

Time in Applied Psychology

The Study of “What Happens” Rather Than “What Is”

Robert A. Roe

Maastricht University, The Netherlands

Abstract. Against the background of a growing awareness of time among researchers, this article sets out to assess the current position of time in applied psychological theory and research. A critical analysis of recent publications in *The Journal of Applied Psychology* and *Applied Psychology, An International Review* reveals that with some noticeable exceptions, the role of time in human behavior is still largely neglected. It is posited that this state of affairs can be explained by a conceptual bias among researchers, which makes them think in terms of “what is” rather than “what happens.” A proposal is made for an alternative way of conceptualizing, designated as temporalism, which starts from the concept of *phenomenon*, which is defined dynamically and operationalized with the help of time. A plea is made for a research strategy that comprises the identification of the dynamic features of phenomena, an analysis of their temporal relations, and an assessment of long term stability and changes of temporal parameters. It is argued that such an approach leads to theoretical innovations and to a substantial expansion of possibilities for intervention. This is illustrated by a discussion of three prototypical patterns of development referred to as *improvement*, *bifurcation*, and *relapse*, which underlie a broad range of practical problems known from social and organizational settings. Finally, attention is directed to the role that time plays when psychological knowledge is applied to such practical problems. It is concluded that time should not only be addressed in the study of behavior of other people but also in the complex interactions between psychologists and clients involved in the application of psychology.

Keywords: time, longitudinal research, dynamic modeling, theory development, research methodology, applied psychology

Toward an Applied Psychology of Time

This article starts from the observation that while time is a salient facet of everyday life, its role is barely acknowledged in the psychological literature. Remarkably enough, very little knowledge exists about the factors that are related to the emergence of particular behaviors, their duration, their stability, the sequence of their occurrence, and so on. Although time is implied in virtually all phenomena under study – no form of behavior could possibly be defined without reference to time, and no behavior could be observed if the time interval were limited to zero – most handbooks and journal articles in applied psychology have presented essentially timeless descriptions and explanations of human behavior. Only certain areas – such as developmental psychology and the psychology of learning – provide exceptions to this rule.

In recent years, researchers have shown a growing awareness of time and its relevance for the study of behavior, and some have begun to question the way in which time is dealt with in applied psychology. For example, Ployhart, Holtz, and Bliese (2002) have declared: “It is probably not an overstatement to claim that the cumulative knowledge gained from applied psychological research gives us little insight into how people develop, behave, perform, and grow over time” (op cit.; p. 455–456). In the same vein, George and

Jones (2000) stated: “many micro- and macro-organizational theories do not adequately incorporate such a time element and, thus, unintentionally distort the phenomena they are describing” (op cit., p. 658). There is also a growing interest among scholars in incorporating time in theory building and research. For example, Eaton (2004), in the context of a discussion about the duration of emotional responses, calls for more time-based research that will eventually build a fully dynamic theory of human emotion. Mathieu and Schulze (2006) proposed a time-based theory of team behaviors in which team attributes are expected to influence episodic transitions and interpersonal processes, as well as team performance. Avolio (2007), in a recent article on leadership theory, argued in favor of studying the dynamic interplay between leaders and followers while taking into account contextual changes. However, it would be wrong to assume that these studies are representative of present-day research. Most researchers continue to study behavior without paying attention to temporal facets, thereby accumulating more and more knowledge that is incomplete, distorted, and/or out of date. Thus, there remains ground for concern and a need to change the way in which human behavior is being conceived and studied.

The aim of this article is to assess the current state of affairs in applied psychology with regard to the use of time, to investigate how time can be given a more central place in theory and practice, and to explore how this would affect the nature and status of the discipline.

Table 1. References to time in two applied psychology journals, publication year 2005: number of articles mentioning time vs total number of articles

Year 2005	Time in theory or model	Longitudinal design	Temporal analysis	Total no. of articles
Journal of Applied Psychology	10	10	6	105
Applied Psychology – An International Review	0	4	0	34

Current State of Affairs

It is unmistakable that time is part of current theorizing and research in applied psychology, at least in certain areas, such as time management (Claessens, Van Eerde, Rutte, & Roe, 2004; Macan, 1994) and entrainment in teams (Kelly & Barsade, 2001; McGrath & Kelly, 1986). In research that studies the unfolding of behaviors over time by means of latent growth analysis (Lance & Vandenberg, 2000; Moon & Illingworth, 2005) or survival analysis (Hom & Kinicki, 2001; Mossholder, Settoon, & Henagan, 2005) time is explicitly addressed and linked to the behavior under study. The recent research literature offers some excellent examples of studies that not only acknowledge the theoretical importance of time but also treat it as a key factor in the analysis. A study by Boswell, Boudreau, and Tichy (2005) on the dynamic relationship between job satisfaction and job change is a case in point. The authors found evidence for a decline in job satisfaction before a voluntary job change and an increase in job satisfaction immediately after a job change.

How typical are these cases for present-day applied psychology? How well is time covered in recent studies? To answer this question I analyzed the content of the 2005 volumes¹ of *The Journal of Applied Psychology* and *Applied Psychology – An International Review*, counting the number of articles in which time was explicitly mentioned. The results are summarized in Table 1. It depicts the numbers of articles that mentioned time as part of the theory or the conceptual model, used a longitudinal research design, or made time focal in the empirical analysis, along with the total number of articles published in the year 2005.

In interpreting the rather small numbers in this table it should be taken into account that a reference to time in the theory section of the research model does not imply that time stands out as a prominent facet of the study. Quite often time is invoked to explain how a process unfolds or how one factor is supposed to affect another one, but the researchers' interest is primarily in the causal order rather than in time as such. The same applies to many longitudinal research studies. Longitudinal studies are interesting to take a closer look at, because they are often believed to indicate that researchers do care about time. Apart from the fact that longitudinal studies remain small in number, it is important to note that in most cases the longitudinal design is merely used to demonstrate a certain sequence, or to pre-

dict later behavior from earlier behavior, and not to study time (cf. Roe, 2005). The interest is not in issues such as timing (early, late, when exactly), time lags (delays, sleeper effects), duration (short, long), and so on. A question such as whether a particular development takes a month to happen or rather 6 months, or a year, would simply not be raised or considered relevant in most studies. Besides, longitudinal designs, as commonly used, are ill-suited to study temporal aspects because the measurement points are usually small in number (rarely over five) and widely spaced (often over years). To adequately study time, one would need larger numbers of time points, shorter intervals, and specific methods of analysis, as is the case for studies applying temporal analysis. Among these are a study by Ben-tein, Vandenberghe, Vandenberg, and Stinglhamber (2005) in which changes in commitment were related to changes in the likelihood of leaving the organization, a study by Ilies and Judge (2005) examining the effect of negative and positive performance feedback on subsequent goal-setting behavior, and a study by Wanberg, Glomb, Song, and Sorenson (2005) investigating psychological antecedents of persistent job-search behavior over time. It is apparent from the table that these kinds of research studies are rare exceptions. The largest part of applied psychological research is still conducted in a conventional way with the disquieting consequence that most of our theory remains essentially timeless.

How do researchers in applied psychology conceive of time? To answer this question, I examined the 2005 volume of the two journals again, now searching for graphs and drawings representing researchers' conceptual models. The graphs and drawings have been categorized in four classes: timeless, methodologically temporal, conceptually temporal, and fully temporal. The first category (timeless) is by far the largest; it contains graphical material from 26 articles in which interrelated variables are depicted without any references to time. Most graphs show a number of observed and/or latent variables that are investigated by means of moderator – mediator analysis, structural equation analysis, etc. The second category (methodologically temporal) comprises models from only three articles. They are similar to those in the first category, the main difference being that they specify moments of measurement (T1, T2, etc.) in a longitudinal design. The variables are all static, though, and there are no references to time in connection with processes, interactions, etc. The third category (conceptually temporal) has a number of graphs originating

¹ The 2005 volumes of these journals represent the most recent state of applied psychology at the moment of writing the manuscript.

from three studies in which time is represented at a conceptual level. One study (Beal, Weiss, Barros, & MacDermid, 2005) shows the timeline of a hypothetical work day, dissected in different episodes (including coffee break and lunch break) and depicts processes that are supposed to happen during different episodes. Another study depicts states and activities that are supposed to successively occur during the turnover process (Griffeth, Steel, Allen, & Bryan, 2005). The third study (Sacco & Schmitt, 2005) depicts dynamic multilevel relationships between community demographic composition, business unit demographic composition, business unit performance, individual demographics, and individual turnover. Here, time is an explicit part of the model.

In the fourth category (fully temporal) we find models from five studies that cover time conceptually as well as methodologically. First there is a study by Boswell et al. (2005), already referred to above, that examines changes in job satisfaction over time in relation to job changes. Kammeyer Mueller, Wanberg, Glomb, and Ahlburg (2005) report a study of turnover in which they analyze differences between “stayers” and “leavers” in how several states and behaviors develop over an 18-month period subsequent to hiring. A study by Sturman, Cheramie, and Cashen (2005) deals with the stability of job performance, proposing a psychometric model in which actual change of performance is incorporated. Sims, Drasgow, and Fitzgerald (2005) present a model of the consequences of sexual harassment that serves as a basis for studying victims’ turnover by means of survival analysis. Finally, there is a study by Salamin and Hom (2005) in which they distinguish several antecedents of voluntary turnover and model the survival rate as a function of job performance and firm tenure.

It should be noted that these studies, which by paying attention to time represent a positive selection from the whole set of articles, address only a few aspects of time. As a matter of fact, the emphasis is on the “moment” in which a particular type of behavior is supposed to happen, very similar to T1, T2, and Tm in longitudinal research. Other temporal facets, such as time lag, duration, etc. are not, or only partly, considered. It is also noteworthy that the specification of “moments” of measurement is in terms of years, or at best months, which is rather crude considering the dynamics of the phenomena studied.

The conclusion from this second look into the recent literature is that the majority of the articles published in the major journals of applied psychology offer research models and figures with results from which time is lacking. Yet,

these articles deal with behavioral phenomena such as perceiving fairness, performing work tasks, socializing at work, experiencing job satisfaction, attaining work-family balance, coping with sexual harassment, engaging in a job search, bargaining, and fulfilling leadership roles, all of which all happen over time². While models of behavior that fail to represent time are hard to defend from a theoretical standpoint – especially when they comprise causal relationships, which call for a temporal separation of cause and effect – time is lacking from most of the models found in these recent articles. Actually less than 5% of all articles provide models that are satisfactory from this point of view³.

As has been pointed out by others (George & Jones, 2000; Mitchell & James, 2001; Ployhart et al., 2002) there are reasons for concern about the nature of our current knowledge in applied psychology. What meaning can be assigned to theories and models that depict behavioral phenomena in terms of variables, and relationships between them, without addressing their temporal aspects? How should we interpret empirically established parameters that lack important referents to time? The predominant ways of researching, regardless of whether they are based on cross-sectional or longitudinal designs can only produce an incomplete and distorted view of how phenomena develop over time⁴. Take for example the study of work performance: Even though the activity of performing is quite unevenly distributed over the circadian interval, the days of the week, and the weeks of the year, most studies treat performance as if it were a constant and timeless phenomenon. However, without a clear reference to the moments in which people’s performance was measured and the relevant dynamic aspects (e.g., stability, slopes, points of inflection) it is virtually impossible to judge the relevance of research data on antecedent and consequent factors. To be sure, there have been studies on certain temporal facets of performance, but because of their scarcity and mostly limited scope, the accumulated knowledge on work performance is still very rudimentary. The same is true for many other phenomena, such as leader-follower relations, group interactions, and organizational processes. There is, in fact, very little that can be said about their dynamic aspects, however popular these topics may have been among psychological researchers.

This even applies to areas designated with labels such as “career dynamics” and “organizational change.” Although one might expect that time plays a critical role here, this is often not the case. Many publications do little more

² Most of the examples mentioned here are from the domain of work and organizational psychology. Although this reflects the content of the two journals mentioned above, it should be acknowledged that applied psychology is broader than work & organizational psychology. The assertions in this article should be understood as pertaining to applied psychology in general.

³ To verify whether these figures give a fair impression of the state of affairs in applied psychology, I performed a count on the abstracts of the presentations at the 26th International Congress of Applied Psychology. The result was even more disquieting, as only 14 out of over 3,000 abstracts were found to contain an explicit reference to time. This seems to suggest a greater awareness of temporal issues in studies published in the academic journals as compared to conference papers.

⁴ This article deals exclusively with applied psychology. It might be argued, however, that there is ground for similar concerns in the domain of basic psychological research.

than offering descriptive and normative models of phases or stages. There is little to learn from them about matters such as when a phase starts, what happens within the phase, how long it takes, and how events in these phases relate to each other. Even if time is explicitly addressed in theoretical work, it often remains undisclosed in empirical research.

Obstacles to the Study of Time

How can the general neglect of time be explained and how can it be given a more prominent place in applied psychology? It is clearly not the lack of relevance of time in human behavior that can account for this neglect. Time is visible, salient, and important in almost any area worthy of psychological study. According to Ancona, Goodman, Lawrence, and Tushman (2001), there are several factors that make it difficult for researchers to incorporate time in their studies, namely: researchers' opportunism, conventions of doing research (e.g., short-term experiments), lack of guiding theory, and lack of methodologies and practical experience. This suggests that building time into a research design is cumbersome, prolongs the research process and slows down researchers' publication achievements. In other words, if it were not so inconvenient for researchers to deal with time, it would have the elevated position that critical authors (e.g., Mitchell & James, 2001) advocate.

Although it cannot be denied that studying time is difficult and that these obstacles may, indeed, discourage researchers from engaging in temporal research, there seems to be another, more fundamental obstacle that prevents many researchers from even considering the possibility of studying time. Based on observations of how researchers conceive of research problems and how they express their thoughts in hypotheses and models – see the previous section for illustrations – I would suggest that the greatest obstacle is a mental one. It is the tendency among researchers to think in terms of “what is,” rather than “what happens.” Very often, and in contradiction with the outlook of people in everyday life, researchers tend to abstract from time and to adopt a static look at human behavior and the world in which it takes place. Neither the behavior itself, nor its determinants or effects, are considered as dynamic phenomena. If, for example, the way in which leaders behave is expected to influence the way in which their subordinates perform – something which is assumed in many leadership studies (e.g., Lowe, Kroeck, & Sivasubramaniam, 1996; Podsakoff, Bommer, Podsakoff, & MacKenzie, 2006) – this is not formulated in terms of a process influencing another process. Rather it is viewed as a state influencing another state. The typical way of conceiving the relationship is a correlation between two variables, measuring these states; not as a pattern of an activity followed by a pattern of another activity with some amount of delay. Implicit in this conceptualization is the idea that the relation-

ship should be cast in terms of individual differences, rather than in terms of variations within a single leader-subordinate dyad.

It is not clear where this erroneous way of conceptualizing comes from. Likely it is associated with the widespread use of the concept of “variable” among behavioral researchers. As pointed out elsewhere (Roe, 2005), it is common practice among researchers to phrase research problems in terms of interrelated variables. These are typically divided into independent and dependent variables, concepts that are viewed as indispensable for describing research designs and methods of analysis. Nowadays, it is virtually impossible to find research articles that do not refer to the concept of variable. There is something peculiar about the notion of variable and the way in which it is used. Its original meaning of “the measured counterpart of a theoretical construct” has largely faded out. Many researchers no longer distinguish the construct and its operational counterpart and use a single term to refer to both. They use the term variable uncritically without considering its limitations.

An important limitation in connection with the study of time is that it is inherently ambiguous with regard to the type of variation it is supposed to reflect. Variables can be understood to reflect intraindividual differences, that is, changes over time, but they can also be seen as reflecting interindividual differences. As a consequence, researchers may confuse these types of variability and even erroneously believe that the same theoretical model may be tested by establishing relationships among variables between and within people. The graphs in Figure 1, based on a simulation study that analyzed a 3-dimensional (Subjects \times Variables \times Time) matrix (Roe, 2004), shows that regressions of performance on motivation were widely different for within-moments and within-subjects analyses. Each of the regression lines in the left panel shows the (cross-sectional) relationship between the variables at a particular point in time. The regression lines in the right panel pertain to the (longitudinal) relationship between the variables for a single subject. These data illustrate that variability between people and within people are different. They lack any logical connection.

The confusion that results from this ambiguity of variables can easily produce a bias against temporal research, namely by evoking the false belief that measurements over people will produce the same results as measurements over time, which would imply that the latter (which are more difficult to obtain) are superfluous. In this connection it is worth noting that it is still common practice among authors to report cross-sectional analyses and in their discussion call for longitudinal studies to confirm their results. It is time to acknowledge that variables used in cross-sectional analysis and variables used in longitudinal analysis are, in fact, different concepts. The results from these two analyses produce different views of reality. Temporal research cannot be substituted for timeless studies of cross-sectional relationships.

The main problem with the use of variables is of a different nature. There is an implicit assumption in the notion of variable that the attribute of behavior or the environment

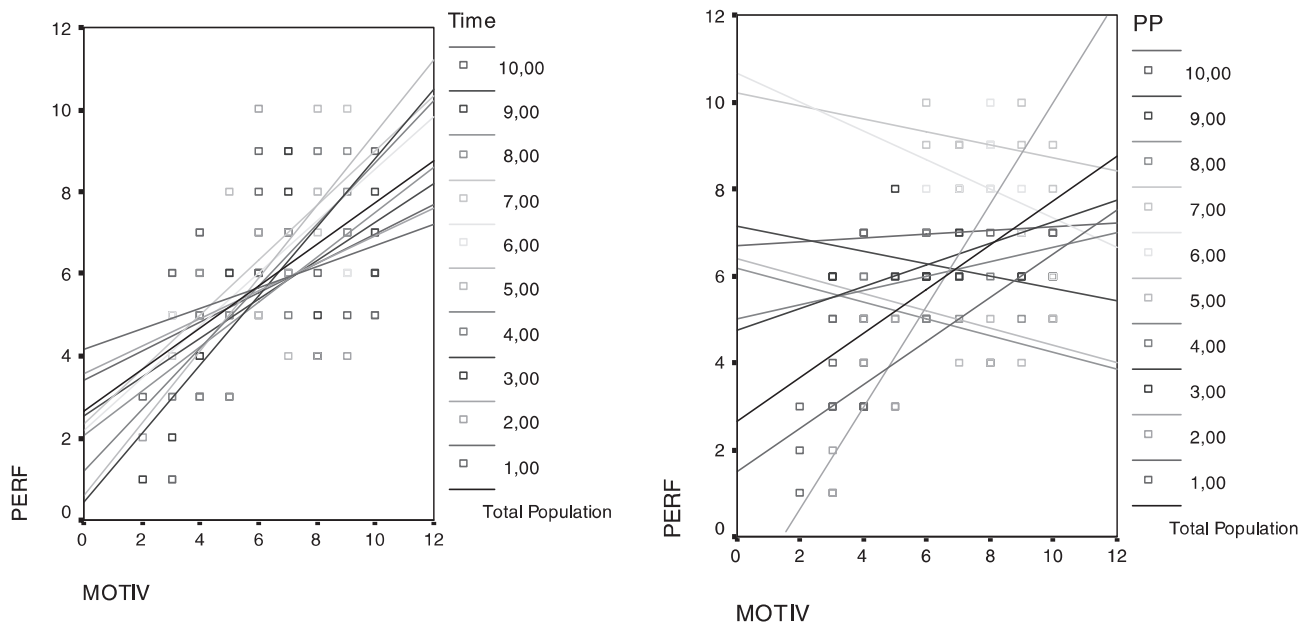


Figure 1. Within-moments vs within-subjects analyses, results from a simulation (Roe, 2004).

to which it refers “is always present,” and that one can always assign a certain value to it. The very assumption that the behavior and the particular situation are always present – to a lesser or greater degree – implies a static view that leaves no room for behaviors that emerge and vanish, and events that happen⁵. Thus, the concept of variable obscures the dynamic aspects of human life. It makes it hard to grasp the changing conditions to which people are exposed as they move to different places and take on different roles. It precludes the recording and analysis of their actual experiences, feelings, and behaviors. For this reason, temporal theory-building and research can only begin if the conceptual hurdle of static thinking inherent in the concept of variable is surmounted. Eliminating the obstacles that were mentioned before (Ancona et al., 2001), related to the practicalities and methodological difficulties of doing time-based research, does not make sense unless researchers start thinking of human behavior as something “that happens” rather than as something “that is.”

Temporalism, an Alternative Approach

An alternative approach to theory-building and research is to view human behaviors in terms of “phenomena.” A “phenomenon” is an observable event, or series of events, happening to a particular object (e.g., individual, group,

organization) during a certain time interval (Roe, 2006, p. 17). To study a particular phenomenon, one has to define the object and the time interval, and to adopt particular techniques to observe and record them. Recording can take place by verbal accounts (narratives), film, video and audio tracks, etc. An analytical description of phenomena can be given by using one or more variables and time, more specifically by a time series of consisting of the values of one or more variables. Clearly, time is to be understood as clock time, or calendar and clock time, in this context, and not as subjectively experienced time⁶. To avoid the problem of ambiguity and confusion mentioned in the previous section, it is necessary to assume that variables measure intra-individual variation in the first place, and that they can have a “zero” value indicating the absence of the particular type of behavior. Variables as meant here can relate to the subject’s behavior as well as to the circumstances impinging on it, including unique and short-lived events. What makes the study of phenomena different from the study of variables is not only the redefinition of variables, but also, and more importantly, the reference to time. It is the combination of variables and moments of time, accumulated over a certain time interval, that makes phenomena suited for the study of “what happens” rather than “what is.”

A crucial assumption is that behavioral phenomena are bounded in time. That is, they emerge and vanish within an interval demarcated by certain points on a time line. In other words, phenomena have a beginning and an end. The points in time defining the interval are not arbitrarily set by

⁵ Of course, variables can be assigned a missing value, but this value has no inherent meaning and only serves to skip the particular observation or substitute it with an estimate derived from observations that are present.

⁶ A discussion of different conceptions of time falls outside of the scope of this article. See, for example, Bluedorn (2002) and Roe (2006) and on this topic.

the researcher, but are part of “what happens,” and, therefore, are theoretically meaningful. For example, the psychological contract between a person and a firm is limited to the period during which a person is employed by the firm. The same is true for organizational commitment. Occupational stress is likewise limited to a part of an individual’s work life. As behavioral phenomena are bounded by the human life span (some also by the life span of the firm they are working for or the institution they are enrolled in) it is reasonable to assume that behavioral phenomena have a certain life span themselves. This implies that they have no “existence” before a starting point (onset), neither after some final point (offset).

What happens in between these two points can be very different, of course, depending on the presence and absence of the behavior, the frequency of reappearance, the rate and overall form of change, etc. It would be worthwhile to investigate phenomena that typically occur in particular fields of applied psychology and explore the possibility of developing an empirical taxonomy that might be useful in the further study of dynamic behavior. However, in the framework of this article it suffices to use a general description of phenomena, in terms of onset, offset, duration (time in between), and “dynamics.” This latter term refers to the overall shape of the phenomenon as it unfolds over time.

An important characteristic of phenomena is that they can be defined with regard to multiple covarying attributes. For instance, leadership might be defined with reference to a set of styles (e.g., initiation, consideration, transactional, transformational) that jointly display certain patterns of development over time. Employee commitment and performance, team interaction, and organizational innovation can similarly be conceived as multiattribute phenomena. Moreover phenomena can be studied at multiple aggregation levels of the time scale. Work performance illustrates this point. It can be studied at the level of hours within a day, days within a week, weeks within a month, and so on. These levels can also be incorporated in a single composite image of performance, while retaining its dynamic character.

In order to promote a dynamic way of thinking about behavior, it can be helpful to abstain from nouns when referring to phenomena and to use verbs instead. Nouns are typically used to designate variables. Their very form suggests a degree of stability within people (or groups, or organizations) and may make researchers oblivious to change over time. At first sight, the difference between verbs and nouns does not seem important, as one may translate either form into the other. However, if one looks at the pairs listed in Table 2, it is clear that such translations are not always easy or obvious. The verb form can differ remarkably from the noun in connotation. Many nouns correspond with active verbs – e.g., collaborating, performing, and trusting – that point at an activity of the person directed at an object. However, several other nouns translate into passive verbs that indicate a psychological state. Examples include: Being cynical, being promoted, or feeling stressed. Several

nouns appear to be ambiguous. It is not clear whether they refer to passive or active verbs. Bullying and harassment are good examples. One would expect them to refer to bullying and harassing behavior, whereas most studies actually deal with victims’ perceptions. A similar ambiguity can be found in commitment and leadership, which can refer to committing oneself and leading others (active) or to feeling committed and experiencing the leadership of someone else (passive).

Translating nouns into verbs brings out important be-

Table 2. Examples of nouns used to designate variables and verbs to designate corresponding phenomena.

Nouns corresponding to active verbs	
Collaboration	Collaborating (a)
Communication	Communicating (a)
Coping	Coping (a)
Cynicism	Being cynical (a)
Decision making	Making decisions (a)
Empowerment	Empowering (a)
Networking	Networking (a)
Organizational citizenship behavior	Engaging in organizational citizenship behaviors (a)
Overtime	Working overtime (a)
Performance	Performing (a)
Planning	Planning (a)
Risk taking	Taking risks (a)
Socialization	Socializing (a)
Trust	Trusting (a)
Withdrawal	Withdrawing (a)
Nouns corresponding to passive verbs	
Climate	Perceiving climate (p)
Promotion	Being promoted (p)
Loyalty	Being loyal (p)
Stress	Being/feeling stressed (p)
Structure change	Experiencing structure change (p)
Unemployment	Being unemployed (p)
Nouns with corresponding active and passive verbs	
Bullying	Being/feeling bullied (p) Bullying (a)
Commitment	Being/feeling committed (p) Committing oneself (a)
Conflict	Experiencing conflict (p) Making conflict (a)
Fairness	Experiencing fairness (p) Being fair (a)
Harassment	Being/feeling harassed (p) Harassing (a)
Leadership	Leading (a) Perceiving leader behavior (p)
Rumors	Hearing rumors (p) Spreading rumors (a)

(a) = active verb, (p) = passive verb

havioral distinctions. More importantly, it makes it easier to identify dynamic issues. Whatever a verb refers to, a cognitive or emotional process, a form of individual behavior, an interaction between group members, or an exchange between individuals and the physical or social environment, time will always be visible.

The difference between nouns and verbs makes us aware that applied psychological research has done little to understand the actual dynamics of behavior. Few researchers have studied the phenomena mentioned in Table 2 in real time – as they occur. Rarely have researchers observed employees engaging in socializing, arguing, showing citizenship behavior, gossiping, harassing or bullying colleagues, or managers engaged in networking, making decisions, leading or empowering employees. The primary source of such information has been the participants themselves. The dominant mode of responding has been answering questions in a survey rather than giving oral or written accounts (e.g., by means of diaries) of what has actually happened.

A Temporal Research Strategy

Adopting phenomena as the building blocks of knowledge in applied psychology opens the way to a research strategy in which temporal aspects can be studied in a systematic fashion. This strategy comprises three objectives:

- to identify dynamic features
- to identify temporal relationships
- to identify long-term stability and change.

Dynamic Features

The first objective is to determine the dynamic features of the focal phenomenon, that is, to establish its onset (relative to some external time scale), its duration, and the typical characteristics of its dynamics. The term “dynamics” refers to the pattern of change in the attributes comprised by the phenomenon. Figure 2 gives an illustration for a phenomenon that comprises a single attribute.

Dynamic features of phenomena can differ in various respects. First, the moment of onset can be early or late in comparison with the beginning of a behavior episode or a specific marker event. For instance, fatigue may appear early or late in the day, or loss of commitment may occur early or late after entry into a new job⁷. In many cases the difference between early and late onset will not only be relevant from a practical point of view, but also from a theoretical perspective. For many behavioral phenomena, it would actually be interesting to discover the underlying mechanism determining the moment of onset. Why would

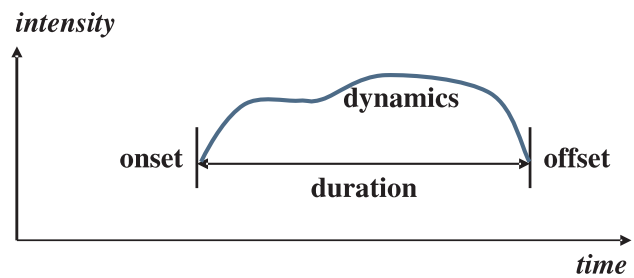


Figure 2. Temporal features of a single attribute phenomenon.

some people be slow to develop trust in a new relationship, and others be fast? What defines the moment of experiencing work-life conflict? When do perceptions of injustice emerge? At what moment do employees ask for a promotion? Differences are certainly interesting when contextual factors are taken into account. In some settings, an early onset might be considered premature; in another it might be seen as overdue. Think, for instance, of the emergence of trust in strangers as opposed to trust in a newly appointed manager. All this shows that the moment of onset is a relevant topic for many research areas.

As for duration, phenomena may be short-lived, long-lasting, or have some intermediate lifetime. The duration can be of widely different magnitudes, ranging from hours to years. Particular emotional states, such as anger or joy, may have a duration of hours, whereas work place learning may take years. The phenomena that are typically studied in applied psychology differ substantially in terms of their average duration. Within a particular class of phenomena, one might make distinctions on the basis of duration; for instance: between acute and chronic fatigue, or between standard and prolonged spells of work performance. Duration is likely to make a difference when relationships with other phenomena are studied. A good example is task conflict in work teams (e.g., De Dreu & Weingart, 2003; Simons & Peterson, 2000). The consequences of task conflict for team processes such as team climate and team performance may be quite different if the conflict had a short duration (e.g., 2 days) or a long duration (e.g., 6 months). Duration effects are only occasionally mentioned in the literature on stress (Carayon, 1995; Frese & Zapf, 1988). They have been rarely the topic of explicit investigation in other areas.

With respect to their dynamics, phenomena can display a very large variety of patterns. Some possibilities are:

1. Stable vs. Unstable

There are inherently unstable phenomena (e.g., attention, mood) that vary with events happening during the day or

⁷ Phenomena will usually be studied in a larger time window that allows studying their relationship with specific events or antecedent and/or consequent phenomena. This allows one to determine whether the onset is early or late.

within the diurnal cycle. For instance, the workday of many people contains quiet moments, peak-moments and rest-breaks, which imply a highly variable workload. On the other hand, there are stable phenomena such as job satisfaction and trust in teams. Of course, the definition of stability depends on the time scale. Job satisfaction may seem to be stable when measured over long time intervals (Dorrmann & Zapf, 2001), but appear to be unstable when measured on a weekly or daily basis. Task performance varies considerably during the average day and week (Alluisi & Morgan, 1982), but it looks stable if measured at points separated by larger intervals.

It is important to note that the degree of stability can differ between individuals. Although there is no immediate evidence of it, the degree of job satisfaction might not only vary between but also within employees; the degree of variation may also differ. Some people must have a constant (high, average, or low) level of satisfaction, as the dispositional view of satisfaction suggests (Judge, 2001). The satisfaction of others may change over time, similar to moods.

2. Growth vs. Decline

If growth is defined as an increase in the strength of an attribute over time, there is much evidence for it with respect to phenomena such as knowledge, skill, and performance. Growth is associated with learning, that is, with changes caused by continued exposure and practice. Decline, or negative growth, is known to happen in motivation and certain performance aspects. Other phenomena can reveal these tendencies as well. An employee may experience growing injustice, declining trust; a manager may display growing empowerment, less risk-taking; a team may show an increase in conflict, a decrease in potency, etc. The apparent pattern of growth and decline observed in human behavior again depends on the time scale. A simple scale with a few moments of observation may reveal slow upward or downward trends, as in the case of age-related learning and performance. A scale with many measurement points can give a more complex picture with many local maxima and minima. There can be differences in growth and decline between individuals (e.g., steeper learning curves have been found for people with higher cognitive ability) or between teams (e.g., faster accelerating conflict, decelerating trust). As there is a great interest in applied psychology in growth and decline, I will return to this issue below.

3. Recurrent vs. Ongoing

The distinction between ongoing and recurrent phenomena is about whether the particular behavior continues during a certain time period or whether it stops and reappears – and if so, how many times. Many behavioral phenomena are discrete and recurrent. This especially applies to all

sorts of activities that are carried out until completion and are started again after some lapse of time. This is not only the case for basic activities like eating, drinking, resting and sleeping, which are somehow linked to the diurnal cycle, but it is also true for work-related behaviors and performance, and for a great part of the activities related to family and social life. They tend to occur repeatedly during the work day, the work week, and longer work periods. Other behavioral phenomena, more related to attitudes and experienced states (satisfaction, loyalty, trust) seem to be ongoing. Again the resolution of the time scale matters; when observing behavior in sufficient detail one would perceive new onsets every time the person enters a new setting. Even feeling satisfied with the job, being loyal to management, and trusting fellow team members, which seem to be more state-like in nature, are unlikely to be present during the full 24 h of a day and 7 days of a week. However, this is a matter to be established by empirical observation – perhaps they are.

Recurrent phenomena are well-suited to an analysis at multiple levels of aggregation (e.g., days, weeks, months, and years). In such cases, there are multiple dynamic features to consider. The notions of onset, duration, and dynamics apply to each level separately. Work performance provides a good example, as its dynamics has been studied empirically (e.g., Alluisi & Morgan, 1982; Kopardekar & Mital, 1994; Smith, 1992). For several jobs, performance shows a particular curve during the working day, with a higher level in the morning, a peak at the end of the morning, a dip after lunch, etc. While this pattern applies to all days of the week, there is a trend over the days of the week, with Monday and Friday showing lower levels and Tuesday showing the highest level. When looked at over the months of the year, the trend is likely to be different again, with levels depending on weather conditions, feasts and holidays, and so on. Interestingly, the multilevel approach to the study of behavioral dynamics opens the way to study mechanisms involved in the temporal organization of behavior. For instance, research by Ancona and Waller (in press) points to differences between work teams in their perception and response to various Zeitgebers as well as in anticipative and reactive entrainment in the pacing of their activities.

Temporal Relations

Studying behavior in terms of phenomena requires an alternative approach to the analysis of associative and causal relationships. It no longer suffices to analyze relations between single variables measured once, either simultaneously or subsequently. To study the relationships between phenomena in a systematic way, the analysis should focus on the links between each of the dynamic features that were mentioned above. Table 3 provides a schema that indicates how this can be done. The schema distinguishes two phenomena, designated as P and Q. It can be applied to an

Table 3. Scheme of possibilities for analyzing relationships between dynamic features of phenomena

	Feature	Phenomenon P		
		Onset	Duration	Dynamics
Phenomenon Q	Onset	1	2	3
	Duration	4	5	6
	Dynamics	7	8	9

antecedent and a focal phenomenon, or to a focal phenomenon and a consequent phenomenon. In comparison to the prevailing practice in current research, which examines the links between variables only, the proposed analysis has a wider scope. It suggests nine options for relating dynamic features of two temporal phenomena to each other. For instance, one might relate the onset of injustice to the onset of declining trust (Option 1), the duration of a stressor to the duration of strain (Option 5), or the growth rate of trust in a team to the growth rate of service climate (Option 9). An example of links between growth rates can be found in the study by Bentein et al. (2005), mentioned before. A steeper decrease in affective and normative commitment was found to be related to a greater increase in the tendency to leave. One might also study the relations between dissimilar features. Thus, research on leader behavior and subordinate performance can be broadened to include links between the early or late onset of a new leader behavior to the duration and dynamics (e.g., stability) of subordinate performance.

The proposed analysis focuses on the selected dynamic features rather than on the values of the variables. They are treated as “dependent” and “independent variables”⁸. Thus, for example, the onset of the leader behavior might serve as independent variable, and the three features (onset, duration, dynamics) of subordinate performance as dependent variables. The duration and dynamics of the leader’s behavior might also be taken as independent variables.

The schema can be useful in formulating research questions for explorative research of the relationships between phenomena. It can also serve to generate hypotheses on the basis of existing theories. For instance, the proposition that procedural justice displayed by managers will lead to greater employee commitment can be extended to a hypothesis that the duration of preceding procedural justice will lead to more stable and more durable employee commitment. Many recent studies in applied psychology can be extended in a similar way.

An additional merit of this approach is that it indicates possibilities for causal analysis beyond those known in traditional research. Using longitudinal designs, researchers have so far concentrated on demonstrating that differences

in variables measured at T1 relate to differences in the same and/or other variables measured at T2. In doing so, they have (with few exceptions) used static information from their measurements, and failed to use any temporal information. Causal analyses can be enhanced by examining the relationships between the dynamic features and showing that the onset of P is followed by the onset of Q, or that the duration of P is followed by a steeper increase of Q, or that a decrease in P is followed by an increase in Q. This would shed a totally different light on causal relationships, and reduce the need to rely on patterns of covariance between individual scores over time.

Long Term Stability and Change

Once knowledge has been gathered about the dynamic features of separate phenomena, and about relationships between phenomena, a third type of research question needs to be answered. This question has to do with generalizability over time. To what degree are the findings from studies stable over longer time periods? Here, the issue is whether there are long-term changes in patterns of behaviors that make it necessary to update extant knowledge and/or to specify conditions associated with such change. Although psychological researchers have rarely questioned historical generalizability⁹, there are many reasons to expect such changes. New technologies have emerged, economies have developed, political systems have evolved, people have been educated differently, population demographics have changed, and social class distinctions have shifted. All these changes may have influenced human behaviors. It cannot be ruled out that patterns of learning, performance, or communication have changed with the spread of the internet and mobile telephony. Employees’ readiness to demonstrate trust, loyalty, and commitment have likely declined after mass-downsizing and the eruption of the Enron scandal. And incisive political events such as the breakdown of the “Berlin wall,” “Srebrenica” or “September 11” may have left an indelible mark on people as well. While such trends and events command attention from scholars in sociology, economics, and political science, they are rarely acknowledged in the field of psychology. Only a few authors have pointed out that a new ecology has emerged that produces behaviors different from the past (Gowing, Kraft, & Campbell Quick, 1998; Latham & Sue Chan, 1998; Lichtenstein & Mendenhall, 2002). The question whether behavior has changed, and whether cause-effect relationships known from the past still hold is almost never raised. Therefore, we don’t know whether parameters describing relationships between conditions and behaviors must be adjusted over the years, nor which laws of behavior have to be discarded. Although it is most likely that people today differ from

⁸ In doing so, independent and dependent variables can no longer be identified with the variables chosen to study the behavior.

⁹ Many meta-analytical studies have analyzed research data that were accumulated over time periods of half a century or more, without questioning this issue. The well-known study by Schmidt and Hunter claiming to assess the validity and utility of selection tests over an 85-year period (Schmidt & Hunter, 1998) is a case in point.

their parents and grandparents in their styles of leadership, their trust in unknown people, their way of combining work and family life, and perhaps their responses to stressors, we cannot assume that such differences have somehow emerged. We need to investigate these issues, using data that have been used in publications from different time periods. Only research can tell us which phenomena are stable over long periods of time and which are not.

Research Methodology

The temporalist approach requires research methodologies that differ in significant respects from those used in traditional, variable-based research. They call for other ways of collecting data, which involve deliberate time-sampling, the use of unobtrusive data collection methods, and the creation of relatively long time-series. Different statistical methods of analysis are required as well, in particular random coefficient modeling, latent growth modeling, event history analysis, time series analysis, cohort analysis, time pattern analysis, and others.

A discussion of these methods falls outside the scope of this article. However, many of the needed methodologies are available and the literature provides excellent examples, although very small in number, of how to use them. Ployhart et al. (2002) described the application of random coefficient modeling to leadership development, while an application of latent growth modeling to employee adjustment can be found in Lance and Vandenberg (2000). Event history analysis has been used to analyze turnover (Hom & Kinicki, 2001; Mossholder et al., 2005). Time series analysis has been applied to study changes in productivity in response to goal-setting and feedback (Latham & Baldes, 1975; Sawyer, Latham, Pritchard, & Bennett, 1999). Cohort analysis is illustrated in a study by Evandrou and Falkingham (2006) predicting later financial well-being of four birth cohorts. Applications of time pattern analysis, a new method for establishing the temporal interdependencies of behavioral events involving one or more actors, are described by Anolli, Duncan, Magnusson, and Riva (2005) and Magnusson (2000). Examples of temporal studies can also be found in related disciplines: biology, medicine, and economics. Moreover, there are excellent methodological introductions to these methods (e.g., Box, Jenkins, & Reinsel, 1994; Chan, 1998, 2002, 2003; Glenn, 2005; Hofmann, 1997; Singer & Willett, 2003).

Challenging Perspectives

The approach proposed here is certainly more laborious and less easy to implement than traditional ones, both in theory development and in the actual research process. However, it holds promise of offering richer knowledge that allows better descriptions and explanations of human reality, and expands the scope and power of applications. Perhaps the best way to demonstrate the implications of the temporalist approach for applied psychology is by giving some imaginative examples. Although research evidence on temporal phenomena is currently very limited, we can imagine a world in which such evidence were already available. I will make use of some vignettes of phenomena in exploring situations that are especially interesting for applied psychology. My starting point is that in today's society time is often valued as much as quality. It is not sufficient that people perform well, that good services are delivered, and that a high quality of life is attained, it is also important that all this happens in the right moment and that it is well-timed as to satisfy human needs whenever and as long as it is needed. On many occasions, time is even more important than quality and it becomes critical when something happens, how long one must wait for it, how long it takes to be completed, and how long the effects remain. Although I will formulate the following in general terms, it is not difficult to see how it relates to situations in which people are at work, act as consumers, or are fulfilling their roles as members of a family or society.

I suggest we consider three classes of phenomena, represented by the vignettes in Figure 3 in which time is of apparent importance, designated as improvement, bifurcation, and relapse.

Improvement

In many settings there is an interest developing a desired behavior up to a certain level, either a maximum or a level specified by a standard. The best example is probably the development of individual performance up to a certain target level. Many other examples could be mentioned, such as: acquiring skills by individuals, developing trust in dyads, building cohesion in teams, and culture change. Improvement, depicted by the vignette in Panel a of Figure 3, is a prototype of a development that is often sought and for which the help of applied psychology is invoked. Obviously, in cases like this, the interest is not only in which person

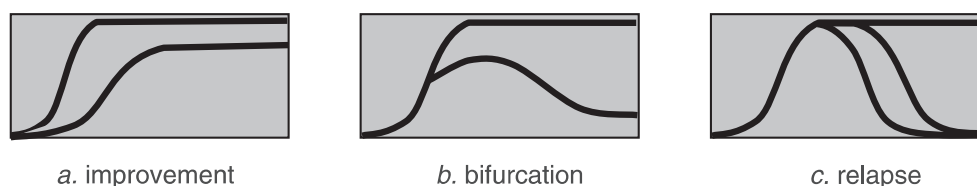


Figure 3. Vignettes of prototypical dynamic phenomena.

(or group, or organization) will achieve the highest or the standard level, but also how long it will take to reach the highest point and whether the behavior will remain stable or is susceptible to decline, and so on.

Now imagine that temporal research had been undertaken and proceeded up to a point where we actually would know when growth begins, how fast it goes, and when the desired level is achieved. Suppose we would also know how individuals (or teams or organizations) would differ in these respects. Such information would be of great practical significance, as it would not only allow one to predict that a particular person (team, organization) would reach the maximum level but also how long further learning or change would add value. Such a prospect is not hard to visualize since applied psychological research has already produced knowledge of this kind – be it on a very limited scale and within the boundaries of specific areas. Learning curves as studied in educational psychology are one well-known example, but there are other scattered cases in the literature on group processes (Gevers, Rutte, & van Eerde, 2006; Walther, 2002) and employee commitment and turnover (e.g., Kammeyer Mueller & Wanberg, 2003). One would simply need more research of this kind, applied to a wider range of phenomena.

Knowledge about improvement in general, embodied in average growth curves of individuals, groups, and organizations, would not be sufficient. A great step forward could be taken by also charting differences between individuals (as well as groups and organizations) and looking for possibilities to predict such differences. Methods for growth modeling do allow incorporating attributes that can help to improve predictions and, hence, to design more effective interventions. For example: Certain individuals would be allowed prolonged training because they are expected to reach higher achievement levels, or certain teams would be disbanded because they cannot be expected to restore deteriorating relationships.

So far, I am assuming that temporal research would be confined to identifying the dynamic features of single phenomena. Of course, further advance in our knowledge could be made if the scope of the research could be broadened to encompass relationships between the behaviors in which the improvement is sought. If some of the links with antecedent phenomena mentioned in Table 3 would be known, we could get an even better prediction of the individual's progress in training or the development of the team's interaction.

A situation in which we would have knowledge about historical generalizability of learning parameters or parameters of team development is less easy to imagine. Yet, there are areas in applied psychology where research has been going on long enough to acknowledge that long-term changes may have altered the validity of results. While meta-analytic researchers have only rarely looked at this facet, relevant data might be extracted from the datasets they have used in doing their analyses. Actually, in a meta-analysis of studies on air pilot selection, Martinussen ob-

served a negative correlation between year of publication and the level of validity (Martinussen, 1996). The decline in validity of biographical inventories in air pilot selection (Roe & Hermans, 2006) is also illustrative. If we realize that pass-fail decisions are based on learning success in pilot training, it may well be that the learning curves of candidates with particular interests and social backgrounds have changed over time, or that differences in slopes are no longer associated with some of these biographical characteristics. Reasons for such changes could be many: developments in aircraft technology, changes in level and type of education, changes in demographic characteristics of candidates, the adoption of new instructional methods in pilot training, etc. Of course, this is just one example, but its logic can easily be applied to phenomena such as work stress, leadership, career counseling, child rearing, and so on.

Bifurcation

Developments of individuals, groups, and organizations are not always successful. When looked at in terms of growth trajectories some show continuous progress until a stable achievement level is reached, while others begin in a similar way but are less successful from a certain point on. This phenomenon can happen in any of the behaviors mentioned previously. It can be designated as *bifurcation* of growth curves, a term used by Waller et al. (Waller, Roe, Gevers, & Raes, 2005) in the context of team processes. The typical pattern is depicted in Panel b of Figure 3. It shows that successful and unsuccessful cases are similar in their development until a certain point in time, but show a differential development from there on. Bifurcation is an issue of great concern in many of the settings in which it occurs. Since the initial development is the same, it is intriguing to find out whether bifurcation will or will not happen, and who (which team, which organization) will appear to be among the unsuccessful. However, as in the case of improvement, there is also a great interest in temporal facets: in which moment the split occurs and what happens afterwards. The issue is equally intriguing from a theoretical point of view: What causes this “forking” of developments, what controls the moment in which it happens, what determines the further developments?

It is exciting to imagine a situation in which sufficient temporal research had been done and we would already know – at least for particular behavioral phenomena – when bifurcation starts, how fast it happens, what the end state is, and when it is reached. This would not only be very useful for predicting developments but also for preventing undesired outcomes and promoting success. Of course, one would need information on differences between individuals (groups, organizations) in this case, not only to differentiate between the successful and unsuccessful, but also to establish how many diverging patterns (“tangs on the fork”) there are. Again, it would be crucial to have infor-

mation about characteristics that may explain the diverging trends.

The study of bifurcation is still in its infancy, but there is evidence on its occurrence from a number of studies of teams. For instance, in a study of project teams Gevers (2004) noted an increasing variance of shared mental models over a 6-month period and on closer examination found indications of diverging developments, resulting in different degrees of project success (meeting deadlines, outcome quality). Waller, Gupta, and Giambatista (2004) reported diverging developments over time in patterns of activity and interaction in effective and noneffective operator teams, particularly under conditions of crisis. Raes, Heijltjes, Glunk, and Roe (2006) similarly observed diverging trends in profiles of task conflict, relationship conflict, and trust in management teams of student associations over the period of a year.

As these studies suggest, there is much to be learned from studies observing a particular phenomenon by using repeated measurements but the power of predictions and the effectiveness of interventions might be further enhanced if research extended beyond the dynamic features of the bifurcation phenomenon. As was said before when discussing studies of improvement, there is much to be gained for applied psychology by investigating links with preceding events or subsequent effects. In the case of bifurcation it is particularly interesting to look at consequences, especially in critical situations. Dramatic impacts on organizational processes may ensue from bifurcation in management teams (cf. Hambrick & D'Aveni, 1992). In high-risk settings (nuclear power plants, aviation, and surgical units) bifurcation in operator teams can result in disasters if it happens when the teams face crisis situations (see Waller, 1999; Waller et al., 2004). With such impacts of bifurcation in mind, studying antecedent phenomena would, of course, also be highly desirable.

I will be brief about studies of long-term trends as they will only make sense in a more remote future when a great deal of temporal research lies behind us. However, it is self-evident that in cases like those just mentioned it would be good to find out whether people keep "reinventing the wheel" or whether they learn from lessons in earlier epochs. Applied psychology has an important contribution to make here.

Relapse

A type of development that is widely considered undesirable is one in which improvements "fail to stick," and people return to old behaviors after some time. This development is depicted in the third vignette, shown in Panel c of Figure 3, and is labeled relapse. Initially the course of development is as desired, just like in the case of improvement, but after some time period of having performed at the highest level there is a decline that ultimately undoes the changes that had been made. Examples can be found in

loss of motivation, training without transfer, recidivism in deviant behaviors, deterioration of cohesion in groups, and ineffective organizational change. Perhaps the best example is offered by the psychological contract between an employee and an organization, which can suffer from a sudden breach. Trust and commitment can build up over time and reach high levels, but they can suddenly disappear if certain conditions occur. Questions of timing are even more salient in this case than in the ones discussed above. It is interesting to know who will lose motivation or trust at some point in time, but it is more pressing to know when it will happen, and what the overall process looks like. The fact that trust builds up slowly and can suddenly disappear as unexpected events occur has often been mentioned (e.g., Rousseau, 1995), but the actual dynamics, including its duration, have rarely been studied. The same is true for processes in teams and organizations.

Knowledge about relapse, although very scarce at the present time, is important for a number of reasons. When the projected result is ultimately not achieved it is associated with a waste of effort and often money, which may have to be spent again with other people. Moreover, the downward trend may have an impact on other behaviors of the same persons, and even spill over to the team and organizational levels. An example is the loss of organizational commitment among employees after a downsizing operation, which may negatively affect collaboration in teams, organizational innovation, and so on (Allen, Freeman, Russell, Reizenstein, & Rentz, 2001; Amabile & Conti, 1997). For these reasons it would be highly desirable if applied psychological research would investigate the occurrence of relapse and relate it to antecedent as well as consequent phenomena. For long-term trends the same note can be made as in the previous paragraph: Although it may seem too early to consider implications in detail, it would be worth noting whether the factors that account for relapses and their timing are stable or change with successive generations of people.

Implications for Applied Psychology

The foregoing was meant to convince the reader that temporal research can enrich applied psychology by significantly deepening and extending its knowledge base. Although several suggestions were given as to how this might widen the range of applications, I would like to expand on this matter. Currently, the applied side of psychology rests on two major pillars: prediction and treatment. *Prediction* is mainly used to identify with a certain likelihood which people and/or conditions will satisfy certain preset criteria and which will not. The prototype of prediction in applied psychology is personnel selection: Assessments of candidates at T1 serve to predict performance outcomes at T2. The term *treatment* refers to decisions about the exposure of people to particular conditions, typically for a certain

period of time (T1–T2). Prediction in the context of personnel selection is followed by treatment in the form of admission or rejection for a job, a training program, or employment. Of course, people should not only be seen as individuals here, they can also be understood to be groups or larger collectives. Currently, time plays a rudimentary role in applications of this kind: There is a time interval to be bridged by prediction and to be filled with the treatment, but apart from this, behaviors are normally seen as stable. The main exceptions to this characterization are to be found in developmental and educational psychology, where developmental and learning processes are studied.

If research into behavioral dynamics were extended to applied psychology as a whole and indeed produced knowledge of the type indicated above, the possibilities for application would certainly become greater than they presently are (prediction – treatment). With behavioral phenomena seen as unfolding over time and research interest focused on improvement, bifurcation, or relapse, the following sequence of options would come to mind:

1. monitoring developmental or change trajectories from the moment they start
2. warning for critical changes in trajectories that could mark the beginning of an unfavorable turn
3. correcting when trajectories deviate from the optimal course
4. predicting ultimate achievements, moments in which these will be reached, and positive as well as negative consequences
5. preventing unfavorable turns in the trajectory as well as negative outcomes
6. optimizing trajectories and their outcomes by changing conditions, prolonging exposure, etc.

Ideally, all these types of action would take place in a timely fashion. For instance, one would intervene in an individual's development program or a team's operation at the "best possible moment," i.e., not too early, not too late. Of course, all this should not be taken too literally and be interpreted as suggesting a closed-loop of meticulous observation and intervention. Knowing when not to intervene and to rely on people's self-corrective capabilities would also be part of a sophisticated approach to the application of psychology.

How such interventions would fit into a future image of applied psychology is hard to say. Applied psychology will probably never resemble medical science where it is standard practice specify interventions in terms of "dosage," a concept of which time is an integral element. The prescription of medicaments is a good example. It specifies under what conditions to apply it, in what amount, how many times a day, how many days (minimum, maximum), when to expect first results, when to expect ultimate results, and when not to continue (expiry dates). Without a direct link of the intervention to a physical substrate that is known to act and respond in a more or less deterministic fashion, such refined interventions seem to make little sense. On the

other hand, it seems unlikely that applied psychology can continue to abstain from notions of amount and timing as it currently does.

When time is taken seriously, there is another aspect of "applying" psychology that should also be considered. It follows from the statement: "*knowing what to do*' is not the same as '*knowing how to do it*'." Applying psychology calls for a process by which knowledge about a specific case is obtained and turned into an intervention. Here, we meet time again, but now in another context, namely in a process of assessment and intervention carried out by a psychologist. The case of personnel selection, mentioned as the classical prototype of applied psychology, can serve as an illustration. Prediction and treatment may be the core of selection, as was said before, but neither of them can be carried out instantaneously. In fact, both require a chain of activities that take time. If we disregard preparatory activities such as making a job analysis, drawing up person specifications, composing and validating a test battery, etc. (Guion, 1998), there is still the administration of tests, the processing of test scores, the comparison and choice of candidates, and the interaction with candidates and managers before an "act of selection" can be considered to be completed.

In an applied psychology enriched by the study of time and, hence, able to offer the wide range of interventions (monitoring, warning, correcting, predicting, preventing, optimizing) that was outlined above, this facet of timing would become much more intricate. Not only would interventions be more complex, they would also have to be synchronized or at least adjusted to the activities of the people (that is, individuals, groups, organizations) for which they are conceived. This is to say that time is not only an essential attribute of the behaviors under study, but also of the professional activities by which these behaviors are monitored and influenced. Seen from this angle the case of personnel selection is actually a rather simple one. In career counseling, team development, and organizational change, to mention a few examples, the interaction between subjects and psychologists may extend over longer periods of time and become more complex. A closer look at what intervention entails in the case of organizational change will emphasize that psychologists, in their role of change agent, mainly interact with a small number of powerful actors (mostly managers) and that the core of the intervention is in the interaction between these actors and others in and around the organization, which can extend over periods as long as several years. In cases like this, it may become difficult to chart the actual dynamics of the interaction and disentangle the contributions made by various parties. This in itself represents another area of study that deserves the attention of applied psychologists. Time is not only a factor that organizes the behaviors of those studied, but also one that organizes the behaviors of those who investigate and intervene. Studying the way in which it runs through the behaviors of the parties involved and ties them together may give new insights that help in understanding and improving the applied side of psychology.

Conclusion

It seems justified to conclude that in spite of a growing awareness of time and more frequent use of longitudinal designs, applied psychology is still largely focusing on individual differences and neglecting the temporal aspect of behavior. Few publications deal with time in a conceptually and methodologically satisfying way. The large majority of articles published in the main journals, *The Journal of Applied Psychology* and *Applied Psychology, An International Review*, leave time unaccounted for or grant it a minor role. Even longitudinal studies do little to study the dynamic aspects of behavior, using short time series and focusing on differences between people at successive points in time rather than on change. Although there are practical and methodological obstacles that make time-based research difficult to conduct, the main obstacle may be of a different nature, i.e.: the tendency among researchers to think in terms of “what is” rather than “what happens.” It has been argued that applied psychology would do well to incorporate time in its theories and research, and that its explanatory power and practical value could increase enormously by doing so.

The strategy to get there starts with thinking in terms of behavioral phenomena (rather than variables), which are conceived as unfolding over a certain time period and, hence, as essentially dynamic. Once a sufficiently large number of phenomena have been charted, the relationships among phenomena may be studied with the help of several temporal parameters. In the longer run, studies may be launched to investigate generalizability over historical epochs and long term trends, such as those related to technological innovation and social transitions.

It seems that much is to be gained from efforts in this direction. Time is salient and important for people throughout the world, and there is a great interest in how human behaviors unfold over time, and why they do so. Studying this would not only produce great theoretical and methodological innovations in applied psychology, it would also expand the range of possible interventions, and enable the field to make substantial contributions to the solution of many societal problems. While the study of patterns such as improvement, bifurcation, and relapse, which seem to underlie many problems, is one great challenge for scholars in applied psychology, clarifying the temporal facets of the “applied” side is another one. There is still much to be discovered about the temporal aspects of interventions and the way in which they intertwine with the behaviors of those studied.

Acknowledgments

This paper is an expanded version of a presentation given by the author at the 26th International Congress of Applied Psychology in Athens, Greece, in July 2006. The author gratefully acknowledges the comments of Gary Latham and Mary Waller on an earlier version of the manuscript.

References

- Allen, T.D., Freeman, D.M., Russell, J.E.A., Reizenstein, R.C., & Rentz, J.O. (2001). Survivor reactions to organizational downsizing: Does time ease the pain? *Journal of Occupational and Organizational Psychology*, *74*, 145–164.
- Alluisi, E.A., & Morgan, B.B. (1982). Temporal factors in human performance and productivity. In E.A. Alluisi & E.A. Fleishman (Eds.), *Stress and performance effectiveness* (pp. 165–247). Hillsdale, NJ: Erlbaum.
- Amabile, T.M., & Conti, R. (1997). Environmental determinants of work motivation, creativity, and innovation: The case of R&D downsizing. In R. Garud, P.R. Nayyar, & Z.B. Shapira (Eds.), *Technological innovation: Oversights and foresights* (pp. 111–125). New York: Cambridge University Press.
- Ancona, D.G., Goodman, P.S., Lawrence, B.S., & Tushman, M.L. (2001). Time: A new research lens. *Academy of Management Review*, *26*, 645–663.
- Ancona, D.G., & Waller, M.J. (in press). The dance of entrainment: Temporally navigating across multiple pacers. In R. Hodson & B. Rubin (Eds.), *Research in the sociology of work*. Elsevier.
- Anolli, L., Duncan, S., Magnusson, M.S., & Riva, G. (Eds.). (2005). *The hidden structure of interaction: From neurons to cultural patterns* (Vol. 7). Amsterdam: IOS Press.
- Avolio, B.J. (2007). Promoting more integrative strategies for leadership theory-building. *American Psychologist*, *62*, 25–33.
- Beal, D.J., Weiss, H.M., Barros, E., & MacDermid, S.M. (2005). An episodic process model of affective influences on performance. *Journal of Applied Psychology*, *90*, 1054–1068.
- Bentein, K., Vandenberghe, C., Vandenberg, R., & Stinglhamber, F. (2005). The role of change in the relationship between commitment and turnover: A latent growth modeling approach. *Journal of Applied Psychology*, *90*, 468–482.
- Bluedorn, A.C. (2002). *The human organization of time. Temporal realities and experience*. Stanford, CA: Stanford University Press.
- Boswell, W.R., Boudreau, J.W., & Tichy, J. (2005). The relationship between employee job change and job satisfaction: The honeymoon-hangover effect. *Journal of Applied Psychology*, *90*, 882–892.
- Box, G.E.P., Jenkins, G.M., & Reinsel, G.C. (1994). *Time series analysis: Forecasting and control*. Englewood Cliffs, NJ: Prentice Hall.
- Carayon, P. (1995). Chronic effect of job control, supervisory social support, and work pressure on office-worker stress. In S.L. Sauter & L.R. Murphy (Eds.), *Organizational risk factors for job stress* (pp. 357–370). Washington, DC: American Psychological Association.
- Chan, D. (1998). The conceptualization and analysis of change over time: An interactive approach incorporating longitudinal mean and covariance structure analysis (LMACS) and multiple indicator latent growth modeling (MLGM). *Organizational Research Methods*, *1*, 421–483.
- Chan, D. (2002). Latent growth modeling. In F. Drasgow & N. Schmitt (Eds.), *Measuring and analyzing behavior in organizations: Advances in measurement and data analysis* (pp. 302–349). San Francisco, CA: Jossey-Bass.
- Chan, D. (2003). Data analysis and modeling longitudinal processes. *Group and Organization Management*, *28*, 341–365.

- Claessens, B., Van Eerde, W., Rutte, C.G., & Roe, R.A. (2004). Planning behavior and perceived control of time at work. *Journal of Organizational Behavior*, *25*, 937–950.
- De Dreu, C.K.W., & Weingart, L.R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology*, *88*, 741–749.
- Dormann, C., & Zapf, D. (2001). Job satisfaction: A meta-analysis of stabilities. *Journal of Organizational Behavior*, *22*, 483–504.
- Eaton, L.G. (2004). Personality and emotional experience in daily life. In S.P. Shohov (Ed.), *Advances in psychology research* (Vol. 30, pp. 101–139). Hauppauge, NY: Nova.
- Evandrou, M., & Falkingham, J. (2006). Will the baby-boomers be better off than their parents in retirement? In J.A. Vincent, C.R. Phillipson, & M. Downs (Eds.), *The futures of old age* (pp. 85–97). Thousand Oaks, CA: Sage.
- Frese, M., & Zapf, D. (1988). Methodological issues in the study of work stress: Objective vs. subjective measurement of work stress and the question of longitudinal studies. In C.L. Cooper & R. Payne (Eds.), *Causes, coping, and consequences of stress at work* (pp. 375–411). Chichester: Wiley.
- George, J.M., & Jones, G.R. (2000). The role of time in theory and theory building. *Journal of Management*, *26*, 657–684.
- Gevers, J.M.P. (2004). *It's about time we align: Meeting deadlines in project teams*. PhD thesis, Eindhoven University of Technology.
- Gevers, J.M.P., Rutte, C.G., & van Eerde, W. (2006). Meeting deadlines in work groups: Implicit and explicit mechanisms. *Applied Psychology: An International Review*, *55*, 52–72.
- Glenn, N.D. (2005). *Cohort analysis* (2nd ed.). Thousand Oaks, CA: Sage.
- Gowing, M.K., Kraft, J.D., & Campbell Quick, J. (Eds.). (1998). *The new organizational reality*. Washington, DC: American Psychological Association.
- Griffeth, R.W., Steel, R.P., Allen, D.G., & Bryan, N. (2005). The development of a multidimensional measure of job market cognitions: The employment opportunity index (EOI). *Journal of Applied Psychology*, *90*, 335–349.
- Guion, R.M. (1998). *Assessment, measurement, and prediction for personnel decisions*. Mahwah, NJ: Erlbaum.
- Hambrick, D.C., & D'Aveni, R.A. (1992). Top team deterioration as part of the downward spiral of large corporate bankruptcies. *Management Science*, *38*, 1445–1466.
- Hofmann, D.A. (1997). An overview of the logic and rationale of hierarchical linear models. *Journal of Management*, *23*, 723–744.
- Hom, P.W., & Kinicki, A.J. (2001). Toward a greater understanding of how dissatisfaction drives employee turnover. *Academy of Management Journal*, *44*, 975–987.
- Ilies, R., & Judge, T.A. (2005). Goal regulation across time: The effects of feedback and affect. *Journal of Applied Psychology*, *90*, 453–467.
- Judge, T.A. (2001). Dispositional affect and job satisfaction: A review and theoretical extension. *Organizational Behavior and Human Decision Processes*, *86*, 67–98.
- Kammeyer Mueller, J.D., & Wanberg, C.R. (2003). Unwrapping the organizational entry process: Disentangling multiple antecedents and their pathways to adjustment. *Journal of Applied Psychology*, *88*, 779–794.
- Kammeyer Mueller, J.D., Wanberg, C.R., Glomb, T.M., & Ahlburg, D. (2005). The role of temporal shifts in turnover processes: It's about time. *Journal of Applied Psychology*, *90*, 644–658.
- Kelly, J.R., & Barsade, S.G. (2001). Mood and emotions in small groups and work teams. *Organizational Behavior and Human Decision Processes*, *86*, 99–130.
- Kopardekar, P., & Mital, A. (1994). The effect of different work schedules on fatigue and performance of a simulated directory assistance operator's task. *Ergonomics*, *37*, 1697–1707.
- Lance, C.E., & Vandenberg, R.J. (2000). Latent growth models of newcomer change: The case of newcomer adjustment. *Organizational Behavior and Human Decision Processes*, *83*, 107–140.
- Latham, G.P., & Baldes, J.J. (1975). The "practical significance" of Locke's theory of goal setting. *Journal of Applied Psychology*, *60*, 122–124.
- Latham, G.P., & Sue Chan, C. (1998). Selecting employees in the 21st century: Predicting the contribution of I-O psychology to Canada. *Canadian Psychology*, *39*(1–2), 14–22.
- Lichtenstein, B.M.B., & Mendenhall, M. (2002). Nonlinearity and response-ability: Emergent order in 21st century careers. *Human Relations*, *55*(1), 5–32.
- Lowe, K.B., Kroeck, K.G., & Sivasubramaniam, N. (1996). Effectiveness correlates of transformation and transactional leadership: A meta-analytic review of the MLQ literature. *Leadership Quarterly*, *7*, 385–425.
- Macan, T.H. (1994). Time management: Test of a process model. *Journal of Applied Psychology*, *79*, 381–391.
- Magnusson, M.S. (2000). Discovering hidden time patterns in behavior: T-patterns and their detection. *Behavior Research Methods, Instruments and Computers*, *32*, 93–110.
- Martinussen, M. (1996). Psychological measures as predictors of pilot performance: A meta-analysis. *International Journal of Aviation Psychology*, *6*, 1–20.
- Mathieu, J.E., & Schulze, W. (2006). The influence of team knowledge and informal plans on episodic team process-performance relationships. *Academy of Management Journal*, *49*, 605–619.
- McGrath, J.E., & Kelly, J.R. (1986). *Time and human interaction: Toward a social psychology of time*. New York: Guilford.
- Mitchell, T.R., & James, L.R. (2001). Building better theory: Time and the specification of when things happen. *Academy of Management Review*, *26*, 530–547.
- Moon, S.M., & Illingworth, A.J. (2005). Exploring the dynamic nature of procrastination: A latent growth curve analysis of academic procrastination. *Personality and Individual Differences*, *38*, 297–309.
- Mossholder, K.W., Settoon, R.P., & Henagan, S.C. (2005). A relational perspective on turnover: Examining structural, attitudinal, and behavioral predictors. *Academy of Management Journal*, *48*, 607–618.
- Ployhart, R.E., Holtz, B.C., & Bliese, P.D. (2002). Longitudinal data analysis applications of random coefficient modeling to leadership research. *Leadership Quarterly*, *13*, 455–486.
- Podsakoff, P.M., Bommer, W.H., Podsakoff, N.P., & MacKenzie, S.B. (2006). Relationships between leader reward and punishment behavior and subordinate attitudes, perceptions, and behaviors: A meta-analytic review of existing and new research. *Organizational Behavior and Human Decision Processes*, *99*, 113–142.
- Raes, A.M.L., Heijltjes, M.G., Glunk, U., & Roe, R.A. (2006). *Conflict, trust, and effectiveness of teams performing complex tasks: A study of temporal patterns*. Presented at the Sympos-

- sium "It's about time! Increasing the temporal focus in organizational research." Maastricht, the Netherlands: Maastricht University, METEOR/Department of Organization & Strategy.
- Roe, R.A. (2004). De paradox van de tijd en de toekomst van A&O-Psychologisch onderzoek [The paradox of time and the future of W&O psychology research]. *Gedrag en Organisatie*, 17, 342–350.
- Roe, R.A. (2005). No more variables, please! Giving time a place in work and organizational psychology. In F. Avallone, H. Kepir Sinangil, & A. Caetano (Eds.), *Convivence in organizations and society* (pp. 11–20). Milano: Guerini.
- Roe, R.A. (2006). *Perspectives on time and the chronometric study of what happens in organizations* (No. 037). Maastricht: Maastricht University, Meteor Research Memoranda.
- Roe, R.A., & Hermans, P.J. (2006). Psychological factors in crew selection. In R. Bor & T. Hubbard (Eds.), *Aviation mental health* (pp. 161–193). Aldershot: Ashgate.
- Rousseau, D.M. (1995). *Psychological contracts in organizations. Understanding written and unwritten agreements*. Thousand Oaks, CA: Sage.
- Sacco, J.M., & Schmitt, N. (2005). A dynamic multilevel model of demographic diversity and misfit effects. *Journal of Applied Psychology*, 90, 203–231.
- Salamin, A., & Hom, P.W. (2005). In search of the elusive u-shaped performance-turnover relationship: Are high performing Swiss bankers more liable to quit? *Journal of Applied Psychology*, 90, 1204–1216.
- Sawyer, J.E., Latham, W.R., Pritchard, R.D., & Bennett, W.R., Jr. (1999). Analysis of work group productivity in an applied setting: Application of a time series panel design. *Personnel Psychology*, 52, 927–967.
- Schmidt, F.L., & Hunter, J.E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin*, 124, 262–274.
- Simons, T.L., & Peterson, R.S. (2000). Task conflict and relationship conflict in top management teams: The pivotal role of intragroup trust. *Journal of Applied Psychology*, 85, 102–111.
- Sims, C.S., Drasgow, F., & Fitzgerald, L.F. (2005). The effects of sexual harassment on turnover in the military: Time-dependent modeling. *Journal of Applied Psychology*, 90, 1141–1152.
- Singer, J.D., & Willett, J.B. (2003). *Applied longitudinal data analysis. Modeling change and event occurrence*. Oxford: Oxford University Press.
- Smith, A.P. (1992). Time of day and performance. In A.P. Smith & D.M. Jones (Eds.), *Handbook of human performance*, Vol. 3: *State and trait* (pp. 217–235). London, UK: Academic Press.
- Sturman, M.C., Chermie, R.A., & Cashen, L.H. (2005). The impact of job complexity and performance measurement on the temporal consistency, stability, and test-retest reliability of employee job performance ratings. *Journal of Applied Psychology*, 90, 269–283.
- Waller, M.J. (1999). The timing of adaptive group responses to non-routine events. *Academy of Management Journal*, 42, 127–137.
- Waller, M.J., Gupta, N., & Giambatista, R.C. (2004). Effects of adaptive behaviors and shared mental models on control crew performance. *Management Science*, 50, 1534–1544.
- Waller, M.J., Roe, R.A., Gevers, J.M.P., & Raes, A.M.L. (2005). Team effectiveness in dynamic settings: A bifurcation model. *Workshop "Human in Command – Military Command Team Effectiveness: Research, Models, and Instruments."* Soesterberg, The Netherlands: NATO RTO HFM Panel Task Group 023 on Team Effectiveness.
- Walther, J.B. (2002). Time effects in computer-mediated groups: Past, present, and future. In P. Hinds & S. Kiesler (Eds.), *Distributed work* (pp. 235–257). Cambridge, MA: MIT Press.
- Wanberg, C.R., Glomb, T.M., Song, Z., & Sorenson, S. (2005). Job-search persistence during unemployment: A 10-wave longitudinal study. *Journal of Applied Psychology*, 90, 411–430.

About the author

Robert Roe is Professor of Organization Theory and Organizational Behavior at Maastricht University, the Netherlands. He is the founding president of the European Association of Work and Organizational Psychology, and former professor of work and organizational psychology at the universities of Delft, Tilburg, and Nijmegen.

Robert A. Roe

Faculty of Economics and Business Administration
 Department of Organization & Strategy
 P.O. Box 616
 NL-6200 MD Maastricht
 The Netherlands
 Tel. +31 43 388-4985
 Fax +31 43 388-4893
 E-mail r.roe@os.unimaas.nl