



**PROCESS MEASURES IN EDUCATIONAL, PSYCHOLOGICAL AND  
COUNSELLING RESEARCH:  
USES AND METHODOLOGICAL IMPLICATIONS.**

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**Abstract**

The process of change is a key research variable in the fields of counselling, psychotherapy and academic learning. Understanding this process is as important as measuring its outcome. This cannot be done without collecting process data. A review of the literature revealed that the use of process measures in the three fields emerged at different times and developed at different rates. The aim of this paper is to shed some light on the development of process research in these three related fields. To this end, we will briefly refer to the meaning of process in these fields, then, we will list different types of research questions that require collecting process data. We will also list the most known process measures in each of the fields in question. Finally, we will discuss the importance of different types of time series analysis as the most adequate and easy process data analysis procedures.

**Keywords:** *process measures; education; counselling; time series analysis.*

**Introduction**

The study of human behavior as a process is more and more gaining ground. This is mainly due to the fact that the dichotomy of stability and change as is the case for the dichotomy of trait and state has never ended. The question whether human behavior and different psychological variables are stable or they undergo change is always asked. Schmitz (2006,

p.434) rightly argues for the importance of analyzing processes in order to answer this question. The advantages of collecting process data in academic learning were discussed by many authors (Klug and his colleagues, 2011; Roth and his colleagues, 2015; Schmitz et al, 2011; Schmitz and Wiese, 2006; Wirth & Leutner, 2008; Winne and Perry,2000). Noble and Hanley (2017) referred to their advantages in the field of counselling and a number of researchers have discussed them in the field of psychotherapy (Conner and Mehl, 2015; Ebner-Priemer and Trull, 2009; Fahrenberg, 1996; Newman et al (1999) as cited in Fahrenberg, 2001)

Given that some researchers call for monitoring the process of pedagogical support (Gadja, 2024) and to promote the success of pedagogical accompaniment (Malle, 2023), it proves necessary for the pedagogical companion to acquire the skills of measuring processes. Moreover, the increasing number of centres of psychological assistance in the Algerian universities and the responsibilities their members bear in dealing with students' pedagogical, psychological and counselling problems urge us to unravel the topic of process data and process measurement tools and analysis.

The purpose of this paper is to shed some light on the importance of analyzing processes in three fields namely education, counselling and therapy. To this end, we will first briefly refer to the definition of process and process analysis in these fields. Then we will discuss the importance of analyzing processes. We will also shed some light on the most cited measurement tools and then the most commonly used data analysis procedures.

### **What is a Process?**

McLeod (2003, pp.325-326) discusses four views of the concept of process in counselling and therapy. The first one refers to any activity that is not static and involving a series of related events. The second one refers to a number of factors that promote or inhibit therapeutic effects in clients and this view contrasts process to outcome. Based on Carl Rogers' conviction that change is an essential characteristic of human life, he refers to the third view as "moments of flowing newness where nothing is fixed" (p.326). The fourth view has to do with how clients in therapy make sense of difficult experiences in their lives.

Heppner (2007, pp 449-458) clearly and straightforwardly refers to the counselling process as the events taking place during the counselling or therapy session. He states that these events or process variables can be any aspects of the participants' behaviour or aspects of the counselling relationship or the combination of both. They can be studied at either a micro level or a macro

level. They can be evaluated from different perspectives namely the client, therapist and observer.

These events can be a therapist behaviour such as supportive versus teaching responses(cf. Patterson & Forgath, 1985) or use of empathy and metaphor (cf. Dennis and Ellis, 2003) or verbal behaviour, anxiety, and verbal activity level- as rated by judges- for both the client (description responses/opening up) and the counsellor (encourager responses/ confrontation) and their impressions of session effectiveness and significant events for each session. It can also be the supervision process as measured by the quality of the session in terms of depth, smoothness, positivity and arousal (cf. Martin, Goodyear, and Newton (1987). An event can also be the level of cohesion and counselee involvement in group counselling (cf.Yalon, 1985 as cited in Heppner et al., 2007)

Process in the field of academic learning was given two main definitions that are in fact related. The first one is its view as a sequence of learning states observed over time (Schmitz, 2006; Perels et al., 2005). The second one has to do with the mechanism or transformation of one state to another (Schmitz, 2006).

The concepts of process and process analysis in education were thoroughly explained and discussed in what I consider as a number of reference papers by Schmitz and different colleagues starting from the early 1990's to 2022. Based on the two definitions stated above, they referred first to the meaning of state and how it is measured, then to the measurement of process.

They consider the state as a relatively changeable attribute of an individual at a single point of time (Schmitz et al., 2011; Perels et al., 2011). Therefore, the state can be the completion of assigned material at a single point of time (Perels et al., 2011) This can be any daily learning episode like a preparation session for an upcoming exam ( بن خذير، 2023 ) or a mathematical problem solving (Perels et al., 2005) or doing a math homework (Schmitz &Perels, 2011; Schmitz & Wiese, 2006). They believe that learning states can only be operationalized by individual state measures of behaviour or cognition, but to gain insight into the learning process that consists of a sequence of daily learning episodes which in turn can be further divided into sub phases, multiple consecutive assessments have to be conducted (Perels et al., 2005, p.124) From what has been stated above we can see that the difference between state and process was clearly articulated in the field of education. In the field of counselling and psychotherapy the terms were used interchangeably.

### **The Importance of Analyzing Process Data**

Schmitz (2006) clearly explained how process data thus time series data that can be obtained by repeatedly measuring the same variable during a certain period of time can help us answer research questions that cannot be answered using traditional methods. Among these questions are the following:

*Is the learning behaviour continuous or discontinuous? Does the amount of knowledge acquired follow a simple trend whether linear or quadratic? Is the learning behavior characterized by great variability over a specific period of time? Is the learning behavior regular? Is there any learning phase that is characterized by the occurrence of learning behaviours that are qualitatively different?*

He also showed how these measures allow us to shed light on the process of learning rather than on the outcome by providing a detailed description thus understanding of the learning trajectories and of the relationship between two and more variables. Moreover, it allows us to use more developed and more complex data analysis methods and procedures.

In the same vein, Brorchart (2008) highlights the types of questions that need to be addressed when trying to understand the anatomy of change. He refers to univariate and multivariate questions. The former refers to any question that seeks to investigate the change either in one symptom or in one in session event or process while the latter refers to questions seeking to investigate the change in two variables simultaneously. These can be a symptom and another symptom; an event or a process and another process or a symptom and an event. These, he believes, allow us to investigate the mechanisms as well as the sequencing of change. Samples of these types of questions are summarized in table 1.

### **Process Measurement Tools in Counselling, Therapy and Education**

In the field of counselling, the main term that was used is process measures as opposed to outcome measures. while outcome measures measure the effect of the therapy i.e. they refer to what therapy does, process measures help us understand how it does it by describing and measuring what is happening in the sessions or during therapy as therapist/counsellor and client/counselee behavior.

McLeod(2003) successfully summarized the main data collection tools used in process research, and their limitations. He asserts that huge amounts of authentic descriptive data about the therapeutic process can be obtained by open –ended client accounts reported in diaries or in response to open-ended questionnaires or in -depth interviews but these are difficult to analyze and can be subject to reminiscence issues. He also referred to rating scales and observation of therapy sessions via videotaped recordings which he considers as unable to depict what was really happening during the therapeutic process. He concluded with the Interpersonal Process Recall (IPR) that he considers as a solution to the afore mentioned shortcomings. This method consists of conducting an interview with participants in the counseling or therapy process immediately after the end of the session after watching the videotape of the latter. The interview questions aim to elicit from the participant ideas and feelings he experienced at specific moments of the therapy session. This method is supposed to be more ecologically valid since it is used soon after the session. Examples of the process measures in this sense are the rating scales developed by Rogers to measure the levels of therapist’s unconditional positive regard and empathy based on session recordings, The Relationship Inventory developed by Barrett-Lennard, the session rating scale developed by Duncan et, al., 2003 and the Child Session Rating Scale developed by Miller and Duncan 2004. The experience in counselling was also assessed by diaries kept by clients. In short, the term process was reduced to the description of the in-session events. Describing the counselling process in terms of counsellor behaviour and its effect on clients’ outcomes was mainly used in counselling supervision so as to train counsellors develop desirable behaviours and reduce undesirable and unhelpful ones (McLeod, 2003, p.344).

**Table 1**

*Sample Process Research Questions*

<b>The variable</b>	<b>Univariate questions</b>	<b>Multi variate questions</b>
<b>Symptom</b>	<sup>a</sup> Once in therapy, when does the patient begin to improve (latency)? <sup>a</sup> At what pace does this improvement occur (slope)?	
<b>Process</b>	<sup>b</sup> Is the learning behavior continuous or discontinuous?	

	<sup>b</sup> Is the learning behavior characterized by great variability over a specific period of time?	
	<sup>b</sup> Is the learning behavior regular?	
<b>Symptom and process</b>		<sup>a</sup> How is ongoing clinical improvement related to quality or frequency of ongoing events in session? <sup>a</sup> If symptom and intervention variables are related, in what order do they change
<b>Symptom and symptom</b>		<sup>a</sup> Is there a sequence of improvement such that changes in Symptom A are followed by changes in Symptom B? If so, what is the lag?
<b>Process and process</b>		<sup>c</sup> How does a particular therapist's behavior affect the client?" <sup>c</sup> "How does a particular client's behavior affect the therapist?"

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*Note.* The sample questions were taken from the following sources

<sup>a</sup>Brorcharadt (2008). <sup>b</sup>Schmitz (2006). <sup>c</sup>Gottman and Markman, 1978, p. 28 as cited in Heppner et al., 2007.

While McLeod classified and discussed the process measures in terms of the type of data collection type, Heppner and his colleagues (2007, p. 468) later, classified them based on the aspect of the counselling process as well as on the level of measurement. So, they successfully presented representative sample measures of each of Hill's (1992) typology of the seven aspects of the counselling process both at the micro and the macro level.

Process measures in the sense of describing what happens in the counselling session are important for practitioners, services and researchers. As far as practitioners are concerned, this kind of measures has long been used in the context of counselling skills training and supervision. For services, they can be used by people who are responsible for commissioning services to assess their quality so as to improve them (Noble and Hanley, 2017). These authors also highlighted the importance of these measures for therapists and clients alike when highlighting the importance of collecting data systematically to track the therapeutic alliance

throughout therapy and to track clients progress towards goals and use these data to look for general patterns in order to improve practice.

In the field of psychotherapy and in the same vein of the focus on ecological validity, Fahrenberg (1996) coined the term ambulatory assessment that refers to collecting real time psychological and physiological data in everyday life and in natural settings. He advocates its use in the fields of applied and clinical psychology, social psychology, developmental psychology and differential psychology before moving to the laboratory settings to investigate causal explanations. He believes that they can be used for a panoply of purposes such as - among others- monitoring, self-monitoring, clinical diagnosis and evaluation.

Newman et al (1999) as cited in Fahrenberg (2001) state the advantages of ambulatory assessment for researchers, therapists and clients focusing mainly on continuous, unobtrusive collection of process data on treatment adherence and on the impact of therapy techniques in the clients' natural settings in addition to their usefulness in extending the treatment outside the therapy session by prompting clients to do their homework assignments.

Ebner-Priemer and Trull (2009) states a list of the advantages of ambulatory assessment mainly in clinical psychology and psychiatry focusing on their ability to avoid biased recollection of data and improve the generalizability of the results by allowing real time and real -life measurement of variables. They also focused on their strength in collecting intra-individual processes as well as multiple types of data at the same time which allows measuring their relationships in context. They finally refer to their role in providing feedback in real time. In the same line, Conner and Mehl (2015) focused on their strength as real time measures as opposed to the common retrospective measures and on their being an authentic natural real-world measures that allow understanding the role of situational factors by depicting everyday life events that are unlikely to occur in an unnatural research environment.

Conner and Mehl (2015) referred to two main types of ambulatory assessment tools that are internet daily diaries and mobile phone- based experience sampling focusing on the former as the most commonly used one. He also referred to the latter as the measure 'par excellence' to collect data on "fleeting and ongoing subjective experiences like mood, pain, and stress because these experiences are quick to decay in memory and are best assessed in true real-time and not "near to real-time" (Conner and Mehl, 2015, p.4). In addition to all the benefits stated above ambulatory assessment is useful in big data collection.

In the field of education, they are called state measures, process measures, online measures, event measures and second wave measures. These are designed based on process models of learning i.e. they assess the process of learning. They measure the actual use of cognitive, motivational and meta cognitive strategies while in an actual real learning situation instead of measuring whether the learners possess the skills necessary to use them (Wirth & Leutner, 2008).

The use of process measures in education started in the 1990's and 2000's with the emergence of process approaches to learning in general and process models of self-regulated learning in particular. They measure the dynamics of learning by measuring learners' actual use of strategies in an actual authentic learning situation. Among the most common event measures cited in the self-regulated learning literature are trace logs, Think aloud Protocols, direct performance observation, error detection tasks, learning diaries and microanalysis (Zimmerman, 2008).

In the following section we will briefly describe each of them. A thorough discussion of the advantages and disadvantages of each will be found in Winne and Perry (2000) and Roth and his colleagues (2015)

The first method used to depict the learning process is the error detection protocols. They consist of including different types of errors in the learning content used by the learners while doing a learning task and observing whether the learners can detect the errors and how they behave in case they did so (Winne & Perry, 2000).

The second one is the direct performance observation that consists of observing learners' behaviours and verbal as well as non-verbal expressions that may indicate that they are displaying self-regulated learning. The third one is the use of trace logs which are protocols designed in electronic technological learning environments. They consist of capturing traces and evidence of any cognitive and meta cognitive operations that the learners display while engaged in a learning task. This is achieved by recording the learners' interactions with any aspect of the technological program. These interactions can range from a click on a specific button to choosing a specific content and Bernacki (2018) made interesting suggestions on how to improve the quality of these trace data. The fourth method is the Think Aloud Protocols. These are concurrent verbal protocols that allow an accurate collection of data about cognitive operations (Ericson and Simon, 1993). They help the researcher detect the strategies used in the actual learning process since the learner is required to express his ideas verbally while

engaged in the learning task. He talks about all the ideas and cognitive operations that he makes while doing the task.

Finally, diaries are the most common data collection tool in process educational research. They systematically and repeatedly measure everyday events over a period of time (Schmitz et al, 2011). Diaries have long been used in personality psychology and developmental psychology but Schmitz and Wiese (2006) strongly recommend their use in education.

Diaries can take different forms. They can be structured, unstructured and semi structured. The items in a diary are written by adding a time indicator to statements in order to describe states of learning i.e. describe processes that take place in the actual learning situation. Klug and his colleagues (2011) believe that open diaries are more suitable for fostering skills and strategies since it provides the opportunity for thinking about actions while structured ones are suitable for measuring them.

A review of the literature shows that process measures in counseling research are relatively older than in education. Their use dates back to the publication of the first volume of the Journal of Counseling Psychology in 1954 (Heppner et al., 2007). In contrast, online or event measures in education and in therapy and physio-psychosocial research occurred later but it seems that they were much more developed since they benefitted a lot from technological developments focusing mainly on making these techniques as unobtrusive as possible.

Despite of their early use in counselling research, process measures were used to collect data on process variables without having a counselling process theoretical foundation. This was not the case for process research in education. In the field of self-regulated learning for example, process measures were used to collect process data based on clear theoretical learning process models.

Moreover, it seems that it is the shift in interest that was remarkably more important. The focus shifted to the process of change and the mechanisms and the dynamics of this change thus necessitating a shift in methodological considerations namely designs and analysis.

### **The Interest in Process Data and its Methodological Implications**

Instead of early counselling research's focus only on either the therapeutic outcome or the therapeutic process data (C.f. Brossart, 1998; Kivlighan and Lilly ,1997; Patton, Kivlighan, and Multon, 1997), recent process research focuses on the relationship between process and outcome (Heppner et al., 2007; Feltham, 2017). In addition, instead of studying learning as a

trait, learning started to be seen as a dynamic process i.e. as a series of states that interact and affect each other through an open feedback loop.

Therefore, instead of the traditional pre-test post-test designs that “obscure the anatomy of change” (Borchard et al., 2008, p.77) many researchers advocated the use of time series analysis in both educational and counselling research (Cf. Schmitz, 2006; Heppner et al., 2007).

Since then, a considerable number of papers have been published that reported the results of research using time series designs in education (C.f. Schmitz, 2006; Schmitz et al., 2011; Klug et.al., 2011) and in counselling (C.f. Kivlighan et al., 2021; Moore et.al., 2024). Similarly; a number of papers have been published that highlighted the importance of time series analysis in education, psychotherapy and counselling. Schmitz (2005), for instance refers to its importance in describing individual as well as group learning trajectories. In the context of mental health, De Vries (1987) highlighted its role in describing the person in context and in taking the variability of mental states into consideration.

Some consider it as the method ‘par excellence’ for counselling and psychotherapy that are natural real- life settings in which laboratory like conditions are difficult to attain and sometimes unethical to apply. This is true in particular in community-based preventive intervention research where such a method would provide non-discriminatory clinical intervention (Dorais, 2024; Dorais et. al., 2024).

Ramseyer and his colleagues (2014) believe that the different types of time series designs with their focus on repeated measurements have the power of broadening the possibilities of analyzing the data and making inferences. They listed the advantages of TSPA in the multivariate modeling of temporal associations in the therapeutic process. He referred to its strength in depicting the temporal aspect of psychotherapy, and in measuring the relationship between multiple variables, conducting ideographic as well as nomothetic analysis and studying possible causal relationship between variables. But they warned against aggregating individual data to group samples, he refers to the problem of ergodicity (intraindividual versus interindividual analysis. This was already referred to by Schmitz (2006) in the field of educational research where he warns against the risk of making inferences from inter-individual to intra-individual analyses. Using data from empirical research, he shows how individual results can significantly differ from sample or group results. The latter being confusing or misleading when making inferences, he suggests combining the analyses at the two levels by starting with the intra-individual level then aggregating across sample level and

he makes two suggestions to do that. The first suggestion is simply focusing on the direction of the intra-individual correlation and reporting the number of negative as well positive and zero correlations. The second suggestion is that cross correlations are analyzed at the intra-individual level, then an average intra-individual correlation value is computed across the individuals that make up the sample. He also suggests a more sophisticated method for doing that which is the use of the Hierarchical linear modeling approach (HLM). He believes that these methods can contribute to the solution of the idiographic-nomothetic controversy.

We have seen so far that process data is useful for answering a number of research questions. Based on the type of research questions, there are also several process analysis procedures depending on the level of aggregation, the aim of the study and the number of variables (Schmitz, 2006).

Spectral analysis for instance is used to locate rhythms and trend analysis is used to describe individual and group learning trajectories (Schmitz et al., 2011).

VAR models using TSPA for example that is “a statistical methodology explicitly focusing on the quantification of temporal, session-to-session, aspects of change in psychotherapy is advocated by Ramseyer and his colleagues (2014). This is a “methodology focusing on the emergence of temporal dynamics between relevant factors of a psychotherapy system” (Ramseyer et al., 2014, P.4)

Multivariate Time series analysis using multivariate autoregressive integrated moving average models (ARIMA models) are used to study the dynamic interaction of two or more variables over time thus studying lagged time correlations (Schmitz, 2006; Borhardt et al., 2008) allowing for inferences of causality (Schmitz, 2006; Schmitz et al., 2011; Klug et al., 2011). Interrupted time series is used to evaluate intervention effects (Cook, Campbell & Shadish, 2002).

## **Conclusion**

The aim of this paper was to show the importance of collecting and analyzing process data in three fields where change is a key concept these are namely therapy, counselling and education. Different definitions of process in these fields were given. Then a number of event and process measures were referred to hence the importance of analyzing processes. The main importance is gaining deeper insight into both the learning process and the therapy as well as the counselling processes and the situational factors affecting them rather than focusing solely on

the learning or the counselling outcomes. Another importance is the ability to analyze individual as well as sample processes in addition to the ability to assess the quality of the data for individuals as well as samples thus allowing for selecting sub samples with satisfactory validity and reliability coefficients. At the end of the paper, some of the easy process data analysis procedures were explored mainly, spectral analysis, trend analysis and multivariate time series analysis using Multivariate ARIMA models. Finally, different ways to collect evidence of validity and stability thus reliability of diary data were also explored.

We therefore highly recommend collecting and analyzing process data that allow us to deal appropriately with students' pedagogical, counselling and therapeutic problems by understanding the different situational factors that are related to them.

In academic learning measuring processes helps teachers and parents monitor the learning process so as to make the right interventions in the right time. In the field of psycho-therapy, this type of data can be used to track the therapeutic alliance throughout therapy, monitor clients' symptoms, make clinical diagnosis and evaluate clients' level of treatment adherence and. In the field of counselling, they help assess the quality of the counselling services, so as to improve them, track clients progress towards goals and use these data to look for general patterns in order to improve practice.

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