

Interactive Patterning of L2 Willingness to Communicate and Foreign Language Anxiety: The Three Time Scales to Examine Emotional Development

WTC と外国語学習不安の相互作用によるパターン形成 —3つの時間尺度による情意発達の解明—

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Abstract

With a view to instrumenting the procedures of reaching for a comprehensive understanding of emotional development in L2 learning and use, the present study discusses the relevance and validity of Lewis's (2000) three time scales model specifically in explicating the nature and mechanisms of the L2WTC–FLA interaction. Referencing the *microgenetic research design* devised by Fogel (2008) in a DS approach, it illustrates how emotional development is characterized by the three time scales model, followed by the discussion of the L2WTC–FLA interactive fluctuations and patterning at each of the three time scales of *microdevelopment*, *mesodevelopment*, and *macrodevelopment* with qualitative analysis of interview data obtained from seven Japanese EFL learners who have nine to ten months of study abroad experience. It was revealed that the three time scales model not only provides relevant and valid scales to investigate the L2WTC–FLA interaction in L2 learning and use in the temporal perspective but also is a very useful tool to explain its interactive fluctuations and overall L2-related emotional development. As implications for future research, the construct of psychological resilience, known as the ability to withstand difficulties and bounce back, was suggested as another issue to be addressed and examined for its involvement in L2 learning and use based on the three time scales model.

Key words : second language willingness to communicate (L2WTC), foreign language anxiety (FLA), dynamic systems (DS) theory, three time scales

1 . Introduction

With the increasing needs and expectations for more context-dependent and idiosyncratic explanations of second language (L2) learner development, the relevance of dynamic systems (DS) theory has been recognized for its explanatory validity. DS theory was originally developed in natural science to explain change and development in organisms, and now it is widening its applicable areas, including second language acquisition. Research in a DS approach initially centered on L2 learner identity and motivation, but now the approach has been employed to address to a wide variety of themes and topics in SLA (e.g., De Bot, Lowie, & Verspoor, 2005; Larsen-Freeman & Cameron, 2008; Gregersen, Meza, & MacIntyre, 2014; Pawlak & Mystkowska-Wiertelak, 2015; Dörnyei, MacIntyre, & Henry, 2015; King, 2016).

As an endeavor to better understand the affective variation of L2 learners in oral communication, the present author explored the possibilities of employing a DS approach to its explication with a focus on willingness to communicate (WTC) and foreign language anxiety (FLA) (Noro, 2016). Both WTC and FLA are known to

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influence L2 learning and use, while fluctuating in the course of L2 communication (e.g., MacIntyre, Clément, Dörnyei, & Noels, 1998; MacIntyre, Baker, Clément, & Donovan, 2003; MacIntyre & Legatto, 2011; Gregersen, Meza, & MacIntyre, 2014; Pawlak & Mystkowska-Wiertelak, 2015). Examination of both interview and questionnaire data obtained from EFL learners who participated in study-abroad programs in English-speaking countries suggested second language WTC (L2WTC) and FLA dynamically interacting with each other to fluctuate across L2 communication scenes.

The dynamic interaction between the two was conceptualized as a unitary entity which self-organized as a dynamic system, and its fluctuations were reformulated as *phase transitioning* of an *attractor*, or a relatively stable state of a dynamic system. The two groups of the participants in the study-abroad programs, that is, the short-term stay group (SSG) and the long-term stay group (LSG), exhibited different types of transitions: SSG showing more frequent and varied fluctuations, while LSG steadier and unvaried ones. The three time scales to explain emotional development, that is, *microdevelopment*, *mesodevelopment*, and *macrodevelopment*, theorized by Lewis (2000), were suggested for consideration in order to delineate the dynamic processes of self-organization of the L2WTC–FLA interaction in the temporal perspective, and tentative explication was attempted, but its exact nature and mechanisms yet remain to be resolved (Noro, 2016).

With a view to instrumenting the procedures of reaching for a comprehensive understanding of emotional development in L2 learning and use, the present study discusses the relevance and validity of Lewis’s (2000) three time scales model specifically in explicating the nature and mechanisms of the L2WTC–FLA interaction. It first examines the theoretical foundation of the three time scales model, referencing the *microgenetic research design* devised by Fogel (2008) in a DS approach. Next, it illustrates how emotional development is characterized at each of the three time scales to provide the base for the argument of their relevance to delineating emotional development in L2 learning and use, followed by the discussion of the L2WTC–FLA interactive fluctuations to be reformulated as phase transitioning of an attractor with four basic types of the interaction. Finally, it examines the possible attractor phase transitioning and patterning of their L2WTC–FLA interaction at each of the three time scales with qualitative analysis of the interview data obtained from seven Japanese EFL learners who have nine to ten months of study abroad (SA) experience, aiming to empirically prove its relevance and validity as a conceptual tool to explain emotional development in L2 learning and use.

2 . Three time scales model to explain emotional development

DS theory seeks to clarify the ways of *self-organization*, or “the ability of systems to maintain themselves and to develop new forms” (Fogel, 2008, p. 203). Considering that any kind of change and development occurs under the

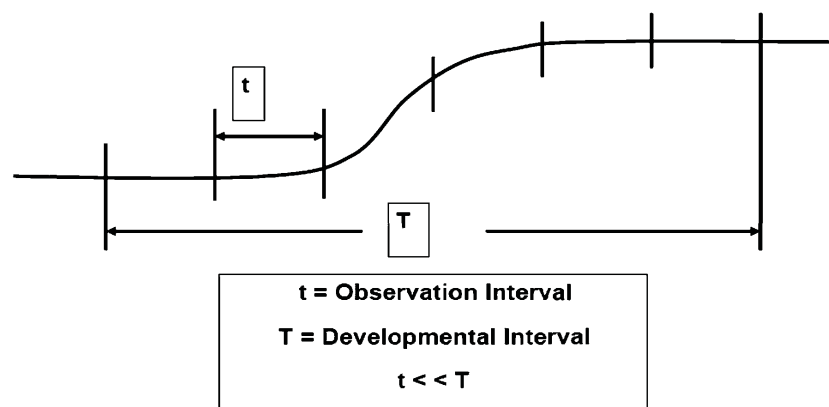


Figure 1. Microgenetic research design in which the intervals between observations (t) are much shorter than the developmental interval (T). Adapted from “Theoretical and Applied Dynamic Systems Research in Developmental Science,” by A. Fogel, 2011, *Child, Development Perspective*, 5, p. 268.

constraint of time, the time scale naturally becomes a crucial factor in observing and analyzing the self-organization processes. As instrumentation for examining the self-organization processes, *microgenetic research design* has been devised in a DS approach (Lavelli et al., 2005; Fogel, 2008, 2011, etc.). In this design, a certain time period is set when the system in question is likely to go through developmental change, and during this time period observations are repeated to trace the self-organizing processes of the system, as shown in Figure 1.

Fogel (2008) claims microgenetic research designs to have “the advantage of being able to trace the historical development of change over time within the same system” and to be defined by the following key characteristics:

- Cases (particular system of interest) are observed through a period of developmental change.
- Observations are conducted *before, during, and after* a period during which rapid change in a particular domain occurs. That is, observation is not simply conducted before and after the change takes place. The change may be a spontaneous developmental change or it may be a planned intervention.
- There is an *elevated density* of observations within the transition period. That is, observations are conducted at time intervals that are considerably shorter than the time intervals required for the developmental change to occur. For instance, if a developmental change takes place over several months, then observations should be conducted weekly or even more frequently.
- Observed behaviors are *intensively analyzed*, both qualitatively and quantitatively with the goal of identifying the historical processes that give rise to the developmental change.

(Fogel, 2008, pp. 205–206).

As indicated in the idea of this microgenetic research design, self-organization processes are addressed in terms of two time scales: *real time* and *development*. Lewis and Granic (2000) succinctly delineate the two scales as follows:

Real-time self-organization refers to the convergence of a system to its attractor, or a shift from one attractor to another when that shift is indeterminate and self-propagating. Developmental self-organization describes the emergence of developmental forms, properties, or constraints through real-time interactions. Phase transitions and other DS phenomena can be demonstrated at both of these scales.

(Lewis and Granic, 2000, pp. 9–10)

The two time scales are supposed to provide *microscopic* and *macroscopic* approaches for the self-organization processes respectively.

Examination of emotion in DS approaches has been attempted in terms of the two time scales as well. Interaction between microscopic and macroscopic processes, however, is not necessarily fully investigated, and the mechanisms of self-organization of emotion were left mostly indiscernible. Lewis (2000) claims that “important interactions between emotional processes in real time and emotional patterning over development is not examined fully” (p. 37), and argues for the importance of interscale relations to explain them. He introduces three time scales, instead of the conventional *real time* and *development*, as a tool for bridging emotional time scales, so that the interdependence of emotional processes and emotional patterning can be better understood and described. The three time scales are *microdevelopment*, *mesodevelopment*, and *macrodevelopment*.

Table 1 shows hypothesized characteristics that Lewis summarized for emotional self-organization at each of the three scales (Lewis, 2000, p. 59). As the table shows, microdevelopment, of which the duration is momentary like seconds to minutes, concerns emotional interpretations or “appraisal–emotion amalgams” (Lewis, 2000, p. 43), and mesodevelopment, which supposedly lasts hours to days, pertains to moods, whereas macrodevelopment, covering a rather longer time span of months to years, is involved in personality development. As in the description of each time scale, microdevelopment naturally will take on more frequent, momentary changes of emotional states,

while mesodevelopment and macrodevelopment show enduring mood and stable personality respectively. This is represented by the dynamic systems formalism of each time scale as well; microdevelopment is seen as an attractor, which is premised to go through phase transition from one state to another. On the other hand, mesodevelopment and macrodevelopment are considered temporary modification of state space and permanent structure of state space respectively. State space is where “attractors are surrounded on the state space by (...) regions of states that gravitate to the attractor” (Lewis & Granic, 2000, p. 9), thus logically assuming more stable formation than attractors.

Table 1

Three scales of emotional self-organization, showing parallels and distinctions across scales and hypothesized psychological mechanisms

	Emotional interpretation	Mood	Personality
Developmental scale	Micro	Meso	Macro
Duration	Seconds–minutes	Hours–days	Months–years
Description	Rapid convergence of cognitive interpretation with emotional state	Lasting entrainment of interpretive bias with narrow emotional range	Lasting interpretive-emotional habits specific to classes of situations
Dynamic systems formalism	Attractor	Temporary modification of state space	Permanent structure of state space
Psychological mechanism	Cognition–emotion coupling or resonance, successful goal-directed action	Cognition–emotion coupling, goal preoccupation, inhibited or unsuccessful action	Cognition–emotion complementarities that arise from and constrain coupling in emotional interpretations and moods
Higher-order form in circular causality	Intention, goal	Intentional orientation	Sense of self

Note. Adapted from “Emotional Self-Organization at Three Time Scales,” by M. D. Lewis, 2000, *Emotion, Development, and Self-Organization: Dynamic Systems Approaches to Emotional Development*, by M. D. Lewis and I. Granic (Eds.), p. 59.

In terms of psychological mechanism, in microdevelopment, cognition–emotion interactions lead to action tendencies to deal with new situations, causing emotional interpretations. In mesodevelopment, however, self-organizing moods endure with biased interpretations because no actions can be taken. As listed for the higher-order forms in circular causality,¹ in microdevelopment, intentions and goals lead to actions, which in turn disperse them, making momentary fluctuations possible for emotional interpretations. In mesodevelopment, intentional orientations are assumed to linger on, because those intentions or goals unattained keep the action tendencies, with certain biased interpretations narrowing the emotional range, leading to rather lasting moods. This contributes to enduring intentional orientations themselves in turn.

Regarding the psychological mechanism of macrodevelopment, cognition and emotion are supposed to complement each other with certain interpretive-emotional habits specific to situations, through repeatedly experiencing emotional interpretations and rather enduring moods, leading to personality development. For the higher-order form in the circular causality of macrodevelopment, a sense of self is hypothesized to play a part. Lewis explains “continuity in a sense of self lasts for years, but it breaks down at personality transitions just as the continuity

of immediate interpretations breaks down between EIs [emotional interpretations]" (Lewis, 2000, p. 57). Thus, a sense of self is regarded as "long-standing orderliness", embodying cognition–emotion complementarities, which naturally contribute to the sense of self in turn.

In the three time scales model, influence between the time scales is also postulated in two directions; smaller-scale self-organizing processes influence larger-scale ones and vice versa. Thus, emotional interpretations repeated in microdevelopment, leading to molding of certain moods in mesodevelopment, eventually have impact on personality over macrodevelopment, while personality prescribes mood tendencies and "constrains the possibilities for feeling and thinking in the moment" (Lewis, 2000, p. 61).

3 . L2WTC–FLA interactive fluctuation and patterning

As briefly outlined above, L2WTC and FLA have been both extensively researched for their influence on L2 learning and use (e.g., MacIntyre, Clément, Dörnyei, & Noels, 1998; Yashima, 2002; MacIntyre, Baker, Clément, & Donovan, 2003; MacIntyre & Legatto, 2011; Gregersen, Meza, & MacIntyre, 2014; Pawlak & Mystkowska-Wiertelak, 2015). WTC was originally conceptualized as a personality trait in first language (L1) communication studies (e.g., McCroskey & Baer, 1985; McCroskey & Richmond, 1990; McCroskey, 1992), but is now recognized as an equally relevant but distinct construct with L2 learners. While McCroskey and associates regarded WTC as a personality trait, MacIntyre et al. (1998) see the situation-specific, transient nature in L2WTC as well and reformulate it as a "situation-based variable representing an intention to communicate at a specific time to a specific person" (p. 559). This situation-specific, transient nature of L2WTC and its real-time influence on L2 learning and use, however, has not yet been fully researched, mainly due to methodological difficulties.

MacIntyre et al. (1998) consider FLA to be a crucial factor influencing L2WTC. As with their conceptualization of L2WTC, the construct of FLA is also presumed to be situation-specific and transient, fluctuating over time and directly affecting learners' self-confidence and eventually their L2WTC. The dynamic mechanism of FLA influencing self-confidence and L2WTC, however, has yet to be proved with empirical evidence. Furthermore, this conceptualization of FLA by MacIntyre et al. is based on the premise that FLA is just another contributing factor of L2WTC, but it is equally possible that L2WTC influences FLA as well, thus the two mutually interacting and fluctuating in the course of L2 communication, of which the mechanism should be worth exploring.

The present author discussed the possibilities and prospects of DS theory to explain the interactive fluctuation of L2WTC and FLA (Noro, 2016). The L2WTC–FLA interaction was conceptualized as constituting a unitary entity and reformulated as a self-organizing system, and its interactive fluctuations were seen as transitioning of attractor states. The phase transitions of the L2WTC–FLA attractor was interpreted to be caused by the perturbation of the attractor.

Figure 1 shows schematic models of an attractor with two types of perturbation, that is, external and internal, which the present author postulates as triggering phase transition of an attractor, and of phase transitioning of an attractor, both based on the topographic representation of dynamic systems. Of the two kinds of perturbation, the external perturbation is presumed to be caused by those variables outside the self-organizing system, i.e., the L2WTC–FLA interaction, such as characteristics of the language, topic interest and/or familiarity, interlocutors' attitude and behavior, physical environment of the communication scene. The internal perturbation comes from the inside, that is, the L2 learner whose L2WTC–FLA interaction is in question. Its possible sources should include L2 proficiency, coping strategies, beliefs and values, and personality. However, the exact mechanisms of the perturbation of the L2WTC–FLA attractor remain unresolved.

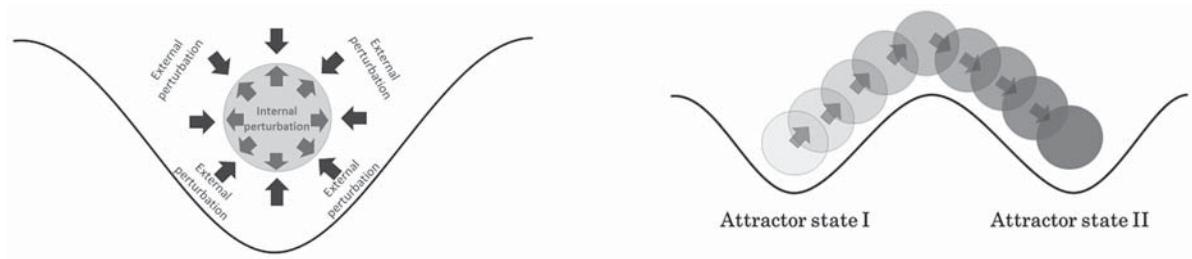


Figure 1. Perturbation and phase transition of an attractor. Adapted from “A Dynamic Systems Approach to the Interaction Between WTC and Anxiety in L2 Oral Communication,” by T. Noro, 2016, *Bulletin of the Faculty of Education, Hirosaki University*, 116, p. 92.

With the theorization of the perturbation and phase transitions of the L2WTC–Anxiety attractor as well as the examination of empirical data, the four basic types of the interaction between L2WTC and FLA were abstracted: 1) high L2WTC and high FLA, 2) high L2WTC and low FLA, 3) low L2WTC and high FLA, and 4) low L2WTC and low FLA. Table 2 shows the four basic types with the possible approach–avoidance tendencies toward L2 communication, as illustrated below (Noro, 2016, p. 93):

Table 2
Four basic types of L2WTC–FLA interaction

Type	L2WTC–FLA Interaction	Approach–avoidance tendency toward L2 learning and use
I	High L2WTC × High FLA	Approach/Avoidance
II	High L2WTC × Low FLA	Approach
III	Low L2WTC × High FLA	Avoidance
IV	Low L2WTC × Low FLA	Non-committal

Note. Adapted from “A Dynamic Systems Approach to the Interaction Between WTC and Anxiety in L2 Oral Communication,” by T. Noro, 2016, *Bulletin of the Faculty of Education, Hirosaki University*, 116, p. 93.

Type II and Type III are assumed to make a perfect symmetry, while Type I and Type IV are rather skewed to each other; that is, Type I, which comprises of high L2WTC and high FLA, is supposedly expected to take either an approach or avoidance orientation toward L2 learning and use, while Type IV, comprising of low L2WTC and low FLA, is most likely to take a non-committal orientation.

In the next section, the three time scales model by Lewis (2000) is discussed for verification of its relevance and validity in L2 learning and use specifically by examining the L2WTC–FLA interactive fluctuation and patterning in L2 communication processes at each of the three times scales with interview data.

3.1 Microdevelopment of the L2WTC–FLA interaction

The most typical emotional experiences on successful L2 communication occasions reported by the Japanese EFL learners with SA experience include relief, enjoyment, satisfaction, and gratitude, while in failed situations, induction of nervousness, frustration, disappointment, a feeling of helplessness, or even anger were mentioned. They naturally contribute to L2WTC and FLA mutually interacting to fluctuate. In the DS terms, these emotions are evoked and appraised in emotional interpretations in the microdevelopment scale to settle into a stable state and then are perturbed to move out to another stable state, causing L2WTC–FLA attractor phase transition.

It was also revealed from the interview that different patterns of L2WTC–FLA interactive fluctuations were observed in different L2 communication scenes depending on each individual learner, pointing to the possibility of attractor phase transition going through both external and internal perturbation interacting with each other. Considering that the possible sources of external and internal perturbation point to different time scales of emotional development, the L2WTC–FLA attractor phase transitioning at the microdevelopment scale is influenced by moods forged in mesodevelopment and personality developed over macrodevelopment.

3.2 Mesodevelopment of the L2WTC–FLA interaction

The scale of mesodevelopment is conceptualized as an intermediate scale linking microdevelopment and macrodevelopment (Lewis, 2000). As elaborated above, mesodevelopment concerns temporary modification of the state space in which emotional interpretations at the microdevelopment scale take place, forging moods that last for hours to days. According to Lewis's theorization, moods endure because certain intentions or goals remain unattained, with intentional orientations lingering on. Thus, mostly negative types of moods are considered for this scale.

The interviews with the Japanese EFL learners, too, revealed that their repeated emotional interpretations with rather negative aspects of L2 learning and use like unsuccessful communication or maladjustment to host cultures contribute to molding of their rather discouraging L2WTC–FLA interactive moods. It follows that the moods in turn influence their L2-related emotional interpretations and L2WTC–FLA attractor phase transitioning at the microdevelopment scale, while contributing to longer-term L2WTC–FLA interactive patterning over macrodevelopment. It should be noted, however, that in some cases, positive types of moods, like eagerness or a feel of self-efficacy, were predominant with some learners, enhancing their L2WTC–FLA interactive patterning for L2 learning and use. This should be ascribed to their repeated experience of positive emotional interpretations accompanying L2 success.

3.3 Macrodevelopment of the L2WTC–FLA interaction

As macrodevelopment over months to years stipulates, experience of emotional interpretations and rather enduring moods consolidate patterns of cognition–emotion complementaries, shaping and developing personality. The L2WTC–FLA interaction in L2 learning and use can be described in similar terms. As observed in the interviews with learners with longer-periods of SA experience, their L2WTC–FLA interaction took on more stable and ordered patterns, which corresponded to more or less their accommodation processes in the new linguistic/cultural context. Their L2WTC–FLA interaction most typically showed during their prolonged stay a gradual increase in L2WTC in contrast with a decrease in FLA, which most probably was triggered by what might work for them as an “anchorage,” like a new role or standing that they took in their new life, lasting human relationships that they established, or even a new perspective that they found about their identity. It is equally possible, however, that the L2WTC–FLA interaction takes patterns of a more avoidance tendency toward L2, of which the most extreme one should result in low L2WTC and high FLA.

As with mesodevelopment, the macrodevelopment of L2WTC–FLA interaction will have lasting influence on the L2WTC–FLA attractor phase transitioning represented in L2-related momentary emotional interpretations in microdevelopment. It also guides the directions of more lasting mood molding in mesodevelopment. Thus, the continuum of emotional development ranging from the approach to avoidance tendencies toward L2 learning and use is to be represented at and across each of the three time scales of development.

4. Conclusion

The present study discussed the relevance and validity of Lewis's (2000) three time scales model to emotional self-organization in L2 learning and use, specifically focusing on the L2WTC–FLA interaction to explicate its nature and mechanisms according to a DS approach. Through enunciation of the three time scales model and examination of

the interview data obtained from the Japanese EFL learners with study abroad (SA) experience, it has turned out that the three time scales model not only provides relevant and valid scales to investigate the L2WTC–FLA interaction in L2 learning and use in the temporal perspective but also is a very useful tool to explain its interactive fluctuation, which is reformulated as an attractor phase transitioning, and overall L2-related emotional development. With larger and more diverse data sets to be further refined for analysis, this model will prove to be able to accurately and adequately delineate the contributing factors and mechanisms of moment-to-moment fluctuations as well as longer-term patterning of the L2WTC–FLA interaction.

For future research on the L2WTC–FLA interaction and L2-related emotional development in general, involvement of the construct of psychological resilience in the processes should be worth examining. Psychological resilience is known as the ability to withstand difficulties and bounce back. It is generally acknowledged that L2 learners are vulnerable beings with their insufficient language control and background knowledge of the target culture. Thus, psychological resilience bears direct relevance to learners' vulnerability in L2 learning and use. The involvement and development of psychological resilience in the overall L2-related emotion are reasonably expected to be explicated in the three time scales model elaborated on in the present research.

Footnote

¹Circular causality is explained as “a higher-order form [causing] a particular pattern of coupling among lower-order elements, while this pattern simultaneously causes the higher-order form” (Lewis, 2000, p. 40),

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