

A Per-second Investigation of the Interconnectedness between Linguistic and Cognitive Factors Underlying L2 Willingness to Communicate

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ABSTRACT

Willingness to communicate (WTC) research has recently witnessed a paradigm shift with the more recent studies looking at the shifting and dynamic nature of the variable. A growing body of literature has interpreted such dynamicity from a complex dynamic systems (CDS) perspective. The theory of CDS has four basic properties, one of which, and the focus of this study, is the interconnectedness among subsystems. This property mainly involves the interplay amongst parts of a system, which interact and influence one another, determining the subsequent dynamics in the system. This qualitative, exploratory study employed an idiodynamic method to investigate the interconnectedness of the cognitive and linguistic factors underlying second language (L2) WTC. To this end, 20 participants completed four three-minute monologic speaking tasks while being video-recorded. Immediately after, they viewed their recordings, rated their WTC moment by moment, and explained the WTC changes in stimulated recall interviews. The interviews were coded, and instances where WTC was affected by cognitive and linguistic factors were identified and analysed. Three patterns of interconnectedness emerged: (1) WTC and linguistic factors; (2) WTC and cognitive factors; and (3) WTC, and linguistic and cognitive factors. Findings provide a clearer account of the interconnectedness property in the WTC system, lending support to viewing WTC as a CDS. The article highlights the importance of self-perception and availability of content message, in addition to the above factors, and concludes with a brief discussion of the pedagogical implications for L2 classroom.

Keywords: willingness to communicate (WTC), complex dynamic systems (CDS), idiodynamic method, interconnectedness

INTRODUCTION

Willingness to communicate—“a readiness to enter into discourse at a particular time with a specific person or persons using a L2” (MacIntyre et al., 1998, p. 547)—has received growing attention in recent years. A major part of this can be attributed to the classic work of MacIntyre et al. (1998) who proposed a triangle model of situational WTC, elaborating on several enduring and transient variables (e.g., cognitive, affective, etc.) underlying WTC. Recent years have also witnessed a paradigm shift in the ways WTC is conceptualized, from the “personality-based, trait-like predisposition” (McCroskey & Baer, 1985, p. 4) view to a more dynamic approach (MacIntyre, 2007). In light of this, WTC is believed to be a changing state during communication due to situational/contextual variables such as the interlocutor (Kang, 2005), classroom variables (Eddy-U, 2015), task types (Cao & Philp, 2006; Mystkowska-Wiertelak & Pawlak, 2014), topics (MacIntyre & Legatto, 2011); cognitive factors such as vocabulary retrieval (Wood, 2016) and self-monitoring (Nematizadeh & Wood, 2019); linguistic factors or self-perceived performance (Nematizadeh, 2019); and affective factors such as anxiety (MacIntyre & Legatto, 2011).

Complex Dynamic Systems, Interconnectedness, and Willingness to Communicate

Complex dynamic systems (CDS) are composed of variables, or sub-systems, that interact and result in change and variation in the system (de Bot et al., 2011). Four major characteristics of CDS in relation to second language (L2) learning phenomena include: (1) sensitive dependence on initial conditions, (2) variation/change in and among individuals, (3) complete interconnectedness of subsystems, and (4) the presence of attractor states (de Bot et al., 2007).

Interconnectedness mainly involves the interrelated interaction between the subsystems of a CDS, which produces change in the whole system (de Bot et al., 2007). As an illustration, language has been viewed as a CDS with interacting and interconnected subsystems including lexical, phonological, and syntactical systems (de Bot & Larsen-Freeman, 2011), with some strong or loose connections. The stronger the connections, the more effective the impacts of the subsystems upon each other. Another illustration pertains to how interconnected memory capacity and

proficiency level are, with both serving as a resource to each other: “memory capacity is a resource for language proficiency, but language proficiency may also be a resource for memory capacity. Higher levels of proficiency allow for larger holistic units to be stored in memory” (de Bot & Larsen-Freeman, 2011, p. 14).

Examples of interconnectedness have also been provided in connection with communications and individual difference variables (IDs). For instance, MacIntyre (2012), in an article introducing the idiodynamic methodology, argued that communication can be viewed as a CDS, with interconnected subsystems including the physical process of audition and vocalization, affective states, cognitive events (e.g., formulating a message and interpreting meaning), the local social system, and patterns of intergroup relations. Over a decade ago, Dörnyei (2009, 2010) proposed that ID variables be viewed as CDS, positing that L2 learning is affected by multiple interrelated components that are at different levels but still interact with each other. Setting the example of WTC, Dörnyei (2009) further noted that the CDS and its subsystems are subject to change as a result of multiple variables (e.g., successful communication or communication confidence) that would impact the system further.

Idiodynamic Methodology

Motivated by complex dynamic systems theory (CDST), MacIntyre (2012) proposed the idiodynamic method to investigate per-second changes of a communication construct as the communication unfolds in real-time. Previous studies had studied the changes on longer time spans; however, the idiodynamic method offered the possibility of monitoring change on a momentary basis. The idiodynamic method involves the use of a Windows-based application (AnionVersion2) that video-captures a participant during a communication task and then allows them to view the recording and rate a communication variable (e.g., WTC) using Increase/Decrease buttons on a -5 to +5 scale. The application then outputs a bitmap graph illustrating the rises and falls of the variable, facilitating a subsequent stimulated recall procedure whereby the participant reflects on and recalls his/her thought processes while performing the task and explains the ratings. Besides identifying the patterns of change, the idiodynamic method reduces the time span between the task and recall phase in

order to avoid recall biases (e.g., forgetting, retrospective thoughts, misattributions, etc.) (MacIntyre, 2012).

This multifaceted and dynamic nature of WTC has come to be better conceptualized in light of the implications offered by the complex dynamic systems theory (CDST) (Nematizadeh & Wood, 2021; Syed et al., 2021). However, despite several empirical studies formally adopting a CDST approach to studying WTC (e.g., MacIntyre & Legatto, 2011; Nematizadeh, in press; Nematizadeh & Wood, 2019; Wood, 2016) or observing evidence of change in WTC (Cao, 2013; Cao & Philp, 2006; Kang, 2005; Mystkowska-Wiertelak, 2018; Mystkowska-Wiertelak & Pawlak, 2014; Pawlak & Mystkowska-Wiertelak, 2015; Pawlak et al. 2015), very few studies have carried out systematic investigations to identify the properties of complex dynamic systems in WTC, in line with what Peng (2020) or Nematizadeh (2021) examined concerning the emergence of attractor states, another property of complex dynamic systems, in WTC. Additionally, the dynamic WTC literature has been mainly concerned with identifying factors influencing WTC and less with exploring whether these factors interact with each other, and how this interaction determines the WTC levels. A few complex dynamic systems studies have observed this property in the ways WTC is shaped during communications (MacIntyre & Legatto, 2011; Nematizadeh & Wood, 2019); however, more concrete evidence is needed to better understand the nature of the dynamics between these factors. This study sets out to bridge these gaps to inform future WTC research as well as L2 classroom practices.

LITERATURE REVIEW

Complex Dynamic Systems, L2 Willingness to Communicate, and L2 Speech Production

Segalowitz's (2010) model of speech production adopts a CDS approach, featuring four influences underlying fluency, including (1) the speaker's cognitive/perceptual systems; (2) speaker's motivation to communicate (e.g., WTC); (3) the communicative context; (4) perceptual and cognitive experiences. The speaker's cognitive/perceptual systems mainly involve the cognitive dimension of speech fluency, which Segalowitz calls cognitive fluency defined as:

This process involves mobilizing the mechanisms for planning the utterance, for lexical search, for

packaging the information into a grammatically appropriate form, for generating an articulatory script for speaking the utterance, etc. It also involves integrating all of these processes in a way that minimizes inefficient processing, reduces or eliminates internal sources of interference and crosstalk that could disrupt the fluidity and evenness of production over time (p. 48).

In addition to the cognitive processes of planning and generating content messages, recalling, and retrieving linguistic resources (e.g., grammatical structures and lexical items), and formulating utterances, Segalowitz argues that there is a subsequent step called motivation to communicate that plays a role in determining one's commitment to communicating fluently or not. Therefore, engaging in L2 conversation will mean speakers need to carry out several cognitive processes at once in order to smoothly convert thought to speech, and depending on how successful they are, they may gain or lose WTC. Investigating this interaction between linguistic knowledge, cognitive processes, and WTC of speakers could reveal a lot about whether and how these operate in an interconnected way.

Interconnectedness in Willingness to Communicate

Studies on dynamic WTC have reported findings that reflect the interactions between the factors underlying WTC. In one of the early studies, Kang (2005) concluded that situational WTC changed moment-to-moment during conversations as a result of the joint effect of the psychological conditions of excitement, responsibility, and security. While Kang's study was mainly concerned with how these factors co-constructed WTC, and not how they influenced each other, she presented instances that reflect the interconnectedness among these factors. For example, she reported that a feeling of security or insecurity was triggered by whether the speaker was talking with a familiar or unfamiliar interlocutor because the L2 speaker was afraid of losing face due to making language errors or producing dysfluent speech. This instance shows how WTC depends on the ways psychological and situational factors affect each other. WTC was also influenced by the feeling of insecurity due to the lack of topical background knowledge that would likely result in moments of silence as the participants were possibly out of, and struggling to generate, ideas. This also indicated the interaction between

psychological, contextual, and performance factors, all of which determined the dynamics of WTC. Kang reported many other instances that plausibly characterize the interconnectedness between these factors (i.e., multiple situational and psychological variables) underlying situational WTC, concluding that “WTC is subject to the joint role of three interacting psychological antecedents, each of which is co-constructed by interacting situational variables” (p. 288). This conceptualization represents the interconnectedness between the variables underlying WTC.

Another pertinent study with a qualitative component was conducted by de Saint Léger and Storch (2009) who observed the complex and dynamic nature of the interplay between self-confidence, anxiety, and perception of the learning environment in generating WTC. They also reported that cognitive and affective variables are “socially grounded and cannot be dissociated from the social setting” (p. 280). For instance, the authors observed that the participants lost confidence during class discussions when they felt exposed and perceived the environment as threatening. In such situations, they struggled to comprehend the discussions or formulate ideas in response to what they heard, and the whole dynamics would raise their anxiety and their WTC. This illustrated how the environment/context and cognition (e.g., ability to comprehend) interacted and affected WTC.

Cao (2011), using class observations, stimulated recall interviews and journals, investigated the dynamic and situated nature of WTC for 20 weeks with mostly Chinese and Korean participants. Having interpreted the results from an ecological perspective, which targets the complex interactions between the individual and their surrounding environment, Cao found that environmental (e.g., task type, interlocutor, etc.), individual (e.g., perceived communication opportunities, personality, etc.), and linguistic (e.g., language proficiency and reliance on L1) factors determined the WTC behaviour. Interestingly, the three factors formed a joint force that contributed to WTC, with each exerting varying levels of strength at a given moment. For instance, a low-proficiency participant’s WTC would be more inhibited due to the linguistic level than the interlocutor. While Cao did acknowledge this joint effect, whether these factors interacted and influenced each other remains to be explored. In another study, Cao (2014) observed the interactions between individual, environmental, and linguistic factors, which triggered WTC

changes, with some of the participants more sensitive to internal cognitive influences and some to more external social influences.

A more recent line of inquiry, framed within CDST, has employed the idiodynamic method to monitor WTC shifts and observed interconnectedness of WTC sub-systems. MacIntyre and Legatto (2011), monitored the moment-by-moment fluctuations of WTC with eight participants across a set of communicative tasks and observed many tenets of CDS, including the interconnectedness between affective, cognitive, and linguistic systems. For instance, they found that the cognitive demands of vocabulary retrieval affected WTC, specifically during tasks with less familiar topics. On the contrary, familiar topics seemed to present less of a cognitive load when retrieving lexical items, during which the WTC remained unchanged. In another idiodynamic study on the interactions between WTC and L2 fluency, Wood (2016) examined the temporal measures of speech samples of four Japanese learners of English in interaction with WTC shifts. Reporting a complex and shifting interplay between the constructs at issue, Wood also observed the interconnectedness between cognitive, affective, and linguistic variables underlying WTC. More specifically, the participants demonstrated dynamic levels of WTC owing to an interplay amongst the cognitive skills of speech production (e.g., item retrieval), linguistic competence (e.g., vocabulary and uncertainty about accuracy), and their affective state (e.g., negative self-assessment, anxiety, sense of efficacy). For instance, reduced WTC was caused by not receiving positive feedback from their interlocutor or failure of lexical retrieval. On the other hand, perceived lexical appropriacy or successful communication of ideas appeared to improve WTC. In a more recent attempt, Nematizadeh & Wood (2019), who investigated the cognitive and affective dynamics between WTC and L2 fluency with four ESL Persian-speaking participants during monologic tasks, observed interconnectedness amongst WTC and the linguistic and cognitive factors. Fluctuations of the WTC systems were attributed to success or failure of speech production (e.g., speech rate or lexical retrieval) as a cognitive process or the participants’ constant self-monitoring of speech quality, including perceived fluency and accuracy. As an illustration, having detected an inaccurate grammar structure, a participant lost WTC, which then troubled the production of the upcoming

utterances. This demonstrated an interplay among linguistic and cognitive variables, which left the participant with an extremely low WTC.

As can be seen, previous dynamic WTC literature has offered some preliminary evidence; however, no study has exclusively examined the interconnectedness between the factors underlying WTC, specifically between cognitive and linguistic factors that have been reported in recent idiodynamic studies. Therefore, the present study aims to gather more concrete evidence of the interaction between these factors as subsystems of WTC. To this end, the research questions are:

RQ 1: What linguistic and cognitive factors influence WTC during monologic speaking tasks?

RQ 2: Do these linguistic and cognitive factors interact in an interconnected way?

METHOD

Participants

Twenty Farsi-speaking participants were selected based on five criteria using a non-random purposive sampling technique (Dörnyei, 2007), which allowed for recruiting participants capable of communicating their experiences and opinions in a reflective, expressive, and articulate manner (Bernard, 2006). The participants were between 25 to 32 years of age, spoke Farsi as their first language (L1) and English as L2, had lived in Canada for a period of six months to a year prior to this study, were graduate students of an engineering program, and had scored between 6 and 7 on the IELTS speaking 1-9 scale during the preceding year to the study. The inclusion criteria ensured that the data came from a homogeneous sample. The participants were assigned pseudonyms in this study.

Procedure

This study is a part of a larger project that investigated WTC and speech fluency as dynamic systems. The present study, however, focuses on the interconnectedness between WTC and its underlying cognitive and linguistic factors. The data collection took place between August 2017 and November 2017 in two Canadian universities after receiving ethics approval. Each participant attended four one-on-one

sessions spread over a two-week period with the researcher. Apart from completing the consent form and a brief introduction to the research and the idiodynamic Windows-based application in Farsi in the first session, the same procedure was performed in all four sessions.

Prior to the data collection, 10 speaking topics were piloted by Nematizadeh (2019) using Khabbazbashi's (2017) background knowledge questionnaire with 20 other participants with similar characteristics. As a result, four topics on which participants had a reasonably equal level of background knowledge were selected. Each session, the participants were given a picture to describe, a list of guiding questions, a list of relevant vocabulary to the topic, and a minute to prepare, which involved taking notes if needed. Then they engaged in a mainly monologic picture description task for a duration of three minutes while being video recorded. The interviewer provided communicative cues such as confirmations or eye-contact and engaged in the task whenever necessary. Participants then viewed their recorded video and rated their WTC while viewing the recording using the idiodynamic application. This step was also screen-captured to facilitate subsequent analyses.

The application also generated a bitmap graph that illustrated the WTC shifts. The graphs were used to guide the following stimulated recall procedure to assist the participants in recalling and explaining the WTC shifts in Farsi. While viewing the recordings, the researcher paused whenever a change in WTC was observed, allowing time for the participant to recall the dynamics and factors leading to the WTC shifts. Whenever necessary, and at the request of the participants, the researcher would rewind to refresh the participant's memory when struggling to explain the shifts. This stimulated recall was also recorded, and the screen was video captured to facilitate the analyses.

Data Analysis

Part of the data analysis was performed during the stimulated recall interviews, with the researcher taking field notes whenever the participants indicated the interconnected effects of more than one factor. This was believed to also facilitate the subsequent in vivo coding, or "verbatim coding" (Saldaña, 2013, p. 91). The transcriptions were inserted into NVivo 12 and coded verbatim using the codes already available from the field notes (see Appendix A for a complete codelist).

Additionally, new codes that emerged guided the remaining coding process. After the coding was completed, the NVivo “coding stripes” feature allowed the researcher to create vertical stripes alongside each other with each representing a separate factor. Since previous dynamic WTC studies have reported the interconnectedness between WTC, cognitive, and linguistic factors (MacIntyre & Legatto, 2011; Nematizadeh & Wood, 2019; Nematizadeh, 2019), the present study attempted to build on the same findings. With the WTC shifts as the starting step of the analysis, the search was further guided by the identification of instances whereby cognitive and linguistic factors triggered the shifts.

Drawing on previous dynamic WTC research, the linguistic factors involved situations where vocabulary or grammar knowledge affected WTC. For instance, a lack of vocabulary knowledge or appropriate word usage lowered the participants’ WTC in MacIntyre and Legatto’s (2011), Wood’s (2016), and Nematizadeh’s (2019) studies. In addition to vocabulary, producing accurate or inaccurate grammar structure, appropriate grammar usage, and lack of grammar knowledge required to complete a task affected WTC in Wood’s (2016) and Nematizadeh and Wood’s (2019) studies.

Drawing on Segalowitz’s model of speech fluency and recent dynamic WTC research, the cognitive dimension mainly involves the process of online conversion of the linguistic resources to speech in a smooth and timely manner, or what Segalowitz (2010) called cognitive fluency. The cognitive factors pertained to instances whereby participants reported WTC shifts due to fluent or dysfluent speech as a result of smooth or delayed lexical retrieval, recalls, or sentence construction. For instance, demands of searching and retrieving vocabulary (MacIntyre & Legatto, 2019; Wood, 2016), fluent or dysfluent (e.g., pauses or hesitations) speech (Nematizadeh & Wood, 2019), and issues with online sentence construction (Nematizadeh, 2019) may trigger WTC changes.

The unit of analysis for interconnectedness specifically included instances where WTC shifts were observed as a result of the co-occurring interplay between cognitive and/or linguistic factors. This was believed to provide sufficient evidence as to how these factors interact and affected each other as the subsystems of WTC.

RESULTS

The search identified 29 cases of interactions between WTC, linguistic factors, and cognitive factors, which cluster around three categories: (1) WTC and linguistic factors, (2) WTC and cognitive factors, and (3) WTC, linguistic, and cognitive factors. It should be noted that these categories reflected the participants’ perceptions of their linguistic and cognitive performance. Exemplars of each category will be provided and elaborated below along with their corresponding context and stimulated recall interviews. Excerpts from the speaking tasks, silent and filled pauses (FP) like “um” or “uh,” and the WTC self-ratings and participants’ explanations of the fluctuations will be provided.

WTC and Linguistics Factors

There were 13 instances where changes to WTC occurred as a result of linguistic factors, including issues with vocabulary and grammar knowledge. In one instance, Niki’s WTC dropped significantly as she perceived an incorrect choice of preposition:

Exemplar (1) ... I don’t know how but I think there are some people that they are (+4) (Silent) int. (hesitation) (FP) interested to help the (-1) (Silent)(FP) you know the (Silent) yeah newcomers and ...

In response to why her high WTC dropped here, Niki commented: “*I was uncertain about the preposition that collocates with the word “interested” and paused to recall it*”. The linguistic uncertainty troubled the fluent production of speech that in turn lowered WTC.

In another instance, Sarah started task two with a high level of WTC as she was using the notes she had taken prior to the task and possessed the vocabulary relevant to the task:

Exemplar (2) ... and there are some kind of advantages and disadvantages for both of them (+1) (FP) for example for online (FP) education (+1) (Silent) it’s some kind of time-consuming because we don’t pass our times in traffic (+2) (Silent) and (FP) it is some kind of save energy and money (+2) ...

She attributed her high WTC to the availability of ideas and lexical items: “*my WTC rose because I had jotted down notes and I was able to use a range of vocabulary of appropriate for the context, such as advantages,*

disadvantages, time-consuming, and saving energy or money.” She also added: “I had acquired the lexical knowledge and supporting ideas from a previous course in e-learning and e-commerce”.

In another instance, recalling a communication experience Mo had just prior to the data collection session improved his WTC as he simply recalled the sentences and words from the experience:

Exemplar (3) ... to touch it (Silent) you better to touch it (Silent) you better to see it from a close distance to get a better understanding of how the mechanism look you eventually need to (+3) (Silent) play it (Silent) play with that device ...

He said: *“I work as a teaching assistant and, prior to this session, I had tried to convince my students to attend the laboratory session of an engineering course to have hands-on experience in using lab devices. This experience had contributed to my confidence in the use of the same linguistic resources to express myself more clearly and more fluently”.*

WTC and Cognitive Factors

There were nine instances where cognitive factors affected WTC. These factors were mainly situations where the participants managed or struggled to retrieve lexical items, supporting ideas, or construct grammatically correct sentences as they were performing the tasks. In one instance, Mehrzad’s WTC dropped as he struggled with lexical retrieval:

Exemplar (4) ... and benefits like (FP) (Silent) the (Silent) (FP) worldwide (Silent) famous thing that is internet (-1) (Silent) (FP) all of us use internet for (+1) (Silent) finding some places (Silent) for searching for (FP) looking for everything that they (+1) ...

He stated: *“I was unable to retrieve the word “web” of the World Wide Web and decided to replace it with the word the internet to avoid pausing”.* He also added: *“being recorded and being unable to retrieve appropriate vocabulary triggered a feeling of embarrassment, causing inhibition and low WTC”.*

In another instance, William’s WTC rose because of the smooth retrieval of ideas, which helped him make his point:

Exemplar (5) ... but about time for cooking since I am a student (+4) (Silent) If I want to cook I should spend a lot of time and I should spend (+4) (Silent) perhaps in the mornings to evenings (+3)

...

He explained: *“I was impressed by how he was able to express myself fluently and avoid Persian-to-English translation”.* He added out of the blue that: *“in daily conversations, I monitor my speech pace, and if fluent, it motivates me to discuss things further. If I perceive my speech to be terrible, I seek any opportunity to bring conversations to an end”.*

Majid’s WTC, however, dropped in an instance where he stuttered over the word “master”:

Exemplar (6) when you are taking online courses I have i have done my (Silent) (FP) software ma (FP) masters of (-2) (FP) (Silent) engineering in software engineering in Iran and completely online course ...

He mentioned that: *“there was a small delay in recalling the word, which caused the stutter and number of pauses. There was a clumsy confusion of word order. These are why my WTC dropped”.* In another instance, smooth structuring sentences was another cognitive process that affected WTC.

In one instance, Hero produced several consecutive long utterances that he was impressed by:

Exemplar (7) ... some may say that you ok you cannot (+3) (FP) (Silent) ask questions directly from the professor(+3) (Silent) so, this happens in the regular class if you have (+2) (FP) anytime if you have (FP) any question then you can ask raise your hand and ask your question from the professor (+4)...

He explained: *“a combination of different factors, like availability supporting ideas, ability to build good stretches of sentences and good quality speech, improved my WTC”.*

WTC and Linguistic-cognitive Factors

In seven instances, WTC shifts were triggered by the co-occurring effects of linguistic and cognitive factors. In one instance, Pouya’s positive WTC at the outset of task three gradually diminished resulting from a lack of lexical items and struggling to retrieve an alternative:

Exemplar (8) ... in some situations and some (Silent)(FP) (Silent) for some people it (Silent)(FP) really (Silent)(FP) make make people (Silent)(FP) (Silent) get far from each other (Silent) (-2) you know(FP)(Silent) ...

He noted that: “*even though I knew what to say, I struggled to find an appropriate equivalent phrase in English for a concept I had in mind (becoming emotionally distant) for a few seconds. So, I paused and hesitated. Later, despite the retrieval of a phrase, I was not sure if it was an appropriate alternative and this lowered my WTC*”.

In another instance, Lili lost WTC due to inaccurate speech:

Exemplar (9) ... a doctor can (Silent) Skype with you or can (Silent)(FP)(Silent) call with you can call with you to (-2) (Silent) (FP) say (FP) some (FP) positive points some (FP) (Silent) prescriptions for you ...

She then explained: “*I had detected the preposition error in “call with you,” and tried to self-correct*”. This clearly resulted in multiple pauses and repetitions. She added: “*I was unable to correct it and this lowered her WTC and troubled the production of the upcoming sentences*”.

In another instance, Sepehr’s WTC declined due to vocabulary and grammar issues and the resulting struggles with lexical retrieval:

Exemplar (10) ... communication and (Silent) (FP) (Silent) and (Silent) (-1) relationship between people (Silent) I think (Silent) (FP) ...

He commented: “*I felt very comfortable with the topic of technology and did not feel the need to prepare during the preparation time, but in the task, I struggled to retrieve lexical items (in two instances, this took between 30 and 40 seconds). I knew what he wanted to say but it was difficult to translate ideas into English words. He added that: I also struggled at grammar level, particularly, when I was building new structures, where sentence construction took longer than usual*”.

DISCUSSION

The identified cases demonstrated interconnectedness between WTC, and the cognitive and linguistic factors, which is in line with previous idiodynamic WTC research

(MacIntyre & Legatto, 2011; Nematizadeh & Wood, 2019). The linguistic factors reported as facilitators or inhibitors of dynamic WTC in previous research have included lexical knowledge (Cao, 2014; MacIntyre & Legato, 2011; Peng, 2012) and perceived grammatical accuracy (Cao, 2011, Nematizadeh, 2019, Zhong, 2013). The present study confirms these findings while revealing the effect of additional factors on WTC, including the participants’ perceived fluency and perceived lexical (in)appropriacy. Cognitive factors, in this study, are viewed from a speech production perspective (Segalowitz, 2010) and refer to the simultaneous formulation of ideas and smoothly accessing the available linguistic resources to produce fluent speech. From this perspective, the cognitive factors concerned the retrieval of the linguistic (grammar and vocabulary) resources, online generation of supporting ideas, and fluent sentence construction, all of which have also been reported in previous WTC literature (MacIntyre & Legato, 2011; Nematizadeh, 2019; Wood, 2016). What follows is an account of the interaction between the variables that led to the formation of the three patterns of interaction.

The knowledge of lexical and grammatical resources, confidence resulting from the perceived accuracy of grammar structures, and perceived appropriacy of lexical items were important factors triggering change to the WTC during the speaking tasks. Typically, when participants possessed or assumed that they possessed the lexical knowledge required to make their arguments, or perceived their lexical choices as appropriate for the context, their WTC increased. This knowledge typically originated from courses they had taken, reading material (e.g., newspaper articles), or previous conversational experiences, which contained relevant ideas and vocabulary to the topics of this study and appeared to provide the participants with a feeling of security and confidence to approach the topics more willingly. The participants either benefited from the exposure to and use of the lexical resources in previous conversational opportunities or had received feedback (e.g., approval or disapproval) from other interlocutors on the quality of their lexical choices. Depending on the success or failure they had with communicating their thoughts using the lexical items, their WTC fluctuated. While lexical resources appeared to be the major linguistic component shaping WTC, availability of or uncertainty about grammar structures were also indicated as factors affecting WTC. In a few cases, participants’ struggles with structuring sentences led to a reduced WTC. In one case also, a combination of lexical and grammatical issues lowered a participant’s WTC.

The interplay between cognition and affect is consistent with previous WTC (de Saint Léger & Storch, 2009) and motivation (Waninge, 2015) research. In this study, lexical retrieval was identified as an important factor affecting WTC, which is consistent with previous WTC research (MacIntyre & Legatto, 2011; Nematizadeh & Wood, 2019; Wood, 2016). It appears as though the participants benchmark their output against the temporal measures of speech as many of them pointed to the negative effects of dysfluent speech (e.g., pauses, repetitions, or delays) on their WTC. As a result of the failure of lexical retrieval, some participants ended up repeating a previously used lexical item; some felt frustrated because of not retrieving words they would typically use; and some failed in retrieving a lexical item and had to move on despite a poor lexical choice, all of which resulted in delays in speech production and reduced WTC. Another case involved retrieval delay, sometimes resulting in stutters, in articulating a word and lowering WTC. It is worth pointing out that the cognitive delay, in some cases, led to sentence structuring issues where the participants hesitated over the correct word order. In terms of directionality, sometimes low WTC occurred as a result of dissatisfaction with speech production (e.g., quality of structures, lexical appropriacy, etc.) in general, which was followed by dysfluent speech, while sometimes dysfluent speech lowered WTC. This finding is in line with Segalowitz's (2010) CDS-based framework of fluency that highlights the role of motivation to communicate and WTC as one of the influences contributing to the production of fluent speech.

Other cases involved situations where ideas were or were not retrieved successfully. For one thing, participants were particularly impressed when they were able to maintain an acceptable speech rate because of the successful retrieval of ideas. William, for instance, believed that a factor improving his fluency involved avoiding constant Persian-to-English translation, which he typically struggled with when speaking English. However, once ideas were readily available, fluent speech was likely to occur, encouraging him to continue. Similarly, Mohsen felt impressed upon perceiving his speech as fluent, or Akbar mentioned that rehearsed structures were easily constructed in real-life communications, so he would not need to do a lot of thinking, which increased his WTC. In another instance, Akbar lost WTC when stumbling over the articulation of a word, which was due to trying to simultaneously maintain fluent speech and plan the upcoming sentence structure where the cognitive demands of his speech seemed to trouble his speech production.

Another pattern that emerged was that an individual's WTC was primarily shaped by the possession of language knowledge (linguistic) and how successfully they managed to access and use the knowledge (cognitive). These two could improve one's WTC whereas a failure in each or both could lower WTC. One typical pattern of interconnectedness pertained to cases in which uncertainty about linguistic resources resulted in a prolonged cognitive search for an alternative (e.g., grammar structure or lexical item) causing delays and lowering WTC. In one case, for example, Niki felt unsure of the correctness of a preposition that preoccupied her mind, imposing some additional cognitive demands to retrieve a lexical choice, all of which resulted in delayed speech and lowered her WTC. Another case concerned the lack of lexical resources about a topic and the resulting delays for lexical search causing dysfluent speech, both of which lowered WTC. In one instance, Sarah did not perceive her sentence structure as proper because she was translating from Persian to English. While she knew that word-for-word translation was not an effective method of L2 production, she had no other choice. This incompetence and the cognitive processing required for translation caused delays in production and lowered her WTC. In one last situation, participants' perception of accurate language and fluent production improved their WTC. For instance, William perceived his speech as highly fluent, and this improved his WTC throughout the entire task two.

The other situations involved reciprocal interactions between WTC and cognitive-affective factors. In one case, after a lexical search that caused some pauses, Pouya felt uncertain whether a phrase he had retrieved communicated his thoughts. At some point, he realized that he did not have the knowledge of the word, and the whole dynamic lowered his WTC. In another instance, Lili detected inaccurate speech and made an unsuccessful attempt to self-correct, which led to dysfluent speech and lowered WTC. The third instance was when Hero had assumed he would have no issues discussing a topic. However, a few seconds into the task he realized that, while he possessed the background knowledge, he lacked the lexical and grammatical resources to express his thoughts. Therefore, he initiated a process of word-for-word translation, whose cognitive demands turned out to be above his processing capacity and affected his speech significantly. The whole dynamic lowered his WTC. One last case involved Anita discussing a familiar topic for which she had the required lexis. She found it unchallenging to access and retrieve the linguistic resources, which increased her WTC.

The Interconnectedness Between Factors Underlying WTC

Dynamic systems have multiple interconnected subsystems that interact and determine the trajectory of the system. The results of this study, though preliminary, reflect the interconnectedness between WTC its underlying cognitive-affective factors, including cognitive factors, linguistic factors, content message, and the participants' self-perceptions. Some of these factors appeared to play a role as the participants planned their speech. At this stage, the participants either possessed supporting ideas or recalled personal, educational (e.g., articles or courses), or prior communication experiences, which sometimes offered the participants some linguistic resources. The availability of content messages generally improved WTC, while lack of supporting ideas lowered WTC. During speech production, the linguistic knowledge, mainly vocabulary, and cognitive factors, such as lexical retrieval, sentence construction, and recalling or generating new supporting ideas played important roles. On the other hand, failures in retrieval or sentence construction typically led to delays, pauses, or repetitions, which almost always lowered WTC. Once the speech was produced, the participants' self-perception of their speech, or what may be called self-perceived performance, exerted a three-fold effect on WTC. From a speech production point of view, the process of self-monitoring not only imposed cognitive demands on the speech production system as speech was being produced but also occupied the speaker's mind if the produced speech was flawed (e.g., inaccurate, dysfluent, mispronounced, etc), which in turn troubled the planning and articulation of upcoming utterances. This would also likely result in pauses that many of the participants perceived as inhibitors of WTC.

CONCLUSION

The present idiodynamic study built on the findings of previous dynamic WTC research to provide additional and more concrete evidence for the interconnectedness between the cognitive and linguistic factors underlying WTC and the ways these interact and influence each other. Three patterns of interconnectedness were identified: (1) WTC and linguistics factors; (2) WTC and cognitive factors; and (3) WTC, linguistics, and cognitive factors. More specifically, not only did the cognitive-linguistic factors directly bring about WTC shifts, but the findings suggested that these

factors interact with other factors like the availability of content message and self-perceived performance, and this interaction resulted in WTC shifts, all of which point to the interconnectedness in WTC.

This study also carries implications for the L2 classroom. In fact, designing activities and tasks around topics about which learners have prior knowledge and experience can increase learners' confidence and their chance of engaging in class activities. More importantly, since the linguistic factors and cognitive factors were found to interact with each other as interconnected components underlying WTC, L2 teachers can benefit their students by not only providing and practicing linguistic resources (e.g., lexical items and grammar structure required for a given task) prior to speaking tasks but also by providing ongoing cognitive support as the students engage in speaking throughout the tasks. This could include helping learners with lexical recall, providing visual and oral lexical and grammatical hints, and providing positive feedback (e.g., approving facial expressions or gestures) when appropriate lexical items or accurate structures are used or when self-corrections are performed successfully. L2 teachers are also encouraged to instill the belief that inaccuracies and dysfluencies occur as part of the language learning process and thus should not discourage learners from participating in class activities. In fact, the results of this study revealed that more practice and prior conversational experiences improved the participants' confidence and WTC; therefore, ample communication opportunities in the classroom can promote the learners' WTC to engage in future communication opportunities when similar topics are being discussed, or previously rehearsed lexical and grammatical resources are required.

This study is not without limitations, one of which was the use of monologic speaking tasks and the laboratory-based nature of the data collection context. Classroom-based studies with authentic communication opportunities that involve multiple interlocutors, rather than a single researcher, could offer a more realistic understanding of the situational and environmental factors that interact and shape WTC in real-time. Examples of this are Cao's (2011) study employing the ecological perspective or Peng's (2012) study that adopted Bronfenbrenner's ecosystems framework. Both studies highlighted the role of environmental and situational factors, which were possibly overlooked due to the nature of the speaking tasks. The idiodynamic application may not lend itself to more authentic communicative situations; however, recent dynamic WTC studies have used self-report grids in the classroom (Pawlak & Mystkowska-Wiertelak, 2015) and

synchronous (Nematizadeh & Cao, in preparation) contexts. The second limitation pertains to the length of speech samples collected. Due to the use of the idiodynamic method, three-minute speech samples were collected to impose lesser memory demands on the participants when

recalling and rating their WTC after completing the speaking tasks; therefore, longer speech samples will most likely provide a more thorough picture of the complexity of the interactions between the linguistic and cognitive factors underpinning WTC.

Author Contributions

The author alone contributed to all stages of research planning, designing, data collecting, analyzing, interpreting the results, and writing the manuscript reported in this study.

Ethics Approval & Consent to Participate

All participants provided informed consent prior to enrollment and data collection in the study.

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APPENDIX

Complete Coding Scheme

Theme types	Themes ↓	Participants →																		Total			
			Niki	Pouya	Linda	Sara	Majid	Pedi	Samaneh	Mohsen	Saba	Lili	Mo	Sahra	Hero	Sepehr	William	Anita	Soha		Mehrzad	Akbar	Kaarni
Supporting ideas/arguments	Possession of support ideas/examples		3	0	6	2	5	5	5	3	2	4	9	3	8	7	3	3	5	7	4	8	92
	Lack of support ideas/examples		2	1	5	4	2	6	3	1	1	1	4	2	4	1	2	3	3	2	2	3	52
	Discussing impromptu ideas		0	0	0	0	1	0	0	1	0	0	0	0	2	1	0	0	0	0	0	0	5
	Perceived inappropriacy or irrelevance of ideas		0	0	1	1	0	1	0	0	0	1	0	0	1	1	2	0	1	0	0	0	9
	Perception of successful argument		0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	2	6
	Unsuccessful communication of ideas		0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	2	0	1	1	7
Individual	Personal Interest or disinterest		0	3	0	0	0	1	1	5	0	5	4	1	1	2	1	4	0	0	0	0	28
	Experience		3	2	2	1	0	1	5	3	4	5	5	1	3	1	1	2	4	2	9	5	59
	Personal beliefs		1	1	2	2	0	0	2	0	1	8	0	1	0	0	1	4	1	1	0	0	25
	Daily routine/habit		0	2	1	1	0	2	1	2	2	1	0	1	0	0	0	0	0	0	2	1	16
	Recent conversation		1	0	0	1	0	0	0	0	0	1	3	1	0	0	1	0	0	0	6	0	14
	Accomplishment		0	1	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	4
Lexis-related (linguistic/cognitive)	(Perceived) lexical knowledge		0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	1	0	5	
	(Perceived) lack of lexical knowledge		0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	3	0	0	5
	Retrieval/search success		1	0	2	4	4	0	0	7	1	3	0	4	1	0	4	1	1	7	1	3	44
	Retrieval/search failure		4	0	2	1	5	0	0	2	2	1	5	6	1	3	1	1	1	3	2	1	41
	Lexical Repetition		0	0	0	1	2	1	0	2	0	0	1	3	0	0	0	0	0	1	1	1	13
	Perceived lexical appropriacy/inappropriacy		0	5	3	0	2	0	0	2	0	0	1	1	0	1	0	0	1	1	1	1	19
Contextual	Topic	Knowledge	0	0	0	6	0	0	0	0	1	1	1	1	1	1	2	2	1	1	0	1	18
		Familiarity	0	2	4	0	0	0	2	0	1	0	1	0	0	0	1	0	0	1	0	0	12
		Transition	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	5
	Interviewer effect		0	0	2	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2	0	1	7
Camera/recording effect		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	
Organizational	Jotted-down notes		0	3	2	1	1	3	1	0	0	1	0	1	1	0	1	1	0	3	2	1	22
	Discussion plan		1	0	1	0	3	0	0	0	0	0	0	0	0	1	1	0	1	2	2	0	12
Grammar-related (linguistic/cognitive)	Sentence construction		0	0	1	0	2	0	0	0	1	0	1	0	0	1	1	0	1	2	6	1	17
	Perceived inaccurate Speech		1	1	1	1	1	0	0	1	0	1	0	2	1	2	0	0	0	1	0	2	15
Self-perceived performance	Control over language		0	0	1	0	1	0	0	2	0	0	0	0	0	0	0	1	0	0	1	6	
	Fluent speech		0	0	1	0	1	0	0	4	1	0	1	0	3	0	4	0	0	0	1	3	19
	Dysfluent speech		0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5