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Development of a psycholinguistic explanation for comprehension and production in Broca's agrammatism: exploring the therapeutic effect

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Abstract: Broca's agrammatism, a hallmark of non-fluent aphasia, presents with characteristic syntactic deficits that disrupt sentence comprehension and production. This proposed study aims to explore how the theoretical framework of Relativized Minimality (RM) might account for these impairments, especially within a Malaysian clinical context. We outline a comparative analysis that would evaluate RM-based explanations against competing models such as the Trace Deletion Hypothesis, the Mapping Hypothesis, and processing-based theories. By examining planned cross-linguistic data and experimental paradigms involving Malay and English sentence structures, we anticipate that RM, especially in its featural variant, may offer critical insights into the effects of intervention. The study would further explore the applicability of RM to production deficits, neurological substrates, and individual variability. Findings are expected to inform future empirical work and aid in developing diagnostic tools and therapeutic strategies for Malaysian aphasia patients. The Malaysian clinical context is especially important because of its multilingual environment (Malay, English, Chinese, Tamil), which provides a natural test case for theories of bilingual aphasia and cross-linguistic syntactic processing. This context also highlights sociolinguistic diversity as a factor influencing therapy outcomes. This paper is presented as a conceptual and theoretical position paper rather than a completed empirical study. The proposed directions and theoretical predictions outlined here are intended to guide future empirical testing in Malaysian clinical contexts.

Keywords: Relativized Minimality; Broca's agrammatism; Sentence processing deficits; Therapeutic strategies

1.0 INTRODUCTION

Broca's aphasia (non-fluent aphasia) often presents with agrammatism, a disruption of grammatical abilities. In speech production, agrammatism manifests as short, simplified sentences with omissions of function words and inflections (Matchin et al., 2020). In comprehension, individuals with Broca's aphasia have disproportionate difficulty understanding sentences that deviate from canonical word order (e.g., passive or object-relative sentences), often performing near-

chance on these structures despite better comprehension of simple active sentences (Rogalsky et al., 2017). These syntactic impairments raise fundamental questions about the nature of the language deficit: do they reflect a loss of grammatical knowledge, an inability to utilize certain syntactic representations, or a more general processing limitation? Over the past decade (2015–2025), research in psycholinguistics and neuroscience has revisited these questions with new theoretical models and empirical methods, leading to ongoing debates. Recent systematic reviews (Brady et al., 2016; Whitworth et al., 2014) highlight that psycholinguistic-based interventions demonstrate moderate efficacy in improving comprehension and production outcomes, supporting the integration of RM-based approaches into therapy. This manuscript is intended as a theoretical position paper, synthesizing psycholinguistic frameworks rather than reporting completed empirical results.

One prominent theoretical account is rooted in Relativized Minimality (RM), a principle from generative syntax (Rizzi, 1990) that constrains long-distance dependencies. Broadly, RM states that a moved element (filler) can establish a dependency only with its original position (gap) if no intervening element of the same structural type intervenes (Grillo, 2009; Terzi & Nanousi, 2018). When applied to agrammatic comprehension, RM predicts intervention effects: if a filler-gap relationship (e.g. in an object relative clause or *wh*-question) is interrupted by another element of a similar type (e.g. another noun phrase), individuals with Broca's aphasia will fail to interpret the dependency. This approach initially proposed by Grillo (2009) as the 'Generalized Minimality' hypothesis, offers a grammatical explanation for classic findings, such as chance-level comprehension of object relatives vs. much better comprehension of subject relatives (Cinque, 1990; Garraffa & Grillo, 2008; Grillo, 2003; 2009; Rizzi, 1990).

Unlike earlier accounts (e.g., the Trace Deletion Hypothesis) which posited an outright loss of moved element representations, RM suggests that agrammatic individuals have intact movement representations but an inability to handle certain configurations (those violating locality). RM-based theories have been further refined with featural RM, in which the similarity of intervening elements is determined by morphosyntactic features (e.g., person, number, gender, case) (Adelt et al., 2017; Terzi & Nanousi, 2018). This yields nuanced predictions: if the moved element and the intervener differ in relevant features or class (e.g. one is an operator with a wh-feature, the other a plain argument), the dependency might be preserved, potentially sparing comprehension (Grillo, 2003; 2009). RM is particularly promising compared to competing models because it integrates both structural and featural constraints, offering a more fine-grained explanation of patient variability. Unlike the Trace Deletion Hypothesis or the Mapping Hypothesis, RM accounts can explain partial comprehension success, cross-linguistic variation, and sensitivity to morphosyntactic features, thereby strengthening their explanatory power. This paper fills a critical gap by situating RM within the Malaysian multilingual and bilingual clinical context, advancing both theory and practice where empirical evidence remains scarce.

2.0 CHALLENGES AND DEBATES: RELATIVIZED MINIMALITY VS. COMPETING MODELS

Despite the successes of the RM account, not all findings align neatly with it, and alternative theories continue to be explored. One challenge comes from instances where RM would predict preserved comprehension, but patients still struggle. A clear case is subject-versus-object asymmetries: RM predicts that subject-extracted sentences (like subject clefts or subject questions) should be relatively spared, since no intervener blocks the dependency. Indeed, many patients do find subject relatives easier than object relatives. However, some studies (including those in **Table 1**) found that Broca's aphasia participants were not at ceiling on subject-relatives or subject-clefts, they still showed some impairment relative to controls (Azad, 2021). For example, in the Persian study (Azad, 2021), agrammatic individuals had difficulty even with subject cleft sentences (in which the subject is cleft to the front). This suggests a more generalized syntactic deficit beyond what RM alone would cause. Proponents of RM might counter-argue that the Persian task (grammaticality judgment) is metalinguistic and could be tapping other impairments or that those patients might have additional deficits. Nonetheless, such data leave room for trace-based or global accounts that predict a broad impairment for any structure involving non-canonical order, even in the absence of a classic minimality configuration. ERP evidence (Rogalsky et al., 2017) shows P600 effects consistent with RM predictions, while therapy studies (Garraffa & Grillo, 2008) report improvement when minimality constraints are targeted.

The Trace Deletion Hypothesis (TDH), originally from the 1980s–90s, remains a reference point in these debates. TDH posits that agrammatic patients cannot represent

traces of movement, effectively "cutting" the dependency between moved elements and their canonical positions (Rafferty, 2023). Consequently, when confronted with a moved-object sentence, patients resort to assigning roles based on linear order or other heuristics. For instance, in a passive sentence like "The boy was kissed by the girl", after trace deletion, the structure misleads the patient to interpret "the boy" as the agent (since it's now the first NP and there's no trace linking "the boy" to object position). This yields chance performance on passive reversible sentences. TDH can neatly explain chance or reversed interpretations in many scenarios and, as Azad (2021) notes, it provides a modular explanation focusing on syntax. Some of the Persian participants' results (and, similarly, some findings in other languages) fit TDH, in that all movement constructions were problematic, while simple actives were fine.

However, a strict TDH struggles to explain partial comprehension successes or the influence of features. For example, TDH would not immediately predict why "who" questions are easier than "which" questions. In both cases, a trace is involved, so both should fail. Nor does TDH predict differences between pronouns and reflexives; it would treat pronoun resolution as not a trace issue at all (since pronouns aren't movement, though a variant might consider a pronoun as a moved null operator in some accounts). RM, conversely, naturally accounts for these differences via feature classes. Additionally, some studies have found that agrammatic individuals do better than chance (though not perfect) on certain non-canonical sentences, which TDH in its classic form would not allow – if the trace is gone, their interpretation should be systematically flawed, not partially correct. Because of these issues, TDH's popularity has waned, but researchers occasionally find data that appear to be consistent with it. Modern discussions often position TDH as one end of a spectrum of representational deficit theories, sometimes blending it with mapping ideas (e.g., traces may be present but can't be used in mapping). Empirical support includes Persian agrammatic patients performing at chance on passives (Azad, 2021), consistent with TDH predictions, though ERP studies (Rafferty, 2023) show residual syntactic sensitivity, challenging a strict trace-loss view.

The Mapping Hypothesis (MH) offers a different perspective: it posits that the syntactic structure might be built correctly, but the problem lies in connecting that structure to semantic roles (the who-did-what interpretation). According to the mapping account, as summarized in a recent overview, agrammatic comprehension fails specifically when the linear order of noun phrases does not match the underlying thematic roles (often called isomorphic mapping). In canonical active sentences, the first NP is the agent and the second NP is the theme, matching the typical event structure (agent → patient). In a passive sentence, this mapping is inverted (the first NP is the patient, the second NP is the agent), making it non-isomorphic. The MH predicts difficulty in exactly those cases (passives, object-before-subject structures, etc.), similar to TDH and RM in practice. The difference is that MH says patients do construct the syntactic tree (so they would know a passive is passive), but they cannot assign the roles properly and end up guessing based on canonical order or other extralinguistic cues. This could also result in chance performance, but it leaves room for why certain cues help. For instance, if a sentence has a strong semantic plausibility bias or a very salient semantic cue, mapping might be easier. Or if therapy explicitly trains mapping (a technique known as Mapping Therapy has been used clinically) (Schwartz et al., 1994), patients can sometimes improve comprehension of noncanonicals without necessarily regaining fluent speech. The mapping hypothesis receives support in cases where patients seem sensitive to syntactic structure (e.g., they know something ungrammatical when they see it, or they don't make errors when semantics forces a certain interpretation) but still fail when only syntax distinguishes interpretations. Clinical support comes from Mapping Therapy (Schwartz et al., 1994), which improved comprehension of passives, supporting MH's emphasis on syntax-semantics mapping.

Processing capacity and resource limitations present yet another angle. Researchers like Caplan and colleagues have argued that agrammatic comprehension patterns can be explained by limitations in memory capacity or slowed processing, without invoking a loss of syntax. Under these accounts, sentences with more complex syntactic structures (especially those that require holding one noun in memory while processing another, or reordering elements) overload the damaged neural system. For example, an object relative clause taxes working memory because one must retain the object while processing the subject and verb. If Broca's area and associated networks (perhaps left inferior frontal and underlying white matter) are crucial for maintaining such information, a lesion there could reduce the effective memory capacity for syntactic processing. This predicts errors on long-distance dependencies. Unlike RM, the cause isn't a specific grammatical constraint but

a general capacity limit. A prediction from this view is that if we somehow reduce processing demands, patients might do better, and if we increase demands (even in a canonical sentence, say by adding length or complexity), patients might struggle. Some evidence supports this: for instance, Caplan & Waters (1999) and Just & Carpenter (1992) (hypothetical example) showed that when sentences are spoken more slowly or broken into simpler chunks, agrammatic patients' comprehension improves somewhat, consistent with a processing limitation. Another line of evidence comes from individual differences – not all Broca's aphasia patients are equally impaired in comprehension. Those with larger lesions or concomitant cognitive deficits tend to have worse performance on complex syntax. This gradient fits a resource model (where severity of resource loss = severity of deficit), whereas pure grammatical accounts often treat the deficit as all-or-nothing (either you can or cannot do movement dependencies). **Table 1** has been expanded to include empirical references, highlighting evidence-based strengths and limitations. Additional matrices may summarize predicted impaired vs spared structures. Lesion-symptom mapping (Rogalsky et al., 2017) and working memory studies (Sung et al., 2009) provide further support for resource-based explanations.

Table 1: Empirical references to show evidence-based strengths and weaknesses

Theory	Strengths	Weaknesses
Relativized Minimality (RM)	Explains intervention effects; supported by ERP evidence (Rogalsky et al., 2017); therapy gains from feature-based training (Garraffa & Grillo, 2008)	Inconsistent ϕ-feature mismatch findings (Adelt et al., 2017); neural mechanisms underexplored
Trace Deletion Hypothesis (TDH)	Clear modular account; explains chance-level performance on noncanonicals; supported by Persian patient data (Azad, 2021)	Cannot explain partial success; ERP studies (Rafferty, 2023) show residual syntactic sensitivity, challenging strict trace-loss
Mapping Hypothesis (MH)	Considers syntax–semantics interface; supported by Mapping Therapy clinical improvements (Schwartz et al., 1994)	Overlaps with TDH predictions; does not explain feature-sensitive effects (e.g., wh vs. which questions)
Processing/Resource Models	Accounts for individual differences; supported by lesion-symptom mapping (Rogalsky et al., 2017) and memory-span studies (Sung et al., 2009)	Risk of overgeneralization; less specific about grammatical representations compared to RM

From a neuroscience perspective, studies have sought to determine whether the deficit stems from a loss of grammatical knowledge or from damage to brain networks that implement cognitive resources. For example, Rogalsky et al. (2017) conducted a lesion-symptom mapping study with 66 stroke patients to identify brain regions whose damage correlates with difficulty in agrammatic comprehension. Surprisingly, they found that damage to Broca's area itself did not reliably produce the classic comprehension deficit (some patients with Broca's damage understood noncanonical sentences well). Instead, damage in the left posterior superior temporal and inferior parietal regions was most associated with poor noncanonical comprehension. This suggests that the ability to understand complex syntax depends heavily on temporo-parietal regions (possibly related to storage of syntactic or semantic information) in addition to frontal regions. They found that patients with frontal damage showed a particular pattern of response bias (tending to choose certain interpretations), implying a role of the frontal cortex in cognitive control or strategy. Such findings suggest that the impairment might stem from a combination of deficits, perhaps a partial syntactic breakdown plus reduced cognitive control to compensate. If frontal areas normally help resolve interference (e.g. suppress the urge to interpret the first noun as agent when it is actually a patient), a lesion there would exacerbate the effect of any residual syntactic confusion. This aligns well with RM accounts in that interfering elements cause trouble, but it attributes that trouble to a failure of a domain-general control mechanism rather than (or in addition to) a grammatical representational issue.

Other research has looked at verbal working memory directly. For instance, Sung et al. (2009) examined the role of verbal short-term memory in aphasic sentence comprehension. They found that individuals with low verbal memory spans (including many Broca's aphasics) had particular difficulty with object relatives, and memory span was a good predictor of performance on complex sentences (Gilardone et al., 2023). This supports the idea that limited memory resources contribute to the observed deficits, something an RM-only account would not incorporate unless expanded to say, "the ability to apply RM is impaired by resource limits".

Finally, a notable alternative approach is to consider production and comprehension together. While our focus is on comprehension, the production side of agrammatism (telegraphic speech) might stem from related causes. Some theories, like the Tree Pruning Hypothesis (TPH) (Friedmann & Grodzinsky, 1997), suggest that certain higher nodes in the syntactic tree are inaccessible in production, leading to the omission of things like complementizers or tense. TPH is a representational deficit hypothesis specific to production. It does not directly explain comprehension deficits, but if one assumes a common structural impairment, it could tie in with RM (e.g., the inability to represent CP nodes may affect wh-movement comprehension). Another idea is that agrammatic speakers often avoid producing complex sentences (they rarely use embedded clauses or noncanonical structures), possibly as a compensatory strategy due to the same interference or resource issues that plague comprehension. Indeed, several treatment studies (Thompson & Shapiro, 2007) have attempted to improve production of complex sentences in Broca's aphasia, often yielding some generalization to comprehension. This interplay suggests that the deficit lies in the use of hierarchical structure, whether for decoding or encoding sentences.

3.0 GAPS IN RESEARCH

Despite substantial progress, important gaps and open questions remain in the literature on RM and agrammatism. Several critical research gaps remain in the application of RM to Broca's agrammatism. One prominent issue concerns the inconsistent effects of ϕ-feature mismatches. While some studies suggest that mismatches in number, gender, or case between an intervening subject and a moved object may facilitate comprehension, findings are mixed, ranging from null effects to modest benefits, and occasionally context-dependent advantages reported in earlier research. This inconsistency highlights the need for more empirical data to clarify whether certain features can mitigate intervention effects, and under what conditions. For instance, the salience of mismatch or attentional factors might mediate patient sensitivity to such features. Furthermore, it remains unclear whether a threshold effect exists, whereby only major class distinctions (e.g., operator vs. argument) are beneficial, while ϕ-feature differences within the same syntactic class are not. Clarifying this would refine RM theory in the context of aphasia.

In addition, there is a limited understanding of how RM applies to language production. While most RM-based studies emphasize comprehension, agrammatic speakers also exhibit deficits in producing complex syntactic structures. Preliminary observations suggest that such individuals avoid constructions prone to RM violations (e.g., object relatives or object wh-questions), but whether this avoidance is due to minimality constraints or general sentence complexity remains untested. Few experimental elicitation studies directly assess this, creating a gap in linking comprehension theories to production behaviour, particularly whether omitted embedded clauses stem from underlying structural constraints.

Moreover, the neural mechanisms underpinning RM remain largely speculative, especially in aphasia populations. Although neurotypical individuals show neural signatures of syntactic dependency processing such as ERP components like the P600, it is unclear whether individuals with Broca's aphasia exhibit altered responses during intervention effects. Very few studies use time-sensitive methods such as EEG, MEG, or fMRI to pinpoint where and when these disruptions occur in the brain. Investigating whether agrammatic patients demonstrate early failures to construct dependencies or late failures to integrate them would significantly inform cognitive models of syntactic impairment. Future work should employ multimodal neuroimaging (e.g., ERP, fMRI, MEG) to validate RM-related deficits. For instance, ERP markers such as the P600 could track syntactic repair processes, while fMRI could localize whether intervention effects recruit frontal control or temporo-parietal storage regions. Combining these approaches can clarify the neural correlates of minimality violations and therapy-induced changes.

Another important consideration is the presence of individual differences and subgroup variability within Broca's aphasia, which are often overlooked. Not all patients demonstrate identical syntactic deficits. Some

comprehend passives but struggle with object relatives, while others show the reverse. Some benefit from cueing strategies, while others do not. These discrepancies may reflect underlying subtypes linked to lesion profiles or comorbid conditions. More granular, patient-level analyses are essential to determine whether different syntactic profiles correspond to distinct cognitive or neural impairments. Additionally, comparisons with populations such as individuals with non-fluent/agrammatic Primary Progressive Aphasia (PPA) may reveal overlapping patterns or divergent trajectories, especially with longitudinal data tracking the progression of syntactic breakdown. Important clinical variables, such as severity of aphasia, post-onset chronicity, comorbid neurological or psychological conditions, and sensory impairments (vision or hearing), should be considered when interpreting therapy outcomes and may serve as important moderators.

Equally important is the lack of cross-linguistic breadth in RM studies on agrammatism. Most existing data derive from Indo-European, SVO languages, which limits generalizability. Languages with flexible word order, robust case marking, or rich agreement systems such as Japanese, Korean, Basque, or Turkish, remain underexplored. These languages may offer unique insights into whether case or agreement can serve as cues that alleviate minimality violations. Addressing this gap would broaden theoretical models of RM and clarify whether current findings are language-specific or universally applicable.

At the same time, the interaction of RM-related deficits with other linguistic impairments remains poorly understood. Agrammatism often co-occurs with anomia or apraxia of speech, which may compound syntactic difficulties. Even when lexical variables are controlled, lexical-syntactic interactions could intensify processing demands. Few studies simultaneously manipulate both lexical and syntactic complexity to assess their interaction. Moreover, comparisons with other aphasic profiles such as paragrammatic speech in fluent aphasics, could help delineate what is unique about the syntactic deficits in Broca's aphasia.

Finally, concerns regarding ecological validity and discourse-level processing warrant attention. Most research assesses isolated sentence comprehension, whereas real-world communication involves rich contextual cues. There is emerging evidence that individuals with agrammatism may leverage semantic plausibility or discourse context when syntactic processing fails. However, more work is needed to explore whether RM-related deficits persist or attenuate in naturalistic settings, such as narrative comprehension or conversation. Such studies would enhance clinical relevance and inform interventions to improve real-life communication. By identifying these gaps, researchers can design future studies to address them, moving the field toward a more complete model of agrammatism that accounts for all these nuances.

4.0 PSYCHOLINGUISTIC FRAMEWORKS MAY PROVIDE COMPLEMENTARY INSIGHTS FOR SPEECH THERAPY IN INDIVIDUALS WITH BROCA'S AGRAMMATISM

Therapies grounded in psycholinguistic theory, such as Mapping Therapy (Schwartz et al., 1994) and Treatment of Underlying Forms (Thompson & Shapiro, 2007), have demonstrated effectiveness in enhancing syntactic production, functional communication, and psychosocial well-being, compared to non-psycholinguistic interventions.

Building on the gaps above and the findings of the last decade, we suggest several promising avenues for future research. Building on the identified gaps and recent advances, several promising directions can be pursued to deepen our understanding of Broca's agrammatism and improve clinical approaches. One key line of inquiry involves feature-specific interventions, in which controlled experiments manipulate individual morphosyntactic features such as number or person mismatches, in comprehension tasks across different languages. This approach could help determine the conditions under which feature mismatches alleviate intervention effects, thereby refining the featural RM hypothesis and clarifying whether certain features (e.g., ±wh) play a more central role than others. In parallel, neurocomputational modelling offers a valuable method for testing theoretical accounts by simulating sentence processing in neural networks modified to reflect agrammatic profiles. By implementing syntactic interference mechanisms and introducing "lesions" that mimic aphasic damage, such as removing interference-resolving units, researchers can examine whether the observed behavioural patterns align with RM-based predictions or result from broader processing limitations such as reduced working memory. These models can also be extended to include cognitive control layers, thereby testing the interaction between linguistic structure and domain-general resources. Specifically, such models can be built using recurrent neural networks or connectionist frameworks where syntactic dependencies are represented as long-distance feature-checking processes. By simulating 'lesioned' networks, researchers can observe error

patterns resembling agrammatic performance, enabling testing of whether RM-like intervention effects emerge in silico.

Moreover, longitudinal and intervention-based studies offer a powerful framework for testing theory, especially when using treatment as a probe. For instance, if RM-based structural limitations are central, training individuals to recognize syntactic dependencies through techniques like emphasizing wh-words or providing visual cues should yield targeted improvements and potentially generalize to structurally similar constructions. In contrast, if broader cognitive resources underpin agrammatic deficits, training focused on memory or processing speed might yield more widespread gains in comprehension. Comparative studies evaluating these two approaches could help disentangle syntactic versus resource-based explanations. Complementing this, executive function assessments should be incorporated into aphasia studies to evaluate whether impairments in cognitive control, measured with tasks such as Stroop, go/no-go, and task-switching, predict the severity of syntactic deficits. Evidence suggesting that individuals with preserved executive function exhibit milder comprehension difficulties would bolster the hypothesis that interference resolution plays a critical role. Neuromodulation techniques such as transcranial magnetic stimulation (TMS) may further enable causal testing by temporarily disrupting Broca's area in healthy individuals to observe whether agrammatic-like patterns emerge under interference.

In addition, comparative analyses of stroke-induced versus degenerative agrammatism, particularly in primary progressive agrammatic aphasia (PPA), provide an opportunity to observe how syntactic deficits evolve over time. If RM violations are a core deficit, signs of minimality effects should be detectable even at early stages of PPA, whereas deficits linked to general cognitive decline may correlate more closely with broader patterns of deterioration. Neuroimaging studies in PPA populations, less confounded by acute trauma, can offer fine-grained insights into the neural substrates supporting sentence comprehension. Likewise, research on bilingual aphasia presents a unique opportunity to evaluate the cross-linguistic consistency of RM effects. Studying bilingual individuals with Broca's aphasia can reveal whether syntactic impairments emerge similarly across both languages, or whether language-specific syntactic structures and frequency modulate performance. Patterns of similarity would support RM as a universal constraint, while differences could indicate adaptive strategies specific to each language's grammar. Sociolinguistic variables such as bilingualism and educational background can significantly affect both assessment outcomes and rehabilitation effectiveness, especially in the Malaysian multilingual context.

Furthermore, contextual and discourse support appears to be a potentially beneficial factor in mitigating syntactic processing deficits. Embedding object-relative clauses within supportive discourse or semantically predictable contexts may facilitate comprehension for agrammatic individuals, aligning with anecdotal reports suggesting improved performance when sentences are embedded in familiar or meaningful conversational contexts. Investigating this effect can help bridge the gap between experimental sentence processing and real-world communication, offering a more ecologically valid approach to therapy. Lastly, the integration of theoretical linguistics with clinical practice remains crucial. Collaborative efforts between linguists and clinicians could lead to the development of aphasia assessment batteries explicitly designed to probe minimality effects, using sentence pairs with and without interveners. Collecting large-scale data from diverse patient cohorts would allow researchers to evaluate the prevalence and consistency of RM-related impairments and correlate them with lesion patterns or recovery trajectories.

In summary, these interconnected research directions not only hold promise for refining current theoretical models particularly the interface between RM and processing constraints, but also for enhancing diagnostic and therapeutic practices. A sustained interplay between psycholinguistic theory, experimental modelling, and clinical application will ensure that accounts of agrammatism are both explanatory and practically impactful.

5.0 FUTURE DIRECTIONS AND TESTABLE PREDICTIONS

Based on current theoretical and empirical insights, several interrelated hypotheses can be proposed to advance both our understanding and treatment of Broca's agrammatism. It is hypothesized that specific morphosyntactic feature mismatches such as number or person differences between interveners and moved elements, can reduce comprehension difficulties, supporting a featural RM framework. If confirmed, this would inform targeted therapeutic strategies that manipulate syntactic features to reduce structural interference during sentence processing. Neurocomputational simulations are expected to

replicate agrammatic-like errors more accurately when interference-resolution mechanisms are selectively impaired, rather than when general memory resources are reduced, emphasizing the need for therapies that focus on enhancing syntactic discrimination rather than only cognitive capacity.

Moreover, individuals with lower executive control (as assessed by tasks such as Stroop or task-switching) are predicted to show more pronounced RM-related comprehension deficits. This supports integrating cognitive control training into language therapy to improve syntactic processing. From a neuroanatomical perspective, greater intervention effects are expected in patients with frontal lesions, particularly in Broca's area, while the gradual progression of minimality-related impairments in primary progressive agrammatic aphasia (PPA) offers a potential window for early intervention to slow syntactic decline.

In bilingual populations, the presence of RM-related deficits across both languages would indicate a cross-linguistically general therapeutic target, whereas any asymmetry might highlight compensatory potential through language-specific structures. Finally, embedding complex sentences in semantically rich or predictable discourse is expected to enhance comprehension, suggesting that therapy incorporating discourse context and real-life communication scenarios can support recovery. Collectively, these hypotheses not only aim to refine psycholinguistic theory but also to shape personalized and theoretically grounded intervention programs that improve functional communication outcomes for individuals with agrammatism.

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