including Organizational Citizenship Behavior (OCB; Ilies et al., 2006) and personal initiative behavior (Binnewies, Sonnentag, & Mojza, 2009; Sonnentag, 2003).

Degree to which performance fluctuates within persons

Research using experience sampling methodology (Beal & Weiss, 2003; Reis & Gable, 2000) and similar approaches (including daily and weekly surveys) provide rather consistent evidence that performance fluctuates substantially within persons. For example, Steward and Nandkeolyar (2006) examined weekly sales performance of 167 sales persons over a period of 26 weeks and found that 73 percent of the variance in performance resided within persons. Similarly, a study on performance of professional football players revealed that 63 % of the week-to-week variance in performance was within persons (Stewart & Nandkeolyar, 2007). Trougakos et al. (2008) found that even within small time units, performance varies largely within persons. Within-persons variance in observed performance during a total of eight performance episodes during three days was 48 percent. Also Fisher and Noble (2004) reported substantial fluctuation of performance within persons. Specifically, in an experience sampling study with five measurement occasions per day, these authors found that subjectively rated performance at a given point in time only predicted 3 percent of subjectively rated performance at the following measurement occasion.

Within-person variability in performance is not limited to task performance; also contextual performance varies substantially within a person. Ilies et al. (2006) analyzed 825 experience-sampling data points collected from 62 persons over a period of 15 working days. They found that 29 percent of the total variance in OCB resided within persons. Binnewies et al. (2009) using day-level data from 99 persons reported that even 50 percent of the total variance in OCB was within-person variance. Also proactive behavior such as personal initiative fluctuates within person. In a day-level study on personal initiative as a specific type of proactive behavior, Sonnentag (2003) found that 46 percent of the total variance was within-person variance. In the study by Binnewies et al. (2009), 56 percent of the total variance of personal initiative behavior resided within persons.

Taken together, task and contextual performance fluctuate within persons. Interestingly, these within-person fluctuations were found for self-ratings of performance

(Fisher & Noble, 2004; Binnewies et al., 2009) as well as for objective performance measures (Stewart & Nandkeolyar, 2006; Trougakos et al., 2008). Analysis of within-persons variance demonstrates that performance is not only dynamic within larger time frames (as demonstrated by research on performance trajectories over months or years; e.g., Ployhart & Hakel, 1998), but varies largely from day-to-day and from week-to-week.

A special case of within day fluctuations of performance around a mean is the circadian rhythm. This 24 hour rhythm has been shown to be biologically based and entrained via social zeitgebers (conditions, agents or events which provide cues to set the biological clock), which regulate the sleep-wake cycle of humans (Aschoff, 1981). Research has shown that performance parameters fluctuate across the day (Daniel & Potašová, 1989; Folkard, 1990). One of the earliest studies of the circadian rhythm was on errors (often conceptualized as the converse of performance) (Bjerner, Holm, & Swensson, 1955).

Predictors of within-person fluctuation of performance

Empirical studies demonstrated that the day-to-day and week-to-week variation in performance within persons can be explained by within-person predictors. In their study using an experience sampling methodology with a total of more than 3,500 measurement occasions from 114 persons, Fisher and Noble (2004) found that momentary task performance was predicted by perceived skill level (with respect to the specific task), task difficulty, interest and effort. Effort partially mediated the effect of interest on task performance. Ilies et al. (2006) showed that momentarily experienced states (positive affect, job satisfaction) predicted day-specific organizational citizenship behavior. On days when employees experienced high levels of positive affect and job satisfaction, they engaged more in OCB. Ilies and his co-workers further tested interaction effects between the experienced states and personality variables. A test of cross-level interactions showed that high levels of agreeableness attenuated the effects of positive affect on OCB. Persons with high

agreeableness showed relatively high levels of OCB irrespective of their momentary affect, whereas persons with low agreeableness showed OCB when experiencing high levels of positive affect, but not when experiencing low levels of positive affect.

Whereas Fisher and Noble (2004) and Ilies et al. (2006) examined job-domain variables as predictors of short-term performance fluctuations, other authors included experiences from the non-work domain in their analyses. Specifically, Sonnentag (2003) and Binnewies et al. (2009) tested whether feeling recovered (i.e., well-rested; assessed in the morning before work) predicted day-level performance during the working day. Using a daily-survey design, the studies showed that feeling recovered in the morning predicted task performance (Binnewies et al., 2009), OCB (Binnewies et al., 2009), and personal initiative (Binnewies et al., 2009; Sonnentag, 2003) throughout the day. Mediation analysis identified day-specific work engagement (Schaufeli & Bakker, 2004) as the mediator between feeling recoverd in the morning and personal initiative behavior. Probably, feeling recovered indicates that regulatory resources are available, which can be invested in the task accomplishment process. A recent study by Trougakos et al. (2008) supports this view. This study focused on one specific type of task performance, namely affective display in cheer leaders. Using an experience sampling design, Trougakos and his co-authors showed that positive emotions and respites (i.e., breaks) from previous work efforts were positively related to subsequent task performance.

Studies by Stewart and Nandkeolyar (2006, 2007) demonstrate that not only factors within the performing person, but also influences from other persons impact on a person´s performance variability. In their study of sales performance, Stewart and Nandkeolyar (2006) identified referrals (i.e., specific information about sales opportunities) from a central office as an important predictor of a sales person's week-level performance. More than 60 percent of the variance in a sales person's weekly performance was explained by referrals from the central office. Moreover, personality variables moderated the relationship between referrals

and performance; the relationship was stronger for persons high on conscientiousness and lower for persons high on openness for experience. Following this line of research, Stewart and Nandkeolyar (2007) examined weekly performance of professional football players and found that also in this domain performance fluctuation can be explained by constraints from outside the focal performing person. More specifically, teammate constraints (i.e., teammates competing for individual performance) and opposition strength were negatively related to weekly performance.

Taken together, research identified affective states, states related to recovery and respites, as well as constraints external to the performing person as the core predictors of shorter-term fluctuations of job performance. This research is not only important for understanding performance dynamics, it is also highly relevant for managing performance in organizations. Of course, one might argue that variations within persons might not matter in the long run, as long as a person's mean performance level is sufficiently high. However, in many modern workplaces it is not enough to show high performance on average, but to perform reliably well on specific days (Sonnentag, Dormann, & Demerouti, in press). Examples for the importance of having to perform reliably are the implementation of a new technological system within a very short time or a presentation to be delivered to a very important customer. If individual employees' performance is low on these days, negative consequences, both for the organization and the individual, may be severe – no matter how good employees' average performance is. Thus, it is crucial that on such days, individuals perform at a high level (i.e., better than their mean level). Moreover, with the increasing importance of customer service quality it is crucial that employees show good performance at the day level. Poor performance on specific days may directly impact customer satisfaction and cannot be compensated by an overall acceptable performance level averaged across longer periods of time.

Theoretical models explaining within-person variability of performance

Theoretical accounts for within-person fluctuations of performance refer to fluctuating affective states as the core cause of performance variability. Two models received substantial attention during the past decade: Affective Events Theory (Weiss & Cropanzano, 1996) and the Episodic Process Model of Performance (Beal, et al., 2005).

Affective Events Theory (Weiss & Cropanzano, 1996) explains fluctuations in job performance by fluctuations in employee affect. More broadly, Affective Events Theory focuses on the structure, causes, and consequences of affective experiences and thereby explicitly acknowledges that affect fluctuates within the person. Work events are regarded as proximal causes of affective reactions that in turn influence behavior and attitudes. Thus, performance as behavior is seen as a consequence of affective experiences resulting from events encountered at work (along with mood cycles and dispositions to experience specific affective states). Weiss and Cropanzano (1996) summarized broad empirical evidence that affect predicts processes relevant for performance. More recent research that tested the theory's propositions about the correspondence between fluctuations in affect and fluctuations in performance is still rare, but generally supports the theoretical assumptions (Ilies et al., 2006; Rothbard & Wilk, 2006).

To explain within-person fluctuations of performance, Beal et al. (2005) proposed a theoretical model that focuses on episodic performance. Performance episodes are relatively short units of behavior that are naturally segmented and organized around rather proximal work-related goals. Typically, one workday comprises several performance episodes. By building on resource allocation models (Kanfer, Ackerman, Murtha, Dugdale, & Nelson, 1994), Beal et al. suggested that performance within each episode is influenced by the person's general resource level (e.g., cognitive ability, task-relevant skills) and the momentary allocation of resources. Performance within an episode is impaired when the person does not succeed in allocating all necessary resources to the primary work task and

when attention is diverted by off-task demands. Affective experiences – along with distractions and interruptions causing specific affective states – are a core source of attentional demands that interfere with the attentional demands of the primary work tasks. Beal et al. argued that affective experiences reduce episodic performance because these affective experiences call for affect regulation which, in turn, depletes resources that otherwise could be devoted to the task. A recent empirical study provided support for the core assumptions of this model (Beal, Trougakos, Weiss, & Green, 2006). Specifically, it was found that when experiencing negative emotions persons find it more difficult to regulate their emotions and to follow display rules which, in turn, decreases job performance. More studies are needed that test other facets of the model.

DYNAMISM WITHIN PERFORMANCE ACTION PHASES

When describing performance from a dynamic perspective, it is important to not only examine performance trajectories over time, but also to describe performance cycles and pay attention to performance fluctuations within a given period of time. A behavioral performance unit in itself can be viewed as a dynamic process ranging from setting a goal via planning and executing to feedback processing. Such a perspective on performance is, for example, suggested by action theory (Frese & Zapf, 1994; DeShon & Gillespie, 2005) and control theory (Carver & Scheier, 1998; Vancouver & Day, 2005). These approaches aim at describing the cognitive and motivational processes involved in goal choice and goal pursuit (Chen et al., 2005; DeShon, Kozlowski, Schmidt, Milner, & Wiechman, 2004).

At the conceptual level, phases such as (1) goal development and goal setting, (2) problem analysis and orientation within the problem space, (3) planning, (4) executing and monitoring, and (5) feedback processing can be clearly differentiated. In real task completion processes, the several phases are very closely intertwined (Sonnentag, 1998). Field studies of performance from such an action perspective require specific process-tracing methods, such

as thinking-aloud approaches (Ericsson & Simon, 1993); alternatively, experimental set-ups help in differentiating between the various phases. There is some empirical support for the idea that action cycles that comprise of all important phases contribute to better performance outcomes than do action processes that are incomplete (Tschan, 2002).

De Shon et al. (2004) proposed a multi-level model of individual performance processes nested in team processes. These authors suggested that situational factors, such as feedback and individual characteristics (for example, mastery and performance orientation), impact on individual-level intentions (including individual goals, individual goal commitment and self-efficacy) which, in turn, influence individual strategies and self-focused effort. An empirical study conducted in a training context provided support for the model with good individual strategy turning out as the most potent predictor of individual-level performance. Moreover, in support of their multilevel conceptualization, parallel processes emerged at the individual and at the team level. Chen and Kanfer (2006) also addressed individual performance processes within teams and suggested cross-level linkages team-level and individual-level processes (cf. also Chen, Kirkman, Kanfer, Allen, & Rosen, 2007).

Engagement in action phases (e.g., planning, feedback processing) can also be regarded from a performance trajectory perspective. For example, over time when a person accumulates experience with a specific task or in a specific domain, planning activities will be reduced and feedback processing will be limited to a small set of features (Frese & Zapf, 1994). Research on expertise supports this idea and shows that, compared to beginners, persons with long years of experience in a specific domain show a different approach to task accomplishment (Ericsson & Lehmann, 1996). These studies, however, basically follow cross-sectional designs and conclusions about real changes over time remain premature (Sturman, 2007). Following changes in action processes over longer periods of times (e.g., months or years) puts great challenges on researchers because it requires good measures of

the action phases. Such measures, however, are most often not available in real-world job settings.

Moreover, it would be interesting to examine within-person fluctuations in engagement in action phases (Frese & Zapf, 1994). Fluctuations in task requirements and in affect might be responsible for such fluctuations. For example, goals may change when they are achieved, plans are adjusted when barriers, problems or errors appear, and feedback processing changes with environmental conditions. Also, when people are in a negative affective state, they tend to process information more systematically than in a more positive affective state (Schwarz & Bohner, 1996). Therefore, one can assume that planning or feedback processing will increase with negative affective states.

DISCUSSION

In this chapter we have looked at issues related dynamic performance. The term "dynamic performance" seems to imply that two performance concepts exist: "(stable) performance" and "dynamic performance". We do not share this view, but rather concentrated dynamic aspects of performance. However, we believe that all performance research should take into account the concept of time and ask how it relates to the specific research question and how performance may change over time.

We also have consciously restricted ourselves to the individual level of analysis because it seemed too big a task to produce this chapter for other levels of analyses as well. We believe, however, that it is particularly important to think of the dynamic nature of performance also at higher levels of analyses. It is likely that the dynamic nature of performance is highly applicable to groups and organizations (Hackman, 1990; Hambrick & D'Aveni, 1988; Lindsley, Brass, & Thomas, 1995). We also have not discussed other processes that may be of importance for performance cycles and the dynamics of performance, such as attribution of failure and success (Lindsley et al., 1995). However, as far

as we know, there has been little research on propositions involving attributional processes in this area.

Summary of research evidence

Research summarized in this chapter showed that performance is not stable over time (see Table 2 for an overview). More specifically, studies looking at performance changes within longer periods of time demonstrated that performance scores do not only increase as tenure on the job increases (Quiñones, Ford, & Teachout, 1995; Sturman, 2003; Tesluk & Jacobs, 1998); also the rank order of individuals' performance scores changes over time (Sturman et al., 2005). This finding implies that an individual, for instance, who performs above average at the beginning of his or her career may show below-average performance after a few years. Studies that explicitly tested performance trends over time largely agree that individuals differ in these trends (Day et al., 2004; Deadrick et al., 1997). Abilities and personality factors were identified as predictors of the differences in performance trends (Deadrick et al., 1997; Ployhart & Hakel, 1998; Thoresen et al., 2004). Interestingly, performance trends were shown to have implications for employee turnover and for performance ratings (Reb & Cropanzano, 2007; Sturman & Trevor, 2001). Theoretical models aiming at explaining individual differences in performance trends (Ackerman, 1988; Murphy, 1989) have emphasized that it is important to differentiate between various stages within performance trajectories and that individual characteristics differ in their relevance within the various stages.

Insert Table 2 about here

Taken together, the crucial question of whether performance is dynamic or stable is resolved (Chen & Mathieu, 2008)– performance is both stable to some extent, as well as

dynamic. But the knowledge that performance is also dynamic has lead to a broad range of further questions that are far from being answered. Until now, theoretical models and empirical studies on performance trends remain largely un-integrated – although there are some important exceptions (e.g., Keil & Cortina, 2001). Furthermore, time frames chosen in the various empirical studies differ largely ranging from several hours to months and years. In addition, potential predictors of individual differences in performance trends have not been studied very systematically and differ largely between studies. This situation is understandable if one thinks of the practical difficulties of gathering longitudinal data suitable for modeling performance trends. It seems that researchers often have to use the data that are made available to them – and they do not have substantial say in the decisions about time lags and predictor variables. As a consequence, knowledge remains scattered and scientific progress is slow.

The situation becomes even more complicated if one thinks of the large changes occurring in today's work situations where tasks and job requirements change rapidly - and maybe not at the same pace for all individuals. These circumstances make it very difficult to disentangle task-related and person-related reasons for performance changes. Moreover, because employees change jobs rather quickly, data for performance trajectories over longer periods of time might increasingly difficult to gather – and available data (that are often company based) might only reflect performance trends for a relatively small (and non-representative) part of the workforce (i.e., individuals who stay in one company, who may not change jobs frequently, and who may not be very active).

Performance cycles have been shown in three areas: Firstly, the high performance cycle of goal setting research has been shown to exist. Here, high and specific goals and high self-efficacy lead to high performance which, in turn, affects rewards and satisfaction, which, in turn, increases commitment which in turn affects the willingness to take on challenges of high and specific goals (Latham & Locke, 2007). Secondly, there is good data showing that

self-efficacy leads to higher performance which, in turn, leads to higher self-efficacy (Lindsley et al., 1995, Frese et al., 2007). Finally, personal initiative and engagement as active performance strategies have been shown to affect the work environment so that higher challenges appear. This in turn then leads to higher personal initiative and engagement (Frese et al., 2007). The common theoretical concept of all performance cycles is that an active form of performance or high performance either changes the challenges posed by the work environment, or increases the readiness to accept challenges which in turn has an influence on these active approaches to performance.

Studies on performance variability within persons have shown that performance fluctuates substantially within persons (Ilies et al., 2006; Stewart & Nandkeolyar, 2006), both from day to day and from week to week. Fluctuating performance levels can be partly explained by factors outside the performing person and partly by factors within the persons. Here, in particular affective states and other states resulting from recovery and respite experiences play a role. Theoretical models explaining performance fluctuations also largely focused on affective processes.

Towards a taxonomy of dynamic performance

Table 3 presents a taxonomy of dynamic performance. On the left vertical side (the y-axis) we describe short and long-term changes that constitute the forms of the performance changes. Horizontally (the x-axis), we describe the most important factors that produce dynamic performance changes. Not every taxon of this table can be filled (therefore, we call it a partial taxonomy); some can probably be filled with new research and in a few cases we suggest the building blocks of such new research. Other taxons may not exist (e.g., curvilinear changes in knowledge) – although we should be open to the idea even in such cases (e.g., as a function of age including very old age). We believe that most taxons could attract a smaller or even larger research tract – in any case, this part of our chapter should contribute to the

development of new research ideas. In the following, we describe Table 3 by discussing the taxons line by line, starting with long-term changes.

Insert Table 3 about here

Long-term changes – increasing. Long term changes that increase or lead to a stronger expression of a personality trait or an emotion may appear in knowledge, skills, ability and personality, emotion, and motivation. Knowledge increases as a result of learning processes. At this point it is necessary to maintain a difference between learning processes and training. While we are not concerned about training interventions in this chapter (because it constitutes direct interventions meant to introduce learning), we should concentrate on those learning processes that take place regardless of training interventions. Much like expertise is developed over time, so is knowledge developed as a result of doing something for a longer period of time (Tesluk & Jacobs, 1998). However, research has persuaded us that expertise is not purely a function of time (in the sense that people increase their knowledge because they are doing something longer), but rather, expertise develops as a function of the time people spend in processing knowledge in depth. For example, it is not true that purely spending time as a programmer produces expertise in programming; rather intensity, breadth, and depth of programming leads people to be called experts by their peers (Sonnentag, 1996, 1998). This type of expertise can be developed by deliberate practice, for example, with a help of a coach (Ericsson & Lehmann, 1996) or when people force themselves to work on issues that are difficult and that lead to a maximal increase of knowledge and expertise (Sonnentag, 2000; Sonnentag & Kleine, 2000; Unger, Keith, Hilling, Gielnik, & Frese, 2009).

A similar process to the development of knowledge also appears in skill development; the increase of skills is an important part of expertise and there are interactions of skills and knowledge (Chase & Simon, 1973). An additional issue here is, however, that skill

development if often developed in a tacit way (Myers & Davids, 1993) and, therefore, cannot be verbalized.

Ability can increase and decrease depending upon the complexity of work – as discussed in this chapter. Age-dependent reductions of cognitive ability occurs more frequently in non-complex work (Schallberger, 1988; Schleicher, 1973; Schooler, Mulatu, & Oates, 1999). Personality traits also change with age – often such a change seems to be related to maturity – older people tend to take less risks and are less open to experience. However, they are more likely to be conscientious and emotionally stable, "People become more socially dominant, conscientious, and emotionally stable mostly in young adulthood, but in several cases also in middle and old age. We found that individuals demonstrated gains in social vitality and openness to experience early in life and then decreases in these two trait domains in old age." (Roberts, Walton, & Viechtbauer, 2006). Also, wisdom increases with age (Baltes & Staudinger, 1993). Thus, maturation may be a natural process of time that affects both, ability and personality. Maturation also plays a role in emotional and motivational long-term changes.

Long-term changes – decreasing. The second row discusses decreases of knowledge, skills, ability, emotions and motivation – here aging plays a pivotal role. Forgetting is an important process that leads to a reduction of knowledge and skills. Forgetting may be a function of time - decay (Portrat, Barrouillet, & Camos, 2008) or of interference of new information (Oberauer & Kliegl, 2006). For skills, non-use may be most important for its loss. Finally, burnout effects in the sense of exhaustion (in contrast to energy), cynicism (in contrast to involvement), and inefficacy (in contrast to efficacy) may also be a function of time in a specific and stressful environment (Maslach & Leiter, 2008).

Cycles – upward and downward. Upward and downward cycles appear in nearly all areas. We have already discussed the self-efficacy- performance cycle as an example. A specific instance of such a cycle is the cycle described by Frese et al. (2007): Self-efficacy

leads to higher performance; it also leads to an increase of the complexity and controllability of the work tasks which, in turn, lead to higher self-efficacy (Frese et al. have shown such job enrichment as a result of control orientation (which includes self-efficacy) among others).

Upward and downward cycles also exist in the areas of ability and motivation. The "broaden and build" theory of positive emotions is related to such cycles; it shows positive emotions to have a positive influence on that type of performance that needs to incorporate new information (such as innovation tasks) (Fredrickson & Losada, 2005). The emotional cycle view assumes that the "broaden and build" theory of emotion leads to more challenging work (because people are open to innovations); good performance in innovative tasks leads to positive affect which, in turn, would increase openness to innovation tasks (Fredrickson & Losada, 2005). In the field of motivation, there is both the self-efficacy- performance cycle as well as the personal-initiative – work characteristics cycle (control and complexity). Both of these have been described above.

The downward cycles can all be the obverse of the above effects – thus, low self-efficacy can cycle downward because people do not take up challenges, do not work hard on complex and controllable tasks and, therefore, the challenges are reduced which leads to low self-efficacy. The opposite of personal initiative is a reactive strategy which leads to lack of success, which, in turn, leads to a higher degree of reactive strategy in small business (Van Gelderen, Frese, & Thurik, 2000). A specific negative cycle is the threat-rigidity cycle: individual or organizational threat leads to individual or organizational rigidity which produces reactive approaches, which, in turn, leads to higher threat (Staw, Sandelands, & Dutton, 1981).

Curvilinear changes. The area of curvilinear changes is more difficult to discuss. One of the curvilinear changes that appear in skills is reverting back to old habits. Psychoanalytic and behaviourist theorists have called this phenomenon habit regression (Mowrer, 1940). Habit regression appears when two conflicting habits have been developed sequentially (one

habit is older than the other) and some frustration or conflicting environmental cues are added. This often leads to regressing (reverting back) to the older habits (Mowrer, 1940). This is important at work when workers revert back to older habits under time pressure or when people are again in the environment in which old habits had developed. This phenomenon is similar to regression because the old habits were originally developed in the work environment; in this case, the new behavior may also not have been developed into a habit yet (i.e., these newly acquired behaviors have not been routinized yet). In this case, the conscious decision to use the new behaviors learned in the training program cannot be put into effect because of cognitive interference due to double tasks or time pressure. Thus, relapse to old habits ensues. Relapse has been a topic of high importance in clinical psychology (Semmer & Frese, 1985) and treatments have been discussed as to how well they prevent relapse – developing explicit skills against relapse may function particularly well (Hollon et al., 2005; Strunk, DeRubeis, Chiu, & Alvarez, 2007). The issue of relapse has not been an important topic in industrial and organizational psychology; however, similar concepts, such as rigidity, resistance towards change in organizational development (Cummings & Worley, 1993), structural inertia of organizations (Aldrich, 1999), entropy in system theory (Katz & Kahn, 1978) have attempted to describe something similar – the tendencies of individuals and organizations not to change although the need to change may be accepted –probably, there is a large overlap of these terms with relapse to prior habits and routines.

In motivation, this relapse to older habits plays a large role as well (e.g., if one is not really motivated to show the new behavior at the work place). In addition, a motivational theory, called the opponent process theory of motivation might be used to explain curvilinear changes as inherent processes of motivation and emotion: "The theory assumes that many hedonic, affective, or emotional states are automatically opposed by central nervous system mechanisms which reduce the intensity of hedonic feelings, both pleasant and aversive. The opponent processes for most hedonic states are strengthened by use and are weakened by

disuse." (Solomon & Corbit, 1974, p. 119). This theory can also explain how adaptation processes appear so that cycles do not continue forever.

Short-term changes – increasing. Short term increases of attention may have an influence on the development of knowledge. What we attend to, can be stored into memory and what we attend to will be rehearsed enough to be kept in memory. Emotional processes are a function of affective events as described above (Weiss & Cropanzano, 1996). Motivational theory is full of descriptions of how motivation can be increased on a short-term basis by changes at work – usually via extrinsic motivation. Often positive reinforcement is seen to produce short-term changes (that are also reduced again, if reinforcements are withdrawn) (Eisenberger, Pierce, & Cameron, 1999). Motivational processes may be enhanced too much in the sense of escalation of commitment (Staw & Ross, 1987). While escalation of commitment has positive effects on performance that is the target of motivation (in the sense of working harder, but not in the sense of working smarter), alternative routes and plans for goal achievement may also get rejected or they are not attended to. Thus, a state of over-motivation for one approach can be observed.

Short-term changes – decreasing. A short-term decrease of knowledge, skills, ability, motivation, etc. can be observed as a result of fatigue. Mental fatigue can be defined as "a psychophysiological state resulting from sustained performance on cognitively demanding tasks and coinciding with changes in motivation, information processing, and mood." (van der Linden, Frese, & Sonnentag, 2003, p. 484). Fatigue leads to higher rigidity, lower degree of planning and a higher degree of errors as well as to a lower degree of motivation (Lorist et al., 2000; van der Linden, Frese, & Meijman, 2003). One of the results of fatigue is a reduction of attention (van der Linden & Eling, 2006). All of this leads to decreased performance. However, this decrease of performance is not absolute (and often not observable at work), because people often compensate the effects of fatigue with different strategies or enhanced effort (Meijman & Mulder, 1998; Sperandio, 1971).

Performance fluctuation. Performance fluctuations within days are tied to the circadian rhythm. We have discussed the circadian rhythm above and do not need to repeat this here. The important issue is that performance fluctuations are regulated by the circadian rhythm; this means that humans typically show a higher performance at certain times across the day, e.g., between 6.00 and 9.00 in the morning or at around 6.00 in the afternoon. The lowest level of performance is likely to be at around 3.00 in the night. The interesting finding here is that these effects appear regardless whether people have already worked for 8 hours or are just starting their work day; there seems to be a seamless performance cycle as a result of the circadian rhythm (Bjerner, Holm, & Swensson, 1955).

Further avenues for future research

As described above, research on dynamic performance still appears rather unsystematic and sometimes lacks a clear theoretical focus. This is particularly the case for performance trajectories over longer periods of time, but also applies to other aspects of dynamic performance. We propose an agenda for future research on dynamic performance that addresses four core issues: (1) advancing theory on dynamic performance, (2) using a more systematic approach for studying performance trajectories over time, (3) including contextual performance in the study of performance trajectories, and (4) paying more attention to performance fluctuation within persons.

With respect to advancement in theory building, it seems reasonable to build on existing models of performance change over time (Ackerman, 1988; Murphy, 1989) and to continue the differentiation between various stages of performance trajectories. Moreover, it is necessary that the time frames for performance changes are specified in some detail – taking into account that the time frames might differ largely between various types of jobs. Although the existing models on performance change over time are already reasonably complex, even more comprehensive theoretical approaches might be useful. For example,

these approaches should aim at combining abilities and skills with personality factors in predicting individual differences in performance trajectories. Moreover, better integration of theory and empirical research is necessary.

When it comes to empirical studies, a more systematic approach, that includes longitudinal data sets, is highly needed – and these longitudinal data sets probably also need longer time frames than is typical of research at the moment (cf. e.g., the fact that the longitudinal studies surveyed by Ng and Feldman, 2008, covered an average time period of only 11 months). This can be achieved by designing studies more systematically with respect to type of jobs, time frames, and type of predictor variables. It is also useful to do studies in critical transition stages as suggested by Ng and Feldman (2008). Another option might be to achieve some systematization by meta-analytical approaches that summarize findings from a large database of studies. However, at this moment in time, we do not have sufficient primary studies that qualify for inclusion in such a quantitative review. For increasing our understanding of longer-term performance dynamics (i.e., performance trajectories over time), longitudinal studies are essential. Sturman (2007) suggested that such studies using Hierarchical Linear Modeling or Latent Growth Curve approaches might want to build on Learning Curve Theory developed in operations research. When implementing these suggestions, researchers have to develop innovative approaches about how to deal with problems typical for longitudinal research such as missing data. Often, it is not known whether missing data are random or non-random. This difficulty becomes evident when looking at the relationship between performance trends and turnover (Harrison et al., 1996; Sturman & Trevor, 2001) suggesting that turnover does not represent random dropout of study participants, but that it is closely intertwined with performance changes over time.

Interestingly, research on performance trends over time has largely focused on task performance. Other aspects of performance (OCB, proactive behavior) have been neglected (an exception is the meta-analysis by Ng and Feldman (2008) on aging and performance). For

example, it is more than plausible to assume that within specific work settings, individual citizenship behaviors increase (or decrease) over time. Similarly, proactive behaviors such as personal initiative might not be stable over one's career but the increase might be influenced by features of the job situation. For example, job control and supportive supervision might increase personal initiative over time (i.e., predict a positive trend), whereas lack of control and discouragement from the supervisor might predict a negative trend.

The degree to which performance fluctuates within a person has not received much research attention. Therefore, future research should address such performance fluctuations more thoroughly. For example, employees may differ in the degree to which their performance fluctuates from day to day or from week to week. Of course, from the perspective of an organization it is preferable to have as little employees' performance fluctuation as possible. Life-span development research showed performance variability within persons to increase with age (MacDonald, Hultsch, & Dixon, 2003; Murphy, West, Armilio, Craik, & Stuss, 2007). However, very little is known about predictors of performance variability within persons who are still participating within the workforce. Thus, studies are needed that treat performance variability within person as an *outcome*. Here, it might be also interesting to link research on performance trends with research on performance variability within persons. For example, performance variability might decrease at later stages of performance trajectories.

In addition to these core issues to be addressed in future research, other research questions are also important and seem promising. Firstly, it would be interesting to examine how engagement in various performance phases (e.g., planning, feedback processing) unfolds its dynamics. For example, explicit planning probably decreases over time. Moreover, changes in the performance process might be related differently to performance outcomes at various stages of a performance trajectory. Secondly, most studies on performance trajectories did not provide much information about HR interventions that might have occurred during the

study time. For example, trainings and other HR practices might boost performance levels over time. Sturman (2007) suggested that future studies might want to explicitly look at the effects of HR interventions on performance trajectories. Thirdly, in this chapter we focused on the "positive" aspects of performance. Scholars have argued that a broad performance concept should also incorporate counterproductive behavior (Penney & Spector, 2005; Rotundo & Sackett, 2002). Therefore, it would be an exiting endeavor to examine also counterproductive behavior from a dynamic perspective. Fourthly, very little is known about the boundary conditions of performance variability within persons. For example, in highly structured work settings with low levels of job control performance variability might be much smaller than in settings where employees can decide themselves about how to do their jobs (cf., Binnewies et al., 2009).

Conclusion

Overall, research on dynamic performance is a very exciting area within industrial and organizational psychology. It is a particularly interesting and challenging topic because it tries to disentangle the processes underlying performance and because it promises to add to our understanding of how high job performance comes about. Many questions are still unresolved and the various aspects of dynamic-performance research still remain un-integrated. However, we are optimistic that in this research area much progress will be made within the years to come.

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Table 1

The Four Dimensions of Process Performance

Concept	Definition	Differentiation from other Constructs	Dominant operationali-zation	Authors
Task performance	Task performance refers to activities that directly transform materials or information into goods or services and to activities that directly support the organization's core activities	Task performance is the primary necessity of doing one's job well	Supervisor ratings	Murphy & Cleveland, 1995
Contextual performance or Organizational Citizenship Behavior (OCB)	Contextual performance refers to discretionary behaviors that add to organizational effectiveness by improving the functioning of the social and organizational context of work: Aspects are altruism, compliance, sportsmanship, courtesy, civic virtue	Contextual performance is oriented towards helping others with their jobs, supporting the smooth social functioning of the organization (Borman, Penner, Allen, & Motowidlo, 2001)	Questionnaire filled out by supervisor or colleague	Organ 1988 Borman & Motowidlo, 1993; Motowidlo & Van Scotter, 1994
Adaptive performance	Coping and supporting organizational change, adapting to new job conditions or requirements.	Deals with the dynamic, unpredictable nature of work that necessitates change	Questionnaire (and experimental approach)	Smith, Ford, & Kozlowski, 1996; Pulakos, Arad, Donovan, & Plamondon, 2000; Joung, Hesketh, & Neal, 2006; Ployhart & Bliese, 2006
Active performance	Self-starting, proactive approach, and persistent in overcoming difficulties (Frese &	Active forms of performance can appear in the areas of task, contextual,	Self-reported and peer	Frese & Fay, 2001; Griffin et al., 2007;

	Fay, 2001, p. 134).	and adaptive performance	reported questionnaire, interview, situational judgment test	Grant & Ashford, 2007; Morrison & Phelps, 1999; Van Dyne & LePine, 1998

Table 2 Summary of research evidence on dynamic performance

Core findings and processes	Predictors of core processes	Relevant theoretical concepts and models
Performance is not stable over time – but has a stable component	• Time lag between measures • Job complexity	• Simplex pattern
Persons differ in performance trajectories	• Job experience • Cognitive ability • Personality • Team performance • Age	• Changing-subject, changing task model • Skill acquisition model (including distinction betwen transitional and maintenance stages) • Selection-Optimization-Compensation
Performance and its predictors constitute a cycle	• Self-efficacy • Work engagement • Job complexity • Job control	• High performance cycle
Performance fluctuates within persons across days and weeks	• Affect • State of being recoverd • Task-specific skill • Effort • Performance opportunities	• Affective Events Theory • Episodic proces model
Behavioral performance units combine into a dynamic process	• Task requirements • Affect	• Action theory • Control theory

Table 3. A Partial Taxonomy of Dynamic Performance

	Knowledge	Skills	Ability and Personality	Emotion	Motivation
Long-term changes					
Increasing	learning deliberate practice	learning deliberate practice	maturation personalilty enhancing work place	maturation	maturation
Decreasing	forgetting	non-use of skills	aging burnout	aging	aging
Cycles					
Upward cycle	self-efficacy-performance	self-efficacy-performance	self-efficacy-performance	„Broaden and build“ – positive affect	self-efficacy-performance personal initiative-work characteristics
Downward cycle				reactive - low performance threat-rigidity cycle	threat-rigidity cycle
Curvilinear Changes		relapse to prior habits		opponent-process	opponent-process relapse
Short-term changes					
Increasing	attention and memory		attention and memory	affective events – emotion - performance	extrinsic motivation, escalation of commitment
Decreasing	forgetting fatigue	monotony fatigue	attention reduction fatigue	fatigue	fatigue

Daily fluctuation	circadian rhythm	circadian rhythm	circadian rhytm		circadian rhythm