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Taking time seriously: Changing practices and perspectives in Work/Organizational Psychology

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ABSTRACT

Although dedicated to the study of processes in people and organizations, W&O Psychology has shown little sensitivity to the fact that processes happen in time and evolve over time. This paper describes how the field has become more aware of time, after an initial neglect of time, and is now engaged in developing theories and empirically investigating when things happen and how they change. We discuss proposals from Molenaar, Van de Ven, Roe, and colleagues to make our conceptual apparatus better suited to the study of temporal dynamics and to make research methods more sensitive to temporal issues, changing their focus on individual differences to within-person variations. We finish with a discussion of how taking time seriously may lead W&O Psychology to explore new frontiers and to enter new paths in the future which can lead to a better recognition of complexities in organizational behavior.

Tomarse en serio el tiempo: cambios en la praxis y en las perspectivas de la Psicología del Trabajo y de las Organizaciones

Palabras clave:
Tiempo
Psicología del Trabajo y de las Organizaciones
Teoría organizativa
Investigación organizacional
Ciencia de la complejidad

RESUMEN

Aunque se ocupa del estudio de los procesos en las personas y en las organizaciones, la Psicología del Trabajo y de las Organizaciones ha mostrado escasa sensibilidad hacia el hecho de que los procesos suceden en el tiempo y evolucionan a lo largo del mismo. Este trabajo describe cómo se ha tomado conciencia del tiempo en este campo después de un periodo inicial de ignorarlo, con una gran implicación actual en el desarrollo de teorías e investigación empírica sobre cuándo ocurren las cosas y cómo cambian. Se comentan las propuestas de Molenaar, Van de Ven, Roe y colaboradores dirigidas a adecuar mejor nuestro aparato conceptual al estudio de la dinámica temporal y a conseguir que los métodos de investigación sean más sensibles a los aspectos temporales, cambiando su enfoque desde las diferencias individuales a las variaciones intra-persona. Se concluye comentando que considerar en serio el tiempo puede hacer que la Psicología del Trabajo y de las Organizaciones explore nuevas fronteras y abra nuevas rutas en el futuro que conduzcan a un mejor reconocimiento de las complejidades del comportamiento organizativo.

The Importance of Time in Work & Organizational Psychology

Time is an issue enjoying growing interest in the behavioral and social sciences (e.g., Levine, 2003; McGrath & Tschan, 2004; Zimbardo & Boyd, 1999) as well as in the specific literatures of management and Work and Organizational (W&O) Psychology (e.g., Albert, 2013; Ancona, Goodman, Lawrence, & Tushman,

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2001; George & Jones, 2000; Mitchell & James, 2001; Roe, 2008; Sonnentag, 2012). Whether conceived subjectively, as a psychological property of people's consciousness, or objectively, as a physical attribute of events and episodes, it is of obvious importance for W&O Psychology, because "the substance of organizational behaviour – its constructs – exists in and through time" (George & Jones, 2000, p. 666). Neither the behavior of human beings nor the activities of organizations can be defined without reference to time, and temporal aspects are critical for understanding them. Moreover, the experience of time among working people reflects in numerous ways what Roe (2014a) has called the 'temporal footprint of work'. This notion refers to the way in which work-related activities are mapped on the time-line, i.e., the start and end of working periods, the alternation and succession of tasks, interruptions and breaks, among others. Finally, there are also numerous constructs that directly refer to time, such as time pressure, polychronicity, deadlines, time perspective, and so forth (Sonnentag, 2012). Therefore, W&O Psychology is a field in which temporal issues matter.

W&O Psychology can be described as the study of cognitive, energetic, motor, and social processes of people at work. However, there is no single, universally accepted definition of process. For instance, a process has been defined as "a series of actions or steps taken in order to achieve a particular end" (Oxford English Dictionary), but also as a continuous flow: "Process is fundamental: the river is not an object, but an ever-changing flow; the sun is not a thing, but a flaming fire" (Heraclitus, cited by Rescher, 1996, p. 10). The psychological literature is rather ambiguous in its use of the term process. For example, the work motivation literature contains several so-called "process theories", which are supposed to depict the processes by which people get motivated (e.g., Latham & Pinder, 2005). Well-known examples include the valence-expectancy theory (Vroom, 1964) or the goal-setting theory (Locke & Latham, 1990), both suggesting that work motivation is produced in a sequence of cognitive and energetic processes. On the other hand, there are many studies in the area of group and team research postulating on-going processes that shape the outputs achieved by people working together (e.g., cohesion, shared cognition, climate, etc.). According to Roe, Gockel, and Meyer (2012, p. 632), a process is a "changing state of a subject defined with reference to a certain period of time".

The idea that W&O Psychology is devoted to the study of processes stands in stark contrast with the observation that very often researchers treat presumed processes in a static, atemporal manner, and measure them in a "snapshot-like" fashion (George & Jones, 2000). Several authors have expressed worries about this inconsistency and the problem-method misfit implied in it, and have pointed at its detrimental consequences for the validity of the accumulated knowledge (e.g., Ancona et al., 2001; George & Jones, 2000; Mitchell & James, 2001; Roe, 2008; Roe et al., 2012). In their view, any serious study of cognitive, behavioral, or social process should concern variables as states rather than quasi-traits.

Thus, while W&O Psychology is a field in which temporal issues are of central importance, there are reasons for concern about the ways in which time is being treated in (at least part of) the theoretical approaches and of the empirical research studies in this field. To better understand the present situation, this paper pursues the following objectives: first, to review how time has been considered in the more recent W&O Psychology literature; second, to describe recent proposals to consider time more seriously; and third, to explore possible future trends in theory-building and research practices. By doing so, we hope to contribute to a growing awareness among W&O psychologists regarding the importance of time and to offer views that can guide future work, which, in our opinion, needs to be more sensitive to temporal issues.

How Has Time in W&O Psychology Been Considered?

A 'Variable' View of Time

The most popular approach to time in the W&O Pychology literature has been that of time as a defining element of a construct. Using the PsycInfo database, within the Industrial and Organizational Psychology field (code 3600), and doing a simple search with "time" as a keyword, we found 277 peer-reviewed journal papers during the period 2000-2014 (information retrieved on October 1st 2014). A cursory look at the abstracts reveals that many researchers have been interested in time as an element of a construct. Authors have investigated, for instance, constructs referring to subjective time, such as time pressure, time strain, time demands, time urgency, or time orientation and their relationships with other constructs. For example, Syrek, Apostel, and Antoni (2013) studied the influence of time pressure on exhaustion and work-life balance. Castro (2011) studied the interaction between time demands and gender role, and how this interaction has important implications for career advancement. Or Zimbardo and Boyd (1999) were interested in time perspective as a personality-related construct that helps to understand how people build their time experience.

Other studies have used constructs and variables related to objective time, such as timing, time lag, time delay, and time management (e.g., Claessens, Roe, & Rutte, 2009; Guenter, Van Emmerik, & Scheurs, 2014; Waller, 2000). Objective time is also present in studies using variables related to working hours, which are for instance used to define shifts or to distinguish between part-time and full-time workers. For example, Wittmer and Martin (2011) studied role involvement, work attitudes, and turnover intentions in a sample of part-time workers. Here, time appears as a construct with a socio-demographic meaning, useful to characterize a population.

Finally, there are studies that use time as an instrumental construct, which refers to elapsed time (captured by 'time 1′, 'time 2′, etc.). Here, time serves as a factor in a before-after experimental design or a longitudinal design that covers multiple measurement time moments (e.g., Beal & Ghandour, 2011; Vancouver, Thompson, Tischner, & Putka, 2002). A pure time variable – measured within individuals – is also used in studies with multi-level or panel designs (Dierdorff & Ellington, 2012), as well as in historic studies describing long-term trends (e.g., Hofmann, Jacobs, & Baratta, 1993).

The recent literature clearly shows the awareness among researchers of the relevance of time and time-related constructs for understanding human behavior in organizations. Organizational behavior is full of temporal influences and the previous list shows only some of the most significant explored in W&O Psychology research.

Time As a Neglected Topic

From another angle it appears that time has not received the attention it deserves. Several authors have pointed at the neglect of time in theory-building, measurement, and data analyses (e.g., Albert, 2013; Ancona et al., 2001; George & Jones, 2000; Mitchell & James, 2001). Compared to earlier decades – up to 1960 – there has even been a declining interest in temporal issues and processes (e.g., works of Lewin, Bales, Bion, etc.; see Roe, 2014a). Roe explains this fact from the standpoint of the 'differential revolution' that happened in the nineteen-sixties, when the original focus on time was displaced by the study of individual differences. Moreover, we can think about several other reasons why time has become a neglected issue. First, at a theoretical level there appears to be an explicit or implicit denial of the role of time, either because theories reject time, embrace the notion of stability, or ignore the possible

Table 1
Main Considerations of Time in W&O Psychology Research.

Time as a . . .	Examples
Construct, variable	Time pressure, time strain, time demands, time urgency, time delay, time management. Polychronicity, temporal focus, temporal depth. Individual and team processes.
Metric	Moments and intervals. Multiple waves (time 1, time 2, etc.) in longitudinal, panel or historical designs. Lacking specification of time scales.
Neglected topic	In theory building, (implicit) assumption of stability, denial or neglect of time, changes and impacts occurring over time, In method, scarcity of longitudinal compared to cross-sectional designs, lack of guidance on how to conduct longitudinal studies which allow due sensitivity to temporal issues and overcome conceptual and practical barriers (e.g., required resources), limitations resulting from differential psychometrics (CTT, IRT). In analyses, lack of distinction between-subject and within-subject variation (differential vs. temporal analyses, limited attention to causality issues in both, ignorance of heterogeneity in within-subject variation.
Way to do better research	In theory building, specifying temporal facets of constructs/variables: e.g., when occurring in time (start, duration, end), how unfolding over time, degree of stability (clarifying their nature as state, trait or both). In method, considering time-scales and time-frames, using repeated measurements (preferably in high-density designs), using temporal sensitive measurement techniques.
Level in multilevel designs	Time nested in participants (e.g., by using diary methods), allowing the simultaneous study of individual differences and within-subject variations.

effect of time. Second, at a methodological level researchers tend to opt for measurement instruments, research designs, and methods of analysis that focus on individual differences (even though these may not fit theoretical propositions of processes or change), out of habit or due to lack of guidance about how to handle temporal data. Let us consider these sources of neglect in more detail.

Some theories in W&O Psychology have explicitly rejected the importance of time. One of the most striking examples is Vroom's valence-expectancy theory of motivation – striking because this theory is usually seen as a process theory. The theory proposes that people's behavior follows from choices, which only depend on current expectancies and valences. Although expectancies obviously relate to something that may happen in the future, and are based on past experiences, this theory "is basically ahistorical in form" (Vroom, 1964, p. 17). It is good to remember that this theory is based on the Lewin's tradition of explaining behavior from *current* field forces, an approach which has significantly influenced the later developments in social and W&O Psychology.

Less explicit than Vroom's theory, but still denying the role of time, are theories that assume constructs to be stable. This applies to performance theories based on abilities and personality, as the ones used in personnel selection, and motivation theories that postulate stable preferences or goal orientations (e.g., Cellar et al., 2011; Oakes, Ferris, Martocchio, Buckley, & Broach, 2001; Tsaousis & Nikolaou, 2001). Theoretically, time could play a role here, but the assumption is that time has no effect or that its effect is not systematic and therefore can be thought of as error (Tables 1 and 2).

Finally, there are theories that mention neither stability nor change, and that simply fail to consider a possible effect of time. Typically, such studies assume that behavior is stable and provide no information as to when behavior happens, how long it lasts, how it changes, etc. We will come back to this idea when discussing the role of time in advancing research in the W&O field.

Methodologically, one of the most interesting consequences of the neglect of time has been the misfit between the theoretical propositions regarding temporal phenomena and the methods used to test the theories (e.g., McGrath & Tschan, 2004; Ployhart & Vandenberg, 2010; Sonnentag, 2012). As Ployhart and Vandenberg (2010) have argued, "it is difficult to imagine a theory (macro, meso or micro) being purposely developed to explain a phenomenon at only a single point in time" (p. 94). However, it is not uncommon to find studies that use cross-sectional methods to analyze associations between different variables, while their original purpose was to examine psychological process or causal effect. In general, such studies use measurement techniques which are well-suited to measure differences between individuals but not changes over time, like attitude scales, rating scales, and psychometric tests. Research designs predominantly compare experimental conditions or investigate associations by means of analytical techniques based on the general linear model (i.e., variance or regression analysis). They allow including time as a variable and to examine within-subject variation, but are primarily geared to the study of between-subject differences.

An often-mentioned explanation for the theory-method misfit is the presence of barriers that discourage researchers to include time in W&O Psychology research (e.g., Ancona et al., 2001; Ployhart & Vandenberg, 2010; Roe, 2008). Here is a brief list of the main barriers that have been mentioned: there is no theoretic guidance

Table 2
Future Directions to deal better with Time in W&O Research.

Future directions	Examples
Adopting a process ontology	Study changes, time-scales involved, and temporal connections among events (Van de Ven & Poole, 2005)
Adopting radical temporalism	Stop using variables (Roe, 2005). Instead, study phenomena (an observable event happening to a particular object during certain time interval), their interrelations over time, and long-term stability and change of phenomena and interrelations (Roe, 2008, 2014a). Identify dynamic features of the phenomena that are continuously changing over time (Liu et al., 2012; Solinger et al., 2013)
Considering non-ergodicity of change patterns	Acknowledge the possibility of differences in intra-individual change (Molenaar, 2004) Study possible patterns (clusters) in intra-individual variability (Li & Roe, 2012; Raes et al., 2009; Solinger et al., 2013)
Considering non-linearity of change patterns	Use methods that identify non-linear changes and non-linear relations among variables/phenomena (Beal & Ghandour, 2011; Navarro & Arrieta, 2010; Ramos-Villagrasa et al., 2012)
Considering endogenous change	Adopt a developmental perspective and acknowledge that change can occur due to endogenous processes (e.g., maturation) in absence of external influences (Levine & Moreland, 1994; Wheelan & McKeage, 1993).
Applying complexity science	Study chaotic dynamics over time, sudden and catastrophic changes, fractal structures, fuzzy boundaries or emergent processes in organizational phenomena (Ceja & Navarro, 2011; Guastello, 1987, 2007; Navarro, Curioso, Gomes, Arrieta, & Cortés, 2013)

about how to conduct a more time-sensitive study, it is more difficult to find organizations that allow longitudinal data-gathering, researchers lack the knowledge of techniques required for longitudinal data-analysis, and researchers are under pressure to conduct research and publish its outcomes in short periods of time (which favors short-term experiments or cross-sectional field studies).

However, other and more fundamental explanations for the theory-method misfit have also been suggested. Thus, Van de Ven and Poole (2005) and Roe (2008) mention a more serious barrier lies in the dominant epistemology of individual differences. Indeed, one cannot expect researchers to disclose the role of time when they keep using constructs and methods premised upon the notion of inter-individual differences. For this, they will have to change their focus and direct it to the intra-individual level, acknowledging a wider range of possible variations than that described by the normal distribution of inter-individual differences. Researchers also have to realize that the very notion of 'variable', which is used in nearly all current research to date, harbors the risk of confusing intra-individual variation with inter-individual variation (Roe, 2005), which should therefore be handled with care or not used at all in further research (also Solinger, 2010).

The absence of guidance about how to analyze longitudinal data should also be mentioned. There is some validity in the argument that this adds to the neglect of time at the methodological level, but it must also be said that the W&O Psychology field has been rather slow in picking up methods such as time series analysis, survival analysis, or growth analysis, used in adjacent fields of science. In recent years, we are seeing some change, as W&O Psychology researchers are becoming more aware of multilevel issues and are incorporating time as a level in multilevel structures (e.g., Dierdorff & Ellington, 2012; Quigley, 2013). Although encouraging, it should be noted that this approach (within-person data nested in person level) offers only limited possibilities to analyze time.

To finish, there are practical and epistemological reasons that seem to have contributed to the neglect of time on the theoretical and methodological level. Work and organization psychology researchers should do better and advance theories and research "that address the dynamics of how important phenomena emerge, evolve, and change over time" (Kozlowski, 2009, p. 3) – just as their predecessors have done before the nineteen-sixties.

Time as an Opportunity to Improve Theory and Research

The next message we take from the literature is that including time in theories and methods offers possibilities for advancing the field and to generate more valid knowledge in W&O Psychology. This "new frontier" (Kozlowski, 2009) suggests that W&O psychologists should change the way they construct their theories and designs and carry out research studies (e.g., McGrath & Tschan, 2004; Mitchell & James, 2001). There are multiple ways in which time can be incorporated in theory-building. First of all, time should be included as a referent to the reality that is being studied (Roe, 2005) or at least as a boundary condition (Bacharach, 1998; Whetten, 1989). Any theory in W&O Psychology must contain four essential elements: 1) answers to what the constructs are, 2) how and why these constructs are related, 3) answers to whom the constructs apply to, and 4) where and when the constructs are applicable. This last requirement just indicates that good theories in our field should specify when things happen.

However, time can also play a role in defining constructs and specifying their relationships (George & Jones, 2000). As it was already mentioned, researchers have proposed many constructs in which time is explicitly included, such as time urgency, time pressure, polychronicity, or future orientation. Yet, other constructs, such as power, creativity, team cohesion, or organizational climate, imply time as well, as they refer to phenomena that occur *in* time (Slife, 1993) and manifest themselves at particular moments or unfold during certain episodes (Roe, 2008). They "do not change, evolve, or develop *because* of time; rather they do so *over* time" (Ployhart & Vandenberg, 2010, p. 98, italics in the original).

Certain phenomena may perhaps seem stable, but they will always show change when considered in a wider time-window (Roe, 2014a). It is increasingly recognized that a phenomenon may appear being variable or stable and that constructs can be conceived of as 'states' or 'traits', depending on the time-window. The best example is probably state and trait anxiety (Spielberger, 1975), but the current debate about work engagement as state and trait shows that this can be applied more broadly and that this distinction has consequences for theory development (e.g., Inceoglu & Roe, 2015; Latham, Ganegoda, & Locke, 2011; Sonnentag, Dormann, & Demerouti, 2010).

Ideally, theories about psychological phenomena should specify their temporal features (George & Jones, 2000; Mitchell & James, 2001; Roe, 2008, 2014a). When it comes to subjective time they should, for instance, spell out how past, present, and future are represented. As for objective time, they should specify, among others, when phenomena occur, their duration, speed, and form of development. Moreover, they should provide information about the rate and shape (linear, non-linear) of change, the type of expected change (incremental or discontinuous; stabilization or destabilization), the presence of stable phases, rhythms, cycles, or spirals, and so on. As Roe (2008) has pointed out, there are many options to consider here, such as which one changes first, how the duration of one can have an impact on the growth rate of another one, which time lags there are, etc. Of course, this raises the question on which grounds theories could give all these specifications. We will come back to this later on, when discussing the role of descriptive and exploratory research.

To describe the features of dynamic phenomena, we need temporal metrics. That is, we need to specify time-scales to specify time-frames and intervals to build and test theories (Roe, 2009; Zaheer, Albert, & Zaheer, 1999). Changing the resolution of the time-scale and of the total period during which phenomena are observed, could dramatically affect the appearance of the phenomena and their relationships with other phenomena. The aforementioned example of engagement as a trait or as a state makes it clear that this depends in part on the time-scale used. Another good example is the study of affect at work, which has used theories about discrete emotions (short-term processes), theories about mood (more mid-term) and theories of temperament (more a long-term process). Likewise, theories of performance dynamics differ when focusing on annual changes in monthly measurements or on hourly changes measured in minutes (Roe, 2014a). Research on abilities and personality, which have conventionally been conceived of as stable, shows that changes do occur when longer time-frames are considered.

Changing the time-frame and time-scale also affects antecedents and consequences, as recent research with daily diaries reminds us. The effect of recovery on subsequent work engagement and proactive behavior may hold for consecutive days (Sonnentag, 2003); whether it also holds for hours or weeks is an open question. This fact calls for the deliberate variation in time frames and scales, or 'temporal zooming' (Roe, 2014a), which may help to find out which type of temporality is characteristic for particular phenomena. For instance, emotions may show most variation on an hourly scale, while organizational climate varies over months or years.

Of course, one cannot build temporal theories unless one engages in longitudinal research. For decades such research has remained quite exceptional in W&O Psychology; Roe (2014c) found that during the period 1970-2006 less than 4% of the articles in five major W&O journals referred to longitudinal research. However,

there are signs of change, such as the recent call for more longitudinal research (see for example the editorial letter of Kozlowski, 2009, for the Journal of Applied Psychology) and the appearance of guidelines for developing and evaluating longitudinal research (Ployhart & Vandenberg, 2010). In fact, Roe's (2014c) data shows an increase from 4% to 6% from 2006 to 2013.

However, not all longitudinal research is equally useful for enriching theories. Designs with two or three, widely-spaced moments can provide little information about the development of phenomena, particularly if the moments are arbitrarily chosen. The type of analytical methods also matters: analysis of associations between individual differences at different moments (such as cross-lagged panel analysis) *cannot* provide information about intra-individual change. More is to be expected from studies with high-density designs that focus on trajectories within subjects (e.g., Ceja & Navarro, 2011; Navarro & Arrieta, 2010; Solinger, Van Olffen, Roe, & Hofmans, 2013). Finally, it would be good if longitudinal research would depart from newer temporal constructs and theories, rather than from conventional ideas rooting in differential thinking. It would also be commendable to engage in descriptive and exploratory research in order to collect the material from which such new constructs and theories could be built.

Time in Multilevel Designs

One of the major drivers of the increase in longitudinal research is the use of techniques to gather sequential data from subjects by means of experience sampling methods, diary methods, ecological momentary assessment, intensive longitudinal methods, etc. Particularly diary methods have become particularly popular in W&O psychology (e.g., Bolger, Davis, & Rafaeli, 2003; Ohly, Sonnentag, Niessen, & Zapf, 2010; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2012). Moreover, many researchers have moved to multilevel analysis to analyze the data, using repeated observations from the same participants to define a new level in a multi-level structure (Kozlowski, 2009). The use of models with time nested in participants is interesting since it allows studying both between-participants differences and within-participants change (Bolger & Laurenceau, 2013; Mehl & Conner, 2012). Yet, multi-level analysis comes with challenges regarding the treatment of temporal information. First, observations obtained from each participant are not mere replications but temporally ordered. Thus, sequence matters and should be part of the analysis. Secondly, observations may contain theoretically relevant information in terms of dynamics, growth, evolutionary changes, and so forth. Due to the preferred use of linear or quadratic trajectories, little of this information is retained when data are aggregated to obtain information about the next level. Third, trajectories may differ qualitatively between cases, and not randomly as is typically assumed in the prevailing analytical models (Li & Roe, 2012; Liu, Rovine, & Molenaar, 2012).

Another more fundamental problem with multilevel designs is the inherent contradiction between the conception of participants as stable entities, defined without reference to time, and the fact that their behaviors unfold over time. If time affects what happens *in* the participants, it may also affect what happens *to* the participants. Thus, for example, people may change roles at an earlier or later point in time – that is, in a larger time window – or teams may change in composition and no longer be the same teams. This reminds us of the fact that people, teams, and organizations exist and behave in time, and that treating them as being "out of time" implies a hidden boundary condition. Namely, the findings are only valid for the particular episode during which the within-participant observations are being made, and for the specific mapping of that episode within the participants' lifetime. Another hidden boundary condition emerges from the fact that studies are premised on a particular mix of these lifetime mappings, which means that replications may give different results if they involve participants at earlier or later moments (and less or more varied moments) in their lifetime.

Where Is Research about Time in W&O Psychology Heading?

We will now move to a discussion of three perspectives on time and temporality that suggests possible directions into which W&O Psychology research may develop. These perspectives were introduced in the recent literature by Molenaar, Van de Ven, and Roe and their colleagues. They have certain points in common but also show interesting differences. All three have clear implications for the way in which research should deal with time, which go beyond the use of time as a variable or as a metric that researchers have begun to adopt in recent years.

Molenaar's Call to Consider Non-Ergodicity

Building on a long and respectable research tradition in developmental psychology (e.g., Bereiter, 1963; Nesselroade & Baltes, 1979; Nesselroade & Ram, 2004), the work of Molenaar represents an effort to sensitize researchers in psychology, including the field of W&O, to the distinction between intra-individual and inter-individual variation. He calls attention to the tendency of psychological researchers to habitually opt for designs, measurement tools, and analytical methods that capture inter-individual variation. The standard use of tools like cognitive tests and attitude questionnaires along with the analysis of data by regression methods can serve as an example. It is straightforward, easy, and time-efficient, but there is a not so obvious disadvantage, namely, that no attention is paid to intra-individual variations, which are time-dependent. And this implies that by choosing these methods, researchers deny themselves the access to the study of psychological processes, which occur in time.

In various publications, Molenaar (e.g., Molenaar, 2004; Molenaar & Campbell, 2009) has argued that these two sources of variations, inter-individual and intra-individual, are exhibiting different psychological realities. Thus, "psychological processes like cognitive information processing, perception, emotion, and motor behavior occur in real time at the level of individual persons" (Molenaar & Campbell, 2009, p. 116), and therefore all of them are person-specific. Although these processes may be designated as variables, they differ from other variables that refer to differences in populations, for instance, gender or social status. Very often, psychologists have studied the first kind of variables as they were of the second kind. For instance, they have studied differences in attitudes within a population, assuming that these give information about how these attitudes change in persons over time. However, variability associated with a construct at a given time (inter-individual variation) can be quite different from the variability associated with the same construct over time (intra-individual variation; see also Ployhart & Vandenberg, 2010; Roe, 2005). These differences have been observed empirically, also in W&O Psychology, for example in the study of self-efficacy (Vancouver, Thompson, & Williams, 2001), affect (Beal & Ghandour, 2011), flow (Ceja & Navarro, 2011, 2012), and performance (Roe, 2014a, 2014b).

Molenaar makes the point that the two types of variation are logically unrelated, and that making inferences from the one to the other, or vice versa, is incorrect. Referring to the classic work of Cattell (1952), in which the author presented a three-dimensional (person, variable, occasion) data matrix and introduced different factor-analytic techniques (P-, Q- and R-techniques), he raises the question under which conditions a relationship between intra- and inter-individual variation might be expected. Molenaar finds an

answer in the principles of 'ergodicity' from mathematics. For any set of data, a relationship will exist if two conditions are fulfilled, namely, homogeneity and stationarity. Homogeneity means that each subject in the population shows the same change or that the models describing the data are invariant across the members of the population. Stationarity means that the change within the construct of interest has constant statistical characteristics over time. For example, statistical parameters of the data (such as factor loadings, mean, variance, etc.) remain invariant across all time points at which they have been assessed. Hamaker (2012) has illustrated the implications of these conditions for means, variances, concurrent covariances, and lagged covariances: 1) all individuals have the same average over time, 2) every person is characterized by the same amount of within-person variance, 3) covariance between two variables is the same across individuals, and 4) all individuals show the same lagged covariances. Considering that these constraints are very limiting, the conclusion is that "ergodicity is very unlikely to hold in psychological practice" (Hamaker, 2012, p. 48).

Molenaar and Campbell (2009) extended the argument by stating that for all non-ergodic processes "the results obtained in standard analysis of inter-individual variation do not apply at the level of intra-individual variation, and vice versa" (p. 113), appealed for psychology to be considered as an idiographic science.

The implications of these ideas for W&O Psychology are quite dramatic because most of the research in the field has studied inter-individual variability. A great and unknown part of the evidence collected up till now may therefore not have the validity that it is assumed to have with regard to processes in motivation, satisfaction, stress, team conflict, innovation, among others. The implications may even reach further since good theory and research are often seen as being applicable and having practical implications (Bacharach, 1998; Klein & Zedeck, 2004). Here, we should note that inter-individual results have frequently been applied to the intra-individual level. The field of leadership training, for example, is replete with suggestions to make leaders change their style (e.g., more transformational) in order to obtain better performing teams. Such "logic jumps" make little sense, and can lead to ineffective or adverse outcomes.

Following Molenaar's (2004) ideas, researchers should begin to study intra-individual variability and then move to the inter-individual level. Unless ergodicity is observed, which is for most phenomena very unlikely to occur, research may continue to look at inter-individual similarities and differences, for example by identifying clusters in intra-individual variability, and possible explanations for this. Although still rare, this approach has recently been used in studies of team conflict (Li & Roe, 2012; Raes, Heijltjes, & Glunk, 2009) and organizational commitment (Solinger et al., 2013).

Van de Ven & Poole's Variance and Processes Ontologies

Another stimulating perspective is offered by Van de Ven and Poole (2005), who are primarily interested in the study of organizational change and the way change can be best conceptualized. They distinguish between two very different ontological positions. The first one considers organizations as real phenomena and represents change as a transition from one state into another state over time; in this view, the organization maintains its identity. The second considers reality as the on-going activity of organizing, the permanent change, and sees the organization as a reification of this on-going activity (see also Hosking & Morley, 1991; Weick, 1969). The distinction between these different ontological positions (see for more details Tsoukas, 2005 or Tsoukas & Knudsen, 2003) has been made explicit by using the words 'organization' (as a noun) and 'organizing' (as a verb) – based on the brilliant ideas presented in the pioneering work of Weick (1969) *The social psychology of organizing*. Both ontologies have proponents among organizational scholars. For example, the EGOS group (the European Group of Organization Studies) has an annual conference dedicated to organizing and related ideas (e.g., sense-making).

In view of these ontologies, Van de Ven and Poole (2005) propose two complementary approaches to the study of organizational change – which imply distinct views on the role of time in organizations. The first approach, called variance method, "focuses on variables that represent the important aspects or attributes of the subject under study" (Van de Ven & Poole, 2005, p. 1382). It considers change as a variable and is interested in explaining and predicting the appearance, magnitude, and effects of change. The second approach, called process method, addresses "the need to account for temporal connections among events, different times scales in the same process, and the dynamic nature of process" (Van de Ven & Poole, 2005, pp. 1383-4). Here, change is conceived of as a process, time is explicitly considered, and the focus is on critical events, turning points, contextual influences, and formative patterns that help understand how change happens.

A strength of Van de Ven and Poole's contribution lies in the connection that it proposes between the treatment of time in research and the underlying ontology. We note that a similar connection was previously suggested by McGrath (1988), when he explained how, in general, social psychology is based on the equilibrium-based paradigm. In this paradigm, variation and change are considered as perturbations from a stable and equilibrium state. Research based on this orientation shows little interest in the "perturbations" and treats them as "error" that should be quantified but does not require further study. It thereby trivializes the temporal features of the system under study and concentrates on the study of static elements, neglecting change at the same time. This suggests that we may obtain a better study of time if we move away from such ideas and open our eyes to processes.

Roe's Radical Temporalism

Like other researchers, Roe has expressed concern about the absence of time in psychological theories, research, and interventions. He attributes this to "the tendency among researchers to think in terms of 'what is', rather than 'what happens' [which implies that] neither the behavior itself, nor its determinants or effects, are considered as dynamic phenomena" (Roe, 2008, p. 40). He is particularly critical of the notion of 'variable', which he considers as ambiguous, since it confounds intra- and inter-individual variation (Roe, 2005). It makes researchers believe that evidence of differences between people is exchangeable with evidence of changes within people, which he sees as misleading and potentially harmful. Another objection against the notion of variable is the implicit idea that the attribute it represents is always present in certain degree. If an attribute is always present, it can be investigated with a static approach (e.g., a cross-sectional design) and a dynamic approach is not needed. Thus, "the concept of variable obscures the dynamic aspects of human life" (Roe, 2008, p. 41).

Taking a phenomenological point of departure, Roe proposes an alternative research paradigm, which he calls 'radical temporalism' (Roe, 2005). He notes that subjective experiences of time, and practices of sharing these inter-subjectively, are at the root of modern conceptions of time. Thus, like other authors (e.g., Clark, 1985; Whipp, 1987), he sees time as socially constructed, and clocks and calendars are artifacts based on these social constructions. Yet, he adds that these artifacts allow defining time in an objective sense, due to their wide acceptance and standardized calibration. Roe argues that all we experience of the world and our own life is subject to change and subscribes to the philosophical position that "everything flows" (Heraclitus). On the basis of these ideas he proposes that psychological science should focus on 'phenomena',

the manifestation of which is open to research through observation. A phenomenon is defined as "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).

Roe's assumption is that all human and organizational phenomena are bounded in time, that is, they have a beginning and an end (and therefore a duration) and display as a certain course of development over time. This perspective has been called "radical" because it assumes a flow of time in everything observable and considers stability "as a special form of change" (Roe, 2008, 2014a). 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, and to identify long-term stability and change (Roe, 2008). Its aims are the description and understanding of "what happens".

In elaborating this approach, Roe differentiates between 'differential' and 'temporal' approaches to the study of phenomena (Roe, 2008, 2014a, 2014b). This distinction builds on that between variance and process methods made by Van de Ven and Poole (2005); but the differential approach is supposed to deal exclusively with individual differences and not with change. It examines between-subject variation and covariation and the proportion of this variance explained. The temporal approach, in contrast, focuses on the dynamics of the phenomena, assuming that they are continuously changing over time. With respect to the research design, the differential approach requires a between-subjects design that allows analyzing the individual differences of interest; and the temporal approach requires a within-subject designs in which time-series are collected to study the dynamic of some phenomenal feature.

Referring to Cattell's three-dimensional data-matrix, Roe adds that there is a common ground between the temporal and differential approaches. Building on Molenaar, he states that the proper way to explore this common ground is to analyze intra-individual variation first and differences next. That is, the research should first chart idiosyncratic trajectories of individuals and next explore which similarities and differences there are, which will depend on the parameters of change that are singled out for this comparison. A number of recent publications show the feasibility and advantages of such studies (e.g., Li & Roe, 2012; Liu et al., 2012; Raes et al., 2009; Solinger et al., 2013).

In a recent publication, Roe (2014a) applies these approaches to understand two of the main topics in the field of W/O Psychology: performance and motivation. One finding is that too often researchers have used a differential approach to study these phenomena, while a temporal approach would be needed: "Neither the performance nor motivation can be adequately described or analyzed when conceived of as quasi-traits that are measured at arbitrary occasions" (Roe, 2014a, p. 64). A second finding is that the literature comprises several publications that document the temporal dynamics of performance and motivation, even though the differences in time frames and time grids make the findings almost impossible to integrate. Roe concludes that a rigorous application of the temporal approach offers a promising way forward, although many theoretical and methodological issues remain to be resolved, including temporal measurement and temporal zooming (Roe, 2014a).

Possible Trends for the Future of Time in W&O Psychological Research

As a field, W&O Psychology is moving and alive. New theories and methods are continuously emerging and the number of publications can be considered as an indicator of the health in the field. Moreover, the appearance of ideas that question some of our fundamental assumptions is also a good indicator of the vitality in the area. The advent of time as a dimension in research and theorizing certainly contributes to questioning some of these assumptions. Let us finish this paper with pondering some of the possible ways in which the study of time in W&O Psychology might develop further from here on.

Revisiting Thinking Habits

Our leading question is: "If we took time seriously in our research, what would happen?" This is not a naive question, as we will try to argue in the following paragraphs. In our opinion the aforementioned approaches are challenging the *statu quo* in the field. Any particular organizational phenomenon can be thought of (theory) and analyzed (research) as an on-going experience, always in flux. For example, the recent two-volume handbook by Shipp and Fried (2014a, 2014b) can be considered as a new reference source that revisits research on socialization, identity, emotions, performance, motivation, stress, creativity, justice, work design, teams, leadership, human resources management, and entrepreneurship from a temporal perspective. This emphasis on dynamics is pushing boundaries that are challenging our conventional thinking.

In our opinion, a serious consideration of time calls for revisiting two strong habits that characterize our current way of thinking: first, our preference to think in linear terms about the relation among different variables, which avoids exploring non-linear relationships; second, our tendency to think about causal process as exogenous, avoiding the study of endogenous causalities.

If we take time more seriously in our research, linearities probably would no longer appear. Studies that have investigated the evolution of behavioral processes (e.g., affect, motivation, stress, performance, etc.) using intensive longitudinal methods share an important finding: these processes exhibit continuous ups and downs (e.g., Beal & Ghandour, 2011; Navarro & Arrieta, 2010; Ramos-Villagrasa, Navarro, & García-Izquierdo, 2012). Even if homeostasis occurs, it seems impossible to draw a straight line to fit the data and look for variables that can produce this perfect straight-line. Non-linearity seems to be the rule, although, as Roe (2014b) reminds us, stable phases may occur during certain intervals. Of course, we can keep following the generalized linear model, and keep searching for straight lines, for example using OLS regression techniques. However, with the current state of knowledge this can only be considered as an excuse for not choosing a more informative approach. Nowadays, there are different procedures to study other than linear forms of change, and these are not hard to apply. For a newcomer, for example, it is as difficult to learn how to use OLS techniques to model data as to learn how to use catastrophe models for studying non-linear relationships.

The study of the phenomena that change in a continuous fashion allows us to realize another important issues, namely, two inherent limitations of between-subjects designs. First, the neglect of within-participant variability and second the downgrading of non linear relations to 'error' variance. As a consequence, part of people's behavior is not explained by the models used. Considering the emerging evidence on these issues, this unexplained part of the behavior appears to be quite important. For instance, in classical topics, such as motivation and performance, it was found that between 45% and 78% of total variance is due to within-person variability (Kanfer, Chen, & Pritchard, 2008). For engagement, the proportion is between 30% and 70% of the total of variance (Xanthopoulou & Bakker, 2013). Studies that have tested the predictive capacity of linear and non-linear models generally have found that the latter ones explain twice as much variance (Guastello & Liebovitch, 2009). Even if we acknowledge that these estimates are

dependent on the degree of real heterogeneity and dynamics captured in the dataset, it seems that we can do better than we have done before with just using between-person designs.

And second, another research habit that is called into question is the search for external causality. As a consequence of the 'differential way of thinking" (Roe, 2014a), we typically try to explain differences between persons in dependent variables from differences between persons in independent variables. Logically, this is problematic because causality requires a sequence in time, and no sequence can be established if differences are established without a time-marker – as is usually the case. More important is that if the process of interest is on-going, that is, unfolding as time proceeds, change may occur without the influence of any external variable. It may change as a consequence of its own development, such as a plant grows from a seed and a child becomes an adult. Our colleagues from developmental psychology made it clear that the cognitive and affective development of children happens in spite of external influences. Of course, external circumstances can influence their development, but the process of change is inherent in life and will happen in any circumstance. In a similar way the processes of interest in W&O Psychology can have their own development. Interestingly, there are several models in the literature about the development of groups (Tuckman, 1965; Wheelan & McKeage, 1993), which suggest that groups pass through certain stages over time. Another example is the group socialization model by Levine & Moreland (Levine & Moreland, 1994; Moreland & Levine, 1982), which suggests the presence of different stages in the socialization of group members to explain different role transitions.

The Imminent Emergence of Complex Behavior

To approach within-subject processes without holding on to the linear model, we have to be prepared for getting another view of reality, namely, that of complex behavior. Here, we use the term 'complex behavior' to refer to complexity in the modern scientific sense, and not as a vague word. By complex behavior we refer to behavior that shows one or more of the next characteristics (Munné, 2005; Waldrop, 1992): non-linear relationships, chaotic dynamics, fractal structure, fuzzy boundaries, catastrophic change, or emergence of new properties. Again, these terms carry very specific mathematical meanings that go beyond the meaning that may be ascribed to them in everyday life. For instance, chaos means a kind of non-linear dynamic that is very sensitive to the initial conditions, which is deterministic and long-term unpredictable at the same time (the atmospheric climate is a well-known example).

It is encouraging that the field of W&O Psychology already offers several studies – on phenomena such as decisions making, creativity, flow experience, work motivation, leadership, and team performance – in which non-linear and chaotic dynamics were discovered. One field in which complexity theory has been widely applied was in work motivation and related phenomena (e.g., Ceja & Navarro, 2011; Guastello, Johnson, & Rieke, 1999; Navarro & Arrieta, 2010). This research studies provided evidence of chaos in work motivation dynamics in the short-term. For example, in the study of Navarro and Arrieta (2010) 48 workers were asked questions about different aspects of work motivation (e.g., self-efficacy, instrumentality perception) six times per day during 21 consecutive working days. It appeared that 75% of the workers showed chaotic dynamics in their work motivation. Other studies produced evidence that this non-linear behavior is associated with the level of motivation. That is, workers with non-linear and chaotic dynamic in their work motivation appeared to be those with higher work motivation (Arrieta, Navarro, & Vicente, 2008). There are also studies that have tried to better model these non-linear behaviors. For example, in an academic setting Guastello (1987) found evidence of how motivation influences performance, absenteeism, and turnover in a non-linear way. Later Ceja and Navarro (2012) found how the balance between challenge and skills can predict flow experiences, as flow theory proposes, but following a non-linear relation. In all these cases the variance explained by the non-linear models was significantly higher than that explained by their linear counterparts.

Methods based on complexity theory have also been applied to other work related phenomena. For example, Ramos-Villagrasa and colleagues (García-Izquierdo, Ramos-Villagrasa, & Navarro, 2012; Ramos-Villagrasa et al., 2012) found evidence of non-linear dynamics in the performance (measured objectively) of professional basketball players, at the individual as well as the team level. Moreover, they have found that teams which usually play the playoffs of the competitions are the teams which show a very specific kind of non-linear dynamics, called low-dimensional chaos. In a study of leadership, Guastello (2007) investigated how different variables, such as general participation and control of the conversation, task orientation, consideration of other players' interests, and concern for solution quality, are related and cause the emergence of leadership in natural groups. Guastello found clear support of non-linear relations among these variables, as they explain more variance that the linear ones.

Based on this evidence, we reiterate that taking time seriously leads to the necessity of using other kinds of research tools and to the discovery that organizational phenomena, more often than not, may follow complex pattern of behavior. The more detailed knowledge that can be obtained in this way may help to raise the level of sophistication of existing theories in W&O Psychology and lead to better informed practical and managerial applications.

Knocking on the Door for Ontological and Epistemological Change

This is not all. As previously mentioned, taking time seriously also means revisiting our ontology, perhaps in a way similar to what happened in the natural sciences in the 1970s. In the natural sciences, time was neglected for long. It was, for example, absent from the physics of the 1930s or 1940s, and the phenomena of interest for this discipline were generally seen as reversible. Past and future were only illusions, "persistent illusions", as they were qualified by Einstein in a personal letter to the widow of a friend (Koyré, 1994). In those years, the works by Prigogine connecting physics, chemistry, and biology served to start a revolution in the field that ultimately was awarded with a Nobel Prize. Prigogine was the first in modern natural science to propose and develop the notion that time was irreversible. This means that time has an arrow and produces processes that evolve in one direction, but not in the reverse. This idea seems to be obvious nowadays. As Prigogine (1991) has shown us, it is important to distinguish between the external and physical time (the clock time) and the internal and chemical time of the system of interest (characteristic for inner temporal sequences). The first one is linear or circular, and thereby reversible; the second one is non-linear and irreversible. The key issue is that this internal time is inherent in evolution and development. Therefore, time is not an illusion – it plays a critical role as a precursor of change and creativity in processes that are irreversible. Irreversibility is also critical in spontaneous processes of self-organization, in chemistry as well as in social science. Thus, time in modern science is not a movement parameter, but a way to measure internal evolutions.

In a similar way, this irreversibility of time can open the door to a possible ontological change in psychological science. As Roe (2008) has emphasized, all processes of interest in W&O Psychology are in a continuous flux. These processes – and the life of which they are part – are not reversible; the time in it has a direction, an arrow. This has a wide range of implications for our way of theorizing and doing research, that is, our epistemology. For instance,

a person's motivation may rise and decline, but instead of being each others' opposites these changes are part of an unfolding development trajectory which follow each other in a certain sequence, building a historical pattern. To understand a person's motivational path, one will have to observe motivation as a sequence of alterations, not by means of a questionnaire path that taps into an arbitrary present. Moreover, the changes will not be seen as caused by external events, but by an inherent development process on which external events may impinge.

There are similar implications for the study of team and organization phenomena. For instance, the irreversibility of psychological processes casts doubt on key notions from group and organizational theories. We have already pointed at the notion of equilibrium in McGrath's (1988) way conception of groups. If time has an arrow and members of a group carry an individual and collective memory of the group's past, their continued interaction may not easily produce an equilibrium. Another example is the principle of equifinality in the systems theory of organizations. Past experiences and future expectations of organization members may make certain organizational arrangements impossible to realize, even though they should be equifinal (be able to reach the same goals) from a systems theory perspective.

Generally speaking, Molenaar's (2004) statement that psychological processes tend to be non-ergodic, not stationary over time, can be extended to psychosocial processes. A promising implication is that time may play a creative role in W&O Psychology, as much as it does in chemistry. As researchers in W&O Psychology, we may come to new discoveries by considering time and concentrating on the internal evolution of the processes of interest.

We would like to end with hinting at some of the opportunities that a change of psychological ontology opens for the future epistemology of W&O psychology. Whether one follows the reasoning of Molenaar (2004), Van de Ven (2007), or Roe (2008), there will be a need for a more-time oriented epistemology that is much more explicit on how time – either as integral part of phenomena or as measurable attribute – can be captured and used to generate knowledge. Yet, there is room for multiple and diverging methodological developments. On the one hand, one could argue that behavior measured by using intensive longitudinal methods in which data are collected in real-time "is ideally suited to illuminate the dynamics of human experience from the actor's perspective, balancing decades of research that privileged the observer's goals" (Schwarz, 2012, p. 38). On the other hand, one might argue that the time has come for boosting the capacities of observational research and lift it to a level where it has never been before. As Roe (2009) pointed out, there is a fascinating multitude of ways in which W&O psychology can recursively use the lenses of subjective (lived) and objective (measured) time to understand and improve the reality of work and organization. Thus, we may see researchers using more methods that catch human subjectivity (e.g., narratives, ethnographic techniques, case studies, etc.) and at the same time see a substantial growth in methods that capture observed changes in multiple, cross-cutting as well as overlapping time frames. Which of the many possible outcomes will materialize, is something the future will tell. We can only hope that W&O Psychology will improve its understanding of the dynamic complexity of work and organization and will be able to develop new methods of (self) assessment and (self) intervention from which future generations will profit.

Conclusions

Time has come to explore new frontiers in W&O psychology. A serious consideration of time can open various avenues for further advancement in the field. At a basic level, we can focus on the study of change in the processes of interest over time. At a deeper level, we can change our assumptions and embrace a different ontology, which emphasizes the dynamics of human and organizational phenomena, and gives room to the subjectivity of participants experience and action, as well as for enhanced scholarly observation. We would like to finish with an invitation to our colleagues, namely, to re-conceptualize phenomena of interest to a temporalist point of view and to engage in novel kinds of research that go beyond the orthodoxy of cross-sectional designs and analyses based on the general linear model. We believe it is time to take time seriously and are hopeful that opening our eyes to the complexity of the world will help making W&O Psychology a richer and more valuable field of science

Conflict of Interest

The authors of this article declare no conflict of interest.

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