DKYAD Dil, Konuşma ve Yutma Araştırmaları Dergisi

Review

Beyond Line Drawings and Photographs: A Narrative Review on the Potential Use of AI-Assisted Images in Acquired Language Disorders

Şevket Özdemir [1], Şükriye Kayhan Aktürk[2], Eda İyigün Uzunöz[3], Aylin Müge Tunçer[4]

[1]Sorumlu Yazar, Dr. Öğr. Üyesi, Muğla Sıtkı Koçman Üniversitesi, Sağlık Bilimleri Fakültesi, Dil ve Konuşma Terapisi Bölümü. ORCID No: 0000-0002-1230-6491, sevketozdemir@mu.edu.tr

[2]Dr. Öğr. Üyesi, Muğla Sıtkı Koçman Üniversitesi, Sağlık Bilimleri Fakültesi, Dil ve Konuşma Terapisi Bölümü. ORCID No: 0000-0003-4678-3795, sukriyeakturk@mu.edu.tr

[3] Dr. Öğr. Üyesi, Muğla Sıtkı Koçman Üniversitesi, Sağlık Bilimleri Fakültesi, Dil ve Konuşma Terapisi Bölümü. ORCID No: 0000-0003-3752-0918, edaiyigun@mu.edu.tr

[4] Dr. Öğr. Üyesi, Muğla Sıtkı Koçman Üniversitesi, Sağlık Bilimleri Fakültesi, Dil ve Konuşma Terapisi Bölümü. ORCID No: 0000-0001-7372-5967, aylinmugetuncer@mu.edu.tr

Sorumlu Yazarın Adresi: MSKU, SBF, DKT. Bölümü, Menteşe, 48000, Muğla

Bu makaleyi kaynak göstermek için/To cite this article: Özdemir, Ş., Kayhan Aktürk, Ş., İyigün Uzunöz, E. & Tunçer, A. M. (2025). Beyond line drawings and photographs: a narrative review on the potential use of AI-assisted ımages in acquired language, *Dil, Konuşma ve Yutma Araştırmaları Dergisi, 8(1)*), 60-86.

Gönderim Tarihi: 05.12.2024

Kabul Tarihi: 03.03.2025

DOI: https://doi.org/10.58563/dkyad-2025.81.4

ABSTRACT

Purpose: This review aims to delve into the question of whether artificial intelligence (AI) could be used to create images that are linguistically and culturally relevant for individuals with acquired language disorders with specific consideration of Turkish. Images are one of highly preferred stimuli among acquired language disorders both in research and clinical contexts.

Method: A narrative review methodology was adopted in the study by synthesizing the findings from previous studies. A literature review was carried out using various databases including Web of Science, Scopus, and EBSCO with search terms including "acquired language disorders", "aphasia", "image research", "artificial intelligence", "text-to-image generation", and "prompt engineering".

Results: Previous studies on image research including neurotypical adults and individuals with aphasia were introduced to draw a comprehensive picture of what ideal image characteristics would involve. The potential uses of AI in acquired language disorders were discussed with particular focus on image generation tools by unraveling the options of image generation, practice of writing prompts, potential benefits and challenges of text-to-image generation tools, and the need to consider cultural and linguistic diversity in the formation of images.

Conclusion: There is a lack of research that embodies AI and image research together, which means that there needs to be a close collaboration between the researchers in the field of AI and those in the aphasia rehabilitation. Regarding languages other than English, AI-generated image tools need to consider the unique linguistic and cultural characteristics of the languages concerned. It is suggested that the use of these tools should be promoted among speech and language therapists in their clinical practice, and their experiences with these tools should be documented so that image generation could be a part of clinical practice.

Keywords: acquired language disorders, aphasia rehabilitation, artificial intelligence, human-computer interaction, image research, text-to-image generation, Turkish.

DKYAD Dil, Konuşma ve Yutma Araştırmaları Dergisi

Çizimler ve Fotoğrafların Ötesinde: Yapay Zekâ Destekli Görsellerin Edinilmiş Dil Bozukluklarında Olası Kullanımları üzerine Geleneksel bir Derleme

ÖZET

Amaç: Görseller edinilmiş dil bozukluklarında araştırma ve klinik uygulamalarda en çok tercih edilen uyaranlardan biridir. Dil ve konuşma terapistleri (DKT) afazili bireyler için görsel oluşturma, bulma veya seçme sürecinde zorlanabilir. Görsellerin anlamlı ve net olması beklenebilir. Bu sebepten, seçilen görselin karşılık geldiği sözcük, ileti ve kavramları net bir şekilde temsil etmesi gerekmektedir (Brown & Thiessen, 2018; Pierce, 2024). Afazili bireylerin dil becerileri heterojen olabilir ve dil modalitelerine ait performans modaliteye özgü değişkenlik gösterebilir (örn. İşitsel ve yazılı anlama, tekrarlama, adlandırma, okuma, yazma). Bununla birlikte metinden görsel oluşturma araçlarını içeren Yapay Zekâ (YZ) teknolojisindeki son gelişmeler, afazili bireyler için uygun görsel belirleme sürecinde DKT'lere farklı bir seçenek sunabilir. YZ teknolojisi halen gelişmeye devam etmektedir ve YZ destekli görsel oluşturma süreçlerinin görsel araştırmalarına nasıl katkıda bulunacağı merak konusudur. Dolayısıyla, bu derleme YZ'nin edinilmiş dil bozukluğu olan bireyler için dilsel ve kültürel açıdan uygun görseller oluşturmada kullanılıp kullanılamayacağı sorusunu Türkçe özelinde ele almayı amaçlamaktadır.

Yöntem: Bu çalışma geleneksel derleme metodolojisini benimsemiştir. Web of Science, Scopus ve EBSCO veri tabanlarında "edinilmiş dil bozuklukları", "afazi", "görsel araştırmaları", "yapay zekâ", "metinden görsel oluşturma", ve "prompt mühendisliği" arama terimleri kullanılarak Haziran-Ağustos 2024 aralığında alan yazın taraması gerçekleştirilmiştir. Tarama sırasında son 10 yılda yayımlanan çalışmalar (2014-2024) öncelikli olarak incelenmiştir, ancak konunun edinilmiş dil bozukluklarındaki önemini vurgulamak ve kuramsal temellerini ortaya koymak amacıyla 2014 öncesinde yayımlanan bazı kaynaklar da dahil edilmiştir.

Bulgular: Bu amaç doğrultusunda derleme iki bölüme ayrılmıştır: İlk olarak, ideal bir görselde bulunması gereken özelliklerin neler olduğuna dair bilgi vermek üzere sağlıklı ve afazili bireyleri dahil eden görsel araştırmalarından bahsedilmiştir. Devamında, görsel oluşturma araçlarına odaklanarak YZ'nin edinilmiş dil bozukluklarında olası kullanımları hakkında bilgi verilmiştir. Görsel araştırmalarının bulguları incelendiğinde; görselin doğru şekilde tanınması, görselin türü ve bağlamı, görsellerin somut veya soyut olması ile kültürel faktörlerin dikkate alınması gerektiği belirtilmektedir. Görseller arasında özellikle el çizimlerinin araştırma ve klinik bağlamlarda uzun süreden beri kullanıldığı bilinmektedir. Bununla birlikte fotoğrafların popülerlik kazandığı; erişilebilirliği ve düşük maliyeti sebebiyle de bu popülerliğin arttığı bilinmektedir. Son yıllarda YZ'nin gelişmesi ile birlikte, metin üzerinden görsel oluşturma teknolojisinin DKT'ler için önemli bir seçenek olabileceği düşünülmektedir. Bu teknolojinin adlandırma da dahil olmak üzere farklı amaçlarla kullanılabileceği belirtilmektedir. Bu zamana kadar YZ tarafından oluşturulan görsellerin adlandırma veya ilişkili bir dil becerisi bağlamında incelenmediği gözlenmekle birlikte, sadece Pierce (2024) DALL-E 2 tarafından oluşturulan görsellerin işlevselliğini değerlendirdiği bir çalışma gerçekleştirmiştir. Çalışmanın bulguları, isimlere ait görsellerin eylem ve cümlelere kıyasla daha net olduğunu göstermiştir (Pierce, 2024). Derlemenin ikinci bölümünde, edinilmiş dil bozuklukları alanında görsel uyaran kullanan araştırmacı ve DKT'lere yol gösterebilecek birtakım bilgiler sunulmuştur. Öncelikle görsel üretim seçeneklerinden bahsedilmiştir (örn. DALL-E 3 , Midjourney , Stable Diffusion , Glide , Craiyon , gibi). Devamında "kısa ve betimleyici / açıklayıcı metin" olarak tanımlanan prompt hakkında bilgi verilmiş (Lo, 2023), prompt yazımı için ileri düzey bir teknik veya programlama becerisine ihtiyaç duyulmadığı vurgulanmıştır (Adikari ve ark., 2024). Buna rağmen promptun içeriğine ve sonrasında ortaya çıkan sonuca (veya ürüne) dikkat çekilmiş, prompt üzerinde yapılabilecek düzenlemeler ile prompt taksonomisinin içeriğinden bahsedilmiştir (Oppenlaender 2022; 2024). Son olarak, metinden görsel oluşturma araçlarının olası faydaları ile zorlukları ve görsellerin oluşturulmasında kültürel ve dilsel çeşitliliği göz önünde bulundurma ihtiyacı dile getirilmiştir.

Sonuç: YZ ve görsel araştırmalarını bir araya getiren araştırmaların sayısının oldukça az olduğu gözlenmiştir. Bu durum YZ ile afazi rehabilitasyonunda çalışan araştırmacılar arasında yakın bir iş birliği olması gerektiğini göstermektedir. Ayrıca, İngilizce dışında farklı bir dilde prompt yazılmasına olanak veren görsel üretim araçlarının ilgili dillerin kendine özgü dilsel ve kültürel özelliklerini dikkate alması gerekmektedir. Bu araçların dil ve konuşma

terapistlerinin klinik uygulamalarında kullanımının teşvik edilmesi ve görsel üretiminin klinik uygulamanın bir parçası olabilmesi için bu araçlarla ilgili dil ve konuşma terapistlerinin deneyimlerinin incelenmesi önerilmektedir.

Anahtar Sözcükler: afazi rehabilitasyonu, edinilmiş dil bozuklukları, görsel araştırmaları, insan-bilgisayar etkileşimi, metinden görsel oluşturma, Türkçe, yapay zekâ

Introduction

Images (or *visuographic supports*) are highly preferred in clinical and research settings in the field of Speech and Language Therapy. Images could serve as stimuli to examine language abilities including narratives, naming, and auditory comprehension during formal and informal assessment (Heuer, 2016; Heuer & Hallowell, 2007). Besides being used as part of augmentative and alternative communication supports to compensate for issues related to impaired or lack of natural speech abilities, to increase functional communication, and to augment memory or attention (Bellaire et al., 1991; Beukelman et al., 2007; Jacobs et al., 2004; Johnson et al., 2008; Waller et al., 1998; Weissling & Beukelman, 2006); images are highly preferred in aphasia-friendly materials (Parr et al., 2006; Özperçin et al., 2023). Individuals with aphasia (IwA) may have significant challenges while processing auditory, written, and visuographic information (Brown & Thiessen, 2018), and these individuals may rely on non-linguistic demonstration of information (McNeil & Pratt, 2001). Therefore, the use of images in aphasia-friendly materials makes information more interesting or appealing; fosters the recall, comprehensibility, and legibility of written information; and finally assists IwA focus on the topic and instructions stated in these materials (Rose et al., 2011a; 2011b; 2012).

Despite the strengths of images mentioned above, speech and language therapists (SLTs) may have to deal with challenges in the process of forming, finding or selecting images for IwA. SLTs need to make sure that the images are both meaningful and transparent, ideally representing clearly the words, messages, and concepts to which such images refer (Brown & Thiessen, 2018; Pierce, 2024). On the other hand, the language profile of IwA could be very heterogenous. The language abilities may not be equally affected by aphasia. This necessitates SLTs to investigate the language abilities as well as the preferences and individual characteristics of IwA in greater detail (Garrett et

al., 2000; Lasker & Bedrosian, 2001; Lasker & Garrett, 2006). These characteristics might influence image selection as there is no *one fits all approach* on a universal basis (Brown & Thiessen, 2018).

Recent progress in artificial intelligence (AI) technology including text-to-image generation tools might shift the way SLTs identify appropriate images for IwA. Technology is still evolving, and there is a significant need to explore how AI could contribute to image research. Drawing up on the recent bibliometric study, Zhang et al. (2024) aim to explore the use of AI in the field of Speech and Language Therapy. The authors state that previous studies on AI are conducted by researchers in the fields outside of Speech and Language Therapy, and most of these studies are limited to single-country publications (Zhang et al., 2024). This restricts our understanding of potential utility of AI technology in diverse cultures and languages, including Turkish. Therefore, the aim of this narrative review is to delve into the question of whether AI could be used to create images that are linguistically and culturally relevant for IwA with specific consideration of Turkish language. To reach this aim, the outline of the review is composed of two sections: First, previous studies on image research including neurotypical adults and IwA will be introduced to draw a comprehensive picture of what ideal image characteristics involve. Second, the potential uses of AI in acquired language disorders will be discussed with particular focus on image generation tools.

Method

A narrative review methodology was adopted in the study by synthesizing the findings from previous studies. A literature review was carried out using various databases including Web of Science, Scopus, and EBSCO with search terms including “acquired language disorders”, “aphasia”, “image research”, “artificial intelligence”, “text-to-image generation”, and “prompt engineering” between June and August 2024. During the screening, the studies published in the last 10 years (2014-2024) were examined primarily, but a number of them published before 2014 were also included to

stress the importance of image use in acquired language disorders and to reveal its theoretical foundations.

Image Research in Acquired Language Disorders

The image characteristics that are important and relevant to the scope of this review include accurate recognition of image, image type and context, concrete or abstract nature of images, and cultural factors (Brown & Thiessen, 2018; Heuer, 2016; Reymond et al., 2019; 2023), which are all presented in the following:

(i) Accurate Recognition of Image: Especially relevant for the naming performance, Heuer (2016) signify that the accurate recognition of the object or image is essential prior to naming it. Referring to previous studies by Humphreys et al. (1999) and Johnson et al. (1996), Heuer (2016) report that the image recognition is a multi-step cognitive process: First, the physical features of images including surface detail, shape, and color are encoded. Then, this information needs to be paired with the mental representations in long-term memory. Additional semantic pieces of information related to the encoded and paired images could be attained in the process of identifying the image content. The name of the image is retrieved following these steps. This means that challenges in naming images faced by IwA may not completely stem from deficits in semantic processing or retrieval, considering the influence of processing the physical features of image as well as stimulus saliency (Heuer, 2016; Brown & Thiessen, 2018).

(ii) Image Type and Context: Image type is related to the method that is used to form an image, thereby classifies an image such as "*drawing, photograph,* or *painting*". Drawings may include black-and-white and colored line drawings. Added to these, icons (or pictograms, pictographs) are part of the drawn stimuli, a "black graphic form" that is the pictorial representation of a physical object. Photographs might be both black-and-white as well as colored (Reymond et al., 2023). On the other hand, such a classification may not be sufficient on its own as these types might

vary in terms of content, context, and engagement. Content refers to the amount of information in the image; context is defined as the information that is represented in the background or setting of an image; and engagement signifies the extent to which an individual or object "engages" with one or more characteristics of the context (Knollman-Porter et al., 2016). Indeed, Knollman-Porter et al. (2016) report that IwA prefer either low- and high-content images which are both rich with context, emphasizing that written materials accompanying high-context images might facilitate the reading performance of IwA.

Each type has its own benefits and challenges. Line drawings including icons may be preferred to depict single words, resulting in the lack of detail (Brown & Thiessen, 2018; Ma et al., 2009). Moreover, line drawings are predominantly used in order to depict verbs compared to photographs (Akinina et al., 2015; Kwaileh et al., 2018; Székely et al., 2004) as drawings might be easier to name than photographs (Reymond et al., 2023). On the one hand, photographs might possess more content with variable context as they portray scenes including objects and individuals identical to how such scenes are perceived in daily life (Reymond et al., 2023), thereby having the potential to assess more complex linguistic performance (Brown & Thiessen, 2018) including picture description as in the case of Turkish assessment tools such as Aphasia Assessment Tool (Toğram & Maviş, 2012). However, studies report that several IwA may not state a clear preference (line drawings over photographs, or vice versa), suggesting that both types may be helpful for their comprehension and/or performance (Rose et al., 2011b; Griffith et al., 2014). Recently, yet less commonly, Reymond et al. (2023) and Moys et al. (2018) examine the potential use of illustrations or graphic representations for IwA from a graphic communication perspective. Moys et al. (2018) conclude that the IwA preferred the illustrations that were similar to icons which aided their comprehension. However, Reymond et al. (2023) report no effect of image types (graphical representations versus photographs) on the naming performances of neurotypical adults and IwA. The authors signify the importance of

controlling for features such as color, texture, and shading through which any possible differences in naming accuracy and latencies between photographs and graphic representations could be eliminated (See **Figure 1** for the examples of line drawing, photograph, and graphical representations of nouns titled tiger, spider, and needle).

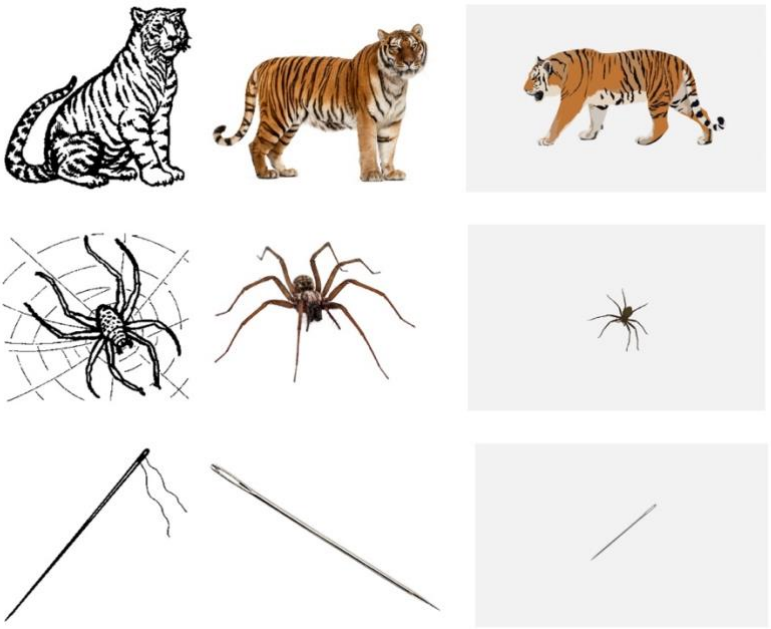

Figure 1. Examples of line drawing, photograph, and graphical representations. The line drawings on the left belong to the Székely et al. (2004), the photographs in the middle were downloaded from Adobe Stock, and the graphical representations on the right were taken from Reymond et al. (2023).

Added to these, the color may also influence the naming accuracy of IwA. Mohr (2010) reports that both IwA and neurotypical adults name colored photographs significantly faster and more accurately compared to the black-and-white photographs. This finding is supported by the findings of eye-movement measures employed by Heuer (2016) among neurotypical adults, reporting that colored photographs facilitate image recognition, visual processing, and encoding of visual information in comparison to black-and-white line drawings. Moreover, color may influence the process of forming images that are culturally appropriate for picture description task, as reported by

Mazumdar et al. (2023) showing that a high-context colored photograph may be an optimal choice for Bangla-speaking neurotypical adults in comparison to black-and-white line drawings. In addition to the color, Reymond et al. (2019; 2023) present an overview of image features that may impact recognition and naming abilities, including size of the object (Johnson et al., 1996; Snodgrass & Vanderwart, 1980), prototypicality of the color (such as "yellow" for banana; Rossion & Pourtois, 2004; Therriault et al., 2009), textures in the form of shading (Rossion & Pourtois, 2004), and canonical view (Snodgrass & Vanderwart, 1980). Despite the obvious significance of image type and context, what images represent is another factor that needs to be taken into consideration, as discussed in the following.

(iii) The Concrete or Abstract Nature of Images: Images visually represent the linguistic content of the relevant stimuli, which means that images need to ensure the transparency and functionality so that they could be used to convey the messages with which they are associated (Brown & Thiessen, 2018). There are several factors or variables that need to be considered in the identification of appropriate linguistic content, such as *word class* and *psycholinguistic factors*. First, word class may have an effect on the level of abstraction of the images. For instance, nouns could be more easily depicted than verbs and adjectives (Brown & Thiessen, 2018; Reymond et al., 2023) in that it may be more challenging to represent the act of "*realizing*" than the object titled "*tooth*". This in turn might impact the performance of IwA as these individuals may need more time to learn the associations that represent abstract concepts in comparison to concrete ones. Therefore, considering the word classes that may be more difficult to represent or depict such as verbs, it is suggested to prepare or select images where the agent who is carrying out the action is depicted (Brown & Thiessen, 2018; Thiessen et al., 2017). Indeed, IwA show a clear preference toward task-engaged images compared to the camera-engaged ones as the former involve an individual who interacts with an object in the context of the image in the form of touching, looking, etc., as reported by Thiessen

et al. (2014; 2016). Despite these findings, verbs may impose more demands than nouns during language performance, especially in the case of naming (De Blesser & Kauschke, 2003; Mätzig et al., 2009; Reymond et al., 2023; Martínez-Ferreiro, 2024). In this direction, a recent review by Martínez-Ferreiro (2024) reports that there is variability in the results of previous experimental studies that reveal noun and verb dissociation in word retrieval skills among different groups of adults including IwA, suggesting that task and item selection may contribute to this variability. Regarding item selection, Martínez-Ferreiro (2024) mentions the importance of the psycholinguistic properties of the items that might impact performance with reference to previous studies (e.g. Vigliocco et al., 2011; Alyahya et al., 2018). Secondly, the *psycholinguistic factors* of the words might hold an effect on language performance including repetition, naming, reading, and writing. There are various variables to be mentioned, involving imageability, frequency, familiarity, age of acquisition, animacy, morphological complexity, phonological neighborhood, orthographic regularity, name agreement, visual complexity, and image agreement (Biedermann et al., 2018; Martínez-Ferreiro, 2024; Maviş et al., 2022; Selvi-Balo et al., 2020), which were considered in the adaptation of aphasia assessment tools including the Turkish version of Comprehensive Aphasia Test (CAT-TR, Maviş et al., 2022; 2024; Özdemir et al., 2022; see Martínez-Ferreiro et al., 2024 for the review of adaptation studies of CAT). Excluding orthographic regularity, the remaining variables might be relevant for image research.

(iv) Cultural Factors: The stimuli to be used in the assessment and intervention process need to be culturally appropriate. This entails forming items and image materials according to the cultural and linguistic characteristics of the language. Otherwise, as Menn et al. (1996) assert, the use of culturally inappropriate picture stimulus may affect linguistic performance. Moreover, Reymond et al. (2023) recommend the consideration of linguistic and cultural diversity in the images used in the assessment and treatment of IwA. This is a particularly important issue as the recent adaptation studies

of CAT into a number of languages needed to take into account the cultural and linguistic equivalences of test items (see Martínez-Ferreiro et al., 2024).

The line drawings in research and clinical contexts hold a long-lasting tradition. However, the use of photographs has gained popularity and increased thanks to their accessibility and low cost. In addition to the attempt of Reymond et al. (2023) including both image sets (photographs and graphic representations), there is another option that is the use of artificial intelligence (AI) assisted images, which is discussed in the following section. At the same time, Reymond et al. (2023) caution that researchers and clinicians need to ensure transparency for image features that might affect naming performance. But, again as stated elsewhere, deficits or challenges in language performance including naming stem from the acquired language disorder itself, which means that image features may not stand on their own in the examination of this disorder (Reymond et al., 2023). In other words, a detailed assessment of the acquired language disorder is warranted, including measurements that examine cognition, language, and quality of life of the IwA.

The Use of AI in Acquired Language Disorders with Particular Focus on Image Generation

A rising trend toward examining the potential use of AI in acquired language disorders is observed mostly through scope or critical reviews conducted by Adikari et al. (2024), Azevedo et al., (2024), and Privitera et al. (2024); with the exception of a research note prepared by Pierce (2024). These reviews report that (a) previous studies mostly used AI to classify or diagnose the subtypes of aphasia (Adikari et al., 2024; Azevedo et al., 2024), (b) text-to-image generation tools may be considered as an option to provide visual stimuli that could be used for a number of purposes such as confrontation naming (Adikari et al., 2024). These authors stress the importance and utilization of multimodal models to form more stimulating materials to be used in aphasia rehabilitation, suggesting that even those without sophisticated technical or programming skills might benefit from the AI (Adikari et al., 2024). In addition to the review articles, Pierce (2024) explores the functionality of

AI-generated images with specific reference to aphasia assessment and intervention. They report that nouns were generated with highest accuracy and efficiency, which was followed by verbs and sentences. The findings showed that there were a number of flaws in the images (i.e., anatomically incorrect depictions of human hands, etc.) generated by DALL-E 2 (Pierce, 2024).

Considering the findings of these studies, it was observed that a detailed overview of image generation tools was needed to better understand how SLTs might benefit from this ever-growing technology. Therefore, in the following sections, information was provided about the options of image generation tools, the practice of writing prompts, the potential benefits and challenges of using AI, and the need to consider the linguistic and cultural differences.

(i) The image generation options: There are a wide range of options for image generators supported by AI. These options include DALL-E 3[1], Midjourney[2], Stable Diffusion[3], Glide[4], Craiyon[5], etc. These options are publicly available despite some of them offering premium or priced options (e.g., Craiyon, etc.). As AI develops in other spheres or arenas, this progress has also been observed in image generation. To make the procedure of generating images possible, the multimodal models were trained on huge amounts of image and text pairs that were imported from World Wide Web, which was initially encouraged by OpenAI's model entitled Contrastive Language-Image Pretraining (Radford et al., 2021) defined as a "contrastive language-vision model trained in an unsupervised way to perform zero-shot classification of images" (Oppenlaender, 2024).

Image generation means producing a range of images with different styles as a result of entering a basic text prompt (Göring et al., 2023; Kim et al., 2025; Lo, 2023; Oppenlander, 2022; 2024; Oppenlaender et al., 2023). This has been a breakthrough for many individuals, including from

[1] https://openai.com/index/dall-e-3/
[2] https://discord.com/invite/midjourney
[3] https://stability.ai
[4] Cf. Nichol et al. (2021)
[5] https://www.craiyon.com

laypersons to professionals interested in visual art, design, and many more. However, from a photographic point of view, Göring et al. (2023) evaluate how realistic and appealing the AI-generated images might be by forming a dataset through preparing 27 prompts, forming images in five different image tools using AI as a result of these prompts (including DALL-E 2, Midjourney, Stable Diffusion, Glide, and Craiyon), and asking 22 participants recruited from university to rate the image appeal, image realism as well as how the image shown to the participants match with the text prompt. These authors also use real images in their study. The results show that the highest appeal ratings come from those that belong to Midjourney and real images, while the most realistic images come from DALL-E 2 and real ones. Lastly, the text prompts mostly match with the real images and those produced by DALL-E 2 compared to the remaining image generators (Göring et al., 2023). The authors signify that the language processing is an important part of AI image generators as some of the text prompts that are designed or formed may challenge the text processing engine. In spite of the fact that the real images have been rated better and distinctly identified by the participants; the authors assert the AI-generators are continuously improved as their limitations are considered and addressed. For instance, the third version of DALL-E has been released with multilingual support in terms of the practice of writing prompts.

(ii) The practice of writing prompts: Prompts are defined as short descriptive texts. Prompt writing practice or skill is repetitive and experimental in nature, therefore the field of "*prompt engineering*" (PE) has been coined to denote the significance of writing or phrasing input prompts in Human-Computer Interaction (Liu & Chilton, 2022; Lo, 2023; Oppenlaender, 2024; Oppenlaender et al., 2023). Moreover, the term entitled "practitioner" has been suggested, which refers to anyone interested in text-to-image generation systems (Oppenlaender, 2024). Therefore, a practitioner is expected to run a prompt, check the outcome, and make adaptations in the content of the prompt to improve the outcome or final product. However, to make such adaptations, one seeks to add certain

key words or phrases that could change the outcome. The words and phrases have been called *prompt modifiers* which are mostly discovered as a result of frequent experimentation or experience (Lo, 2023; Oppenlaender, 2022; 2024).

Oppenlaender (2024) suggests a taxonomy of these modifiers to serve for text-to-image generation systems, following an adoption of autoethnographic and online ethnographic methodology. As a result, they suggest six different types of prompt modifiers, including *subject term* (the requested subject from the system to generate the image, such as "a car", "a tall green tree in front of a shack", etc.), *style modifier* (e.g., "oil painting", etc.), *image prompt* (referring to one or more uniform resource locators (URLs) added to the textual prompt to provide a visual target), *quality booster* (e.g., "highly-detailed, award-winning", etc.), *repeating term* (e.g., "very very speedy car"), and *magic term* (that is semantically distant to the subject term or refers to qualities that are not visual such as the sense of taste, touch, etc. E.g., "feel the sound"). The subject term is required to depict the image desired by the user; however, the remaining types add detail or flavor to the depiction of the images.

Moreover, Oppenlaender (2022) introspects the nature of human creativity in generating synthesized images. The response comes from the Rhodes' conceptual model of creativity (Rhodes, 1961) that includes product (the synthesized image), person (the practitioner), process (iterative nature of PE), and press (the text-to-image art community or ecosystem). According to Oppenlaender (2022), the creativity involved in the generation of these images stems from the human interaction with AI, the end product (the synthesized image) and the iterative practices that refer to this interaction. These authors both conclude that each component of this creativity model needs to be together so that the model operates on a functional basis (Oppenlaender, 2022; Rhodes, 1961). In addition, Lo (2023) unravels the multifaceted aspects of the artistry in PE in that collaborating with the field experts (such as psychologists or linguists to explore the socio-cultural and cognitive aspects

of language) might pave the way for a more relevant, precise, and context-rich prompts. As the practice of PE is still evolving, researchers also critically evaluate the AI by revealing the benefits and challenges of using it, as discussed in the following section.

(iii) The potential benefits and challenges of text-to-image generation tools: Using large language models, all practitioners including laypersons could synthesize images through free or relatively inexpensive tools, which hold implications for the productivity and creativity (Oppenlaender, 2022). Using such tools do not require any technical skills or expertise (Oppenlaender, 2024), which hopefully democratizes the access toward these tools. However, there are bias in image generation systems. For instance, Oppenlaender (2024) refers to a link from Twitter in which a prompt including "princess" may demonstrate images of women having light skin color, a bias toward "*Western, educated, industrialized, rich and democratic (WEIRD)*" individuals. The risk of AI to increase biases has also been raised by Kim et al. (2025) and Lo (2023). In this direction, the latter study suggests that ethical issues could be integrated into PE to foster inclusivity (Lo, 2023).

Moreover, the awareness levels and nature of attitudes toward text-to-image generation might differ among individuals as reported by previous research (Oppenlaender et al., 2023; Kim et al., 2025). First, Oppenlaender et al. (2023) administered a survey to 35 participants from a diverse range of fields including computer science, literature, and information systems to unravel the perceptions of these participants toward text-to-image generation. The findings relevant to the content of this review included the following: (a) The participants suggested the application areas of text-to-image generation would involve therapy and education even though they did not specify what kind of therapy it was (i.e., Speech and Language Therapy, Physiotherapy, Occupational Therapy, etc.). (b) Although most participants responded that text-to-image generation may not be significant for their profession, they reported that artists and designers would be those to be particularly affected by this system. (c) Concerns related to copyright violation were raised despite the "legal gray zone" in which

text-to-image generation tools operate. (d) Images that could be inappropriate, offending, abusive, and insensitive to the individuals' beliefs could be produced following the utilization of AI; (e) Biased visual culture could be promoted with images including individuals that are mainly white European along with particular yet fixed aesthetic values (Oppenlaender et al., 2023). These authors suggested that in spite of a preliminary awareness of text-to-image generation technology, individuals need to be more aware of the potential implications of this technology.

Second, Kim et al. (2025) conducted a qualitative study in which they examined the user experience of DALL-E 2 by including a range of 13 field expert users including data scientists, fine artists, graphic designer, researcher, photographer, etc. The participants created images using the DALL-E 2. The results revealed that participants held attitudes that were both positive and negative toward the system. More importantly, the participants stated that they preferred a bidirectional communication with AI rather than the participants solely entering their prompts as they had to handle the lack of feedback. In other words, the participants expected feedback from the AI through which they could reflect on it, and improve their experience and learning process. Therefore, a bidirectional communication is needed to ensure a collaboration between individuals and AI that results in a successful final product (Kim et al., 2025).

(iv) The need to consider the linguistic and cultural differences: As previously stated, the AI-generated image tools may hold bias while producing the images. However, Reymond et al. (2023) suggest considering linguistic and cultural diversity in forming the pictorial stimuli for assessment and treatment of IwA. The need to consider linguistic and cultural differences is discussed here through a number of images generated by AI by entering prompts in Turkish language. Turkish has been selected to form the basis of the review as Turkish is the mother language of the researchers who are experts in language disorders in Türkiye. Prior to evaluating the outputs of image generation practice, it may be beneficial for readers to briefly outline the linguistic characteristics: Turkish

belongs to the Ural-Altaic language family. It is an agglutinative language which allows large inflectional paradigms. This means nouns and verbs could receive numerous suffixes for inflection and derivation. The canonical order of Turkish is subject-object-verb (SOV). However, other orders are accepted, too (Maviş et al., 2020; 2022).

As for the image generation tools, recently tools such as Bing Image Creator[6] owned by Microsoft Designer that follows the latest version of DALL-E have paved the way for entering prompts in languages in addition to English, i.e. Turkish. In addition, this tool is free, which means that it could be accessible to general public. Despite this progress, images produced in this tool could be both problematic and successful from the perspective of Speech and Language Therapy (see **Figures 2, 3** and **4**). As seen in Figure 2, there are 16 images in total that were produced with the help of Bing Image Creator. These images belong to *simit* (namely, Turkish bagel), *mosque*, *saz*, and *sujuk*. This tool shows four images following the entry of same prompt, therefore 16 images were derived and shown in Figure 2. Among all these nouns, the following prompt was entered separately for each noun: "*Generate a photograph of a … (simit, mosque, saz, and sujuk) that is eaten in Türkiye (for simit and sujuk), that is located in Türkiye (for mosque), and that is used as an instrument in Türkiye (for saz)*". However, all of these images were not appropriate, which meant that the results did not refer to their intended visual representation, compared to their ideal photographic depictions demonstrated in Figure 3. For instance, *saz* (also called as *baglama*) is one of the string musical instruments that is commonly used in the folk music in Middle East including Türkiye. The result, however, was not *saz* or *baglama* in any of the four images generated. This means that there should be more investment toward making AI-generated image tools more aware of the cultural and linguistic diversity. On the other hand, there were successful images as shown in Figure 4. These images were the visual representations of the words entitled "*sandals, pen, cat, and dice*" in Turkish.

[6] https://www.bing.com/images/create?FORM=IRPGEN

These nouns, compared to the ones in Figure 2, may be more generic and less culture specific. Therefore, this may have facilitated the image generation procedure.

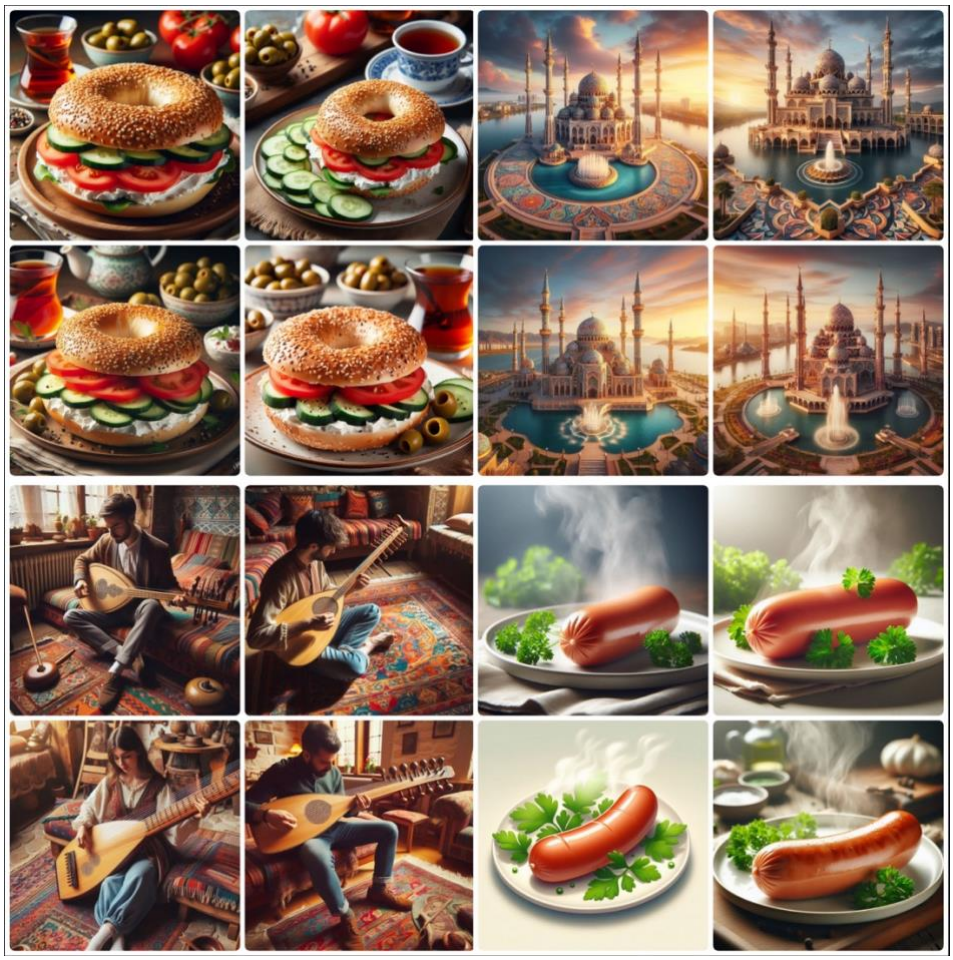

Figure 2. The results from Bing Image Creator for the nouns entitled "*simit, mosque, saz, and sujuk*". Source: Own elaboration using Bing Image Creator.

Figure 3. The photos of the nouns entitled "*simit, mosque, saz, and sujuk*" are shown. The photos of mosque and saz were downloaded from iStockphotos, and the others were downloaded from Adobe Stock.

Figure 4. The results from Bing Image Creator for the nouns entitled "*sandals, pen, cat, and dice*". Source: Own elaboration using Bing Image Creator.

Future research on this topic is warranted to examine in detail about the functionality of AI-generated image tools in different languages and cultures (in this case, Turkish language and culture).

Previous studies conducted so far mostly include images that could have artistic value (Kim et al., 2025; Oppenlaender, 2022; 2024), except the one conducted by Pierce (2024) who use the DALL-E 2 to produce 200 targets including nouns, verbs, and sentences. Pierce (2024) cautions that the practitioners should expect randomness while using image generation tools. Therefore, the practitioners should keep this in mind while using these tools for image generation.

Conclusion

In conclusion, the overview of image research was provided, with the recent potential of AI-generated image tools to further revolutionize how clinicians and researchers evaluate the quality and content of the images. There is a lack of research that embodies AI and image research together, which means that there needs to be a close collaboration between the researchers in the field of AI and those in the aphasia rehabilitation, as suggested by Azevedo et al. (2024). In addition, researchers need to consider digital inclusion as individuals with aphasia need to be involved in the process to make sure whether the final products formed by AI are usable and accessible (Adikari et al., 2024). Moreover, with regards to languages other than English, the AI-generated image tools need to consider the unique linguistic and cultural characteristics of the languages concerned. The availability of Bing Image Creator for languages other than English is a significant milestone for linguistic inclusivity, however, such tools have a way ahead to fully operationalize so that the individual needs of those with acquired language disorders are met in the long term. As some of the studies covered in the review emphasize (Lo, 2023; Kim et al., 2025), the AI should not be seen as a tool only, but as a rewarding opportunity to foster the content of work including image generation despite continuous challenges in mastering the PE. Lastly, it is suggested that the use of these tools should be promoted among SLTs in their clinical practice, and their experiences with these tools should be documented so that image generation could be a part of clinical practice.

References

Adikari, A., Hernandez, N., Alahakoon, D., Rose, M. L., & Pierce, J. E. (2024). From concept to practice: a scoping review of the application of AI to aphasia diagnosis and management. *Disability and Rehabilitation, 46*(7), 1288-1297. https://doi.org/10.1080/09638288.2023.2199463

Akinina, Y., Malyutina, S., Ivanova, M., Iskra, E., Mannova, E., & Dragoy, O. (2015). Russian normative data for 375 action pictures and verbs. *Behavior Research Methods, 47*(3), 691–707. https://doi.org/10.3758/s13428-014-0492-9

Alyahya, R. S., Halai, A. D., Conroy, P., & Ralph, M. A. L. (2018). Noun and verb processing in aphasia: Behavioural profiles and neural correlates. *NeuroImage: Clinical, 18*, 215-230. https://doi.org/10.1016/j.nicl.2018.01.023

Azevedo, N., Kehayia, E., Jarema, G., Le Dorze, G., Beaujard, C., & Yvon, M. (2024). How artificial intelligence (AI) is used in aphasia rehabilitation: A scoping review. *Aphasiology, 38*(2), 305-336. https://doi.org/10.1080/02687038.2023.2189513

Bellaire, K. J., Georges, J. B., & Thompson, C. K. (1991). Establishing functional communication board use for nonverbal aphasic subjects. *Clinical Aphasiology, 19*, 219–227.

Beukelman, D. R., Fager, S., Ball, L., & Dietz, A. (2007). AAC for adults with acquired neurological conditions: A review. *Augmentative and Alternative Communication, 23*, 230–242. https://doi.org/10.1080/07434610701553668

Biedermann, B., Fieder, N., & Nickels, L. (2018). Spoken Word Production: Processes and Potential Breakdown. In A. Bar-On & D. Ravid (Eds.), *Handbook of Communication Disorders: Theoretical, Empirical, and Applied Linguistic Perspectives* (pp. 155-178). De Gruyter Mouton. https://doi.org/10.1515/9781614514909-009

Brown, J., & Thiessen, A. (2018). Using images with individuals with aphasia: Current research and clinical trends. *American Journal of Speech-Language Pathology, 27*, 504–515. https://doi.org/10.1044/2017_AJSLP-16-0190

De Bleser, R., & Kauschke, C. (2003). Acquisition and loss of nouns and verbs: Parallel or divergent patterns? *Journal of Neurolinguistics, 16*(2), 213–229. https://doi.org/10.1016/S0911-6044(02)00015-5

Garrett, K., Kimelman, M., Beukelman, D., Yorkston, K., & Reichle, J. (2000). AAC and aphasia: Cognitive-

linguistic considerations. In D. R. Beukelman, J. Reichle & K. M. Yorkston (Eds.), *Augmentative and Alternative Communication for Adults with Acquired Neurologic Disorders* (pp. 339–374). Baltimore, MD: Brookes.

Göring, S., Rao, R. R. R., Merten, R., & Raake, A. (2023). Analysis of Appeal for realistic AI-generated Photos. *Ieee Access, 11*, 38999-39012. https://doi.org/10.1109/ACCESS.2023.3267968

Griffith, J., Dietz, A. and Weissling, K. (2014). 'Supporting narrative retells for people with aphasia using augmentative and alternative communication: photographs or line drawings? Text or no text?' *American Journal of Speech-Language Pathology, 23*, S213–S224. https://doi.org/10.1044/2014_AJSLP-13-0089

Heuer, S. (2016). The influence of image characteristics on image recognition: A comparison of photographs and line drawings. *Aphasiology, 30*(8), 943–961. https://doi.org/10.1080/02687038.2015.1081138

Heuer, S., & Hallowell, B. (2007). An evaluation of multiple choice test images for comprehension assessment in aphasia. *Aphasiology, 21*(9), 883–900. https://doi.org/10.1080/02687030600695194

Humphreys, G. W., Price, J., & Riddoch, M. J. (1999). From objects to names: A cognitive neuroscience approach. *Psychological Research, 62*, 118–130. https://doi.org/10.1007/s004260050046

Jacobs, B., Drew, R., Ogletree, B. T., & Pierce, K. (2004). Augmentative and alternative communication (AAC) for adults with severe aphasia: Where we stand and how we can go further. *Disability and Rehabilitation, 26,* 1231–1240. https://doi.org/10.1080/09638280412331280244

Johnson, C. J., Paivio, A., & Clark, J. M. (1996). Cognitive components of picture naming. *Psychological Bulletin, 120*, 113–139. https://psycnet.apa.org/doi/10.1037/0033-2909.120.1.113

Johnson, R. K., Hough, M. S., King, K. A., Vos, P., & Jeffs, T. (2008). Functional communication in individuals with chronic severe aphasia using augmentative communication. *Augmentative and Alternative Communication, 24*, 269–280. https://doi.org/10.1080/07434610802463957

Kim, S., Eun, J., Oh, C., & Lee, J. (2025). "Journey of finding the best query": Understanding the user experience of AI image generation system. *International Journal of Human–Computer Interaction, 41*(2), 951-969. https://doi.org/10.1080/10447318.2024.2307670

Knollman-Porter, K., Brown, J., Hux, K., Wallace, S. E., & Uchtman, E. (2016). Preferred visuographic images to support

reading by people with chronic aphasia. *Topics in Stroke Rehabilitation, 23*(4), 269-275. https://doi.org/10.1080/10749357.2016.1155276

Khwaileh, T., Mustafawi, E., Herbert, R., & Howard, D. (2018). Gulf Arabic nouns and verbs: A standardized set of 319 object pictures and 141 action pictures, with predictors of naming latencies. *Behavior Research Methods, 50*(6), 2408–2425. https://doi.org/10.3758/s13428-018-1019-6

Lasker, J., & Bedrosian, J. (2001). Promoting acceptance of augmentative and alternative communication by adults with acquired communication disorders. *Augmentative and Alternative Communication, 17*, 141–153. https://doi.org/10.1080/aac.17.3.141.153

Lasker, J., & Garrett, K. (2006). Using the Multimodal Communication Screening Test for Persons with Aphasia (MCST-A) to guide the selection of alternative communication strategies for people with aphasia. *Aphasiology, 20*, 217–232. https://doi.org/10.1080/02687030500473411

Liu, V., & Lydia, B. C. (2022). Design guidelines for prompt engineering text-to-image generative models. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems (CHI '22)*. Association for Computing Machinery, New York, NY, Article 384. https://doi.org/10.1145/3491102.3501825

Lo, L. S. (2023). The art and science of prompt engineering: a new literacy in the information age. *Internet Reference Services Quarterly, 27*(4), 203-210. https://doi.org/10.1080/10875301.2023.2227621

Ma, X., Boyd-Graber, J., Nikolova, S., & Cook, P. R. (2009, October). Speaking through pictures: Images vs. icons. In *Proceedings of the 11th international ACM SIGACCESS conference on computers and accessibility* (pp. 163–170). New York, NY: ACM. https://doi.org/10.1145/1639642.1639672

Martínez-Ferreiro, S. (2024). Naming as a window to word retrieval changes in healthy and pathological ageing: Methodological considerations. *International Journal of Language & Communication Disorders, 59*(1), 68-83. https://doi.org/10.1111/1460-6984.12827

Martínez-Ferreiro, S., Arslan, S., Fyndanis, V., Howard, D., Kraljević, J. K., Škorić, A. M., Munarriz-Ibarrola, A., Norvik, M., Peñaloza, C., Pourquié, M., Simonsen, H. G., Swinburn, K., Varlokosta, S., & Soroli, E. (2024). Guidelines and recommendations for cross-linguistic aphasia assessment: a review of 10 years of comprehensive aphasia test adaptations. *Aphasiology,* 1-25. https://doi.org/10.1080/02687038.2024.2343456

Mätzig, S., Druks, J., Masterson, J., & Vigliocco, G. (2009). Noun and verb differences in picture naming: Past

studies and new evidence. *Cortex, 45*(6), 738–758. https://doi.org/10.1016/j.cortex.2008.10.003

Maviş, İ., Tunçer, A. M., & Balo, S. S. (2020). *The adaptation of MAIN to Turkish. ZAS Papers in Linguistics, 64*, 249-256. https://doi.org/10.21248/zaspil.64.2020.579

Maviş, İ., Tunçer, A. M., Selvi-Balo, S., Tokaç, S. D., & Özdemir, Ş. (2022). The adaptation process of the Comprehensive Aphasia Test into CAT-Turkish: Psycholinguistic and clinical considerations. *Aphasiology, 36*(4), 493-512. https://doi.org/10.1080/02687038.2021.1923947

Maviş, İ., Tunçer, A. M., Selvi-Balo, S, Özdemir, Ş., Tokaç Scheffer, S. D., Yaşar Gündüz, E., Günhan Şenol, N. E. (2024). *Kapsamlı Afazi Testi Türkçe Versiyonu (CAT-TR) Kullanım Kılavuzu*. Detay Yayıncılık.

Mazumdar, B., Donovan, N. J., & Duncan, E. S. (2023). Identifying an appropriate picture stimulus for a Bangla Picture Description Task. *Journal of Speech, Language, and Hearing Research, 66*(4), 1334-1350. https://doi.org/10.1044/2022_JSLHR-22-00152

McNeil, M. R., & Pratt, S. R. (2001). Defining aphasia: Some theoretical and clinical implications of operating from a formal definition. *Aphasiology, 15*(10-11), 901–911. https://doi.org/10.1080/02687040143000276

Menn, L., Niemi, J., & Ahlsen, E. (1996). Cross-linguistic studies of aphasia: Why and how. *Aphasiology, 10*(6), 523–531. https://doi.org/10.1080/02687039608248434

Mohr, E. (2010). *Colour and Naming in Healthy and Aphasic People*. Unpublished Doctoral dissertation. University of Durham, Department of Psychology, Durham, UK. Retrieved from https://etheses.dur.ac.uk/394/

Moys, J. L., Martínez-Freile, C., McCrindle, R., Meteyard, L., Robson, H., Kendrick, L., & Wairagkar, M. (2018). Exploring illustration styles for materials used in visual resources for people with aphasia. *Visible Language, 52*(3), 97-113. https://journals.uc.edu/index.php/vl/article/view/4635

Nichol, A., Dhariwal, P., Ramesh, A., Shyam, P., Mishkin, P., McGrew, B., Sutskever, I., & Chen, M. (2021). Glide: Towards photorealistic image generation and editing with text-guided diffusion models. *arXiv preprint* arXiv:2112.10741. https://doi.org/10.48550/arXiv.2112.10741

Oppenlaender, J. (2022, November). The creativity of text-to-image generation. In *Proceedings of the 25th international academic mindtrek conference* (pp. 192-202). https://doi.org/10.1145/3569219.3569352

Oppenlaender, J. (2024). A taxonomy of prompt modifiers for text-to-image generation. *Behaviour & Information*

Technology 43(15), 3763-3776. https://doi.org/10.1080/0144929X.2023.2286532

Oppenlaender, J., Visuri, A., Paananen, V., Linder, R., & Silvennoinen, J. (2023). Text-to-image generation: Perceptions and realities. *arXiv preprint* arXiv:2303.13530. https://doi.org/10.48550/arXiv.2303.13530

Özdemir, Ş., Maviş, İ., & Tunçer, A. M. (2022). The validity and reliability of the language battery in Comprehensive Aphasia Test-Turkish (CAT-TR). *Journal of Psycholinguistic Research, 51*(4), 789- 802. https://doi.org/10.1007/s10936-022-09850-2

Özperçin, M., Kara, N., & Özdemir, Ş. (2023). Afazi dostu yazılı materyal hazırlama. In A. Özşimşek (Eds.) *Güncel Nöroloji Çalışmaları IV* (ss. 45-59). Akademisyen Yayınevi. https://doi.org/10.37609/akya.2819

Parr, S., Pound, C., & Hewitt, A. (2006). Communication access to health and social services. *Topics in Language Disorders, 26*, 189–198. https://doi.org/10.1097/00011363-200607000-00003

Pierce, J. E. (2024). AI-Generated images for Speech Pathology—An exploratory application to aphasia assessment and intervention materials. *American Journal of Speech-Language Pathology, 33*(1), 443-451. https://doi.org/10.1044/2023_AJSLP-23-00142

Privitera, A. J., Ng, S. H. S., Kong, A. P. H., & Weekes, B. S. (2024). AI and aphasia in the digital age: A critical review. *Brain Sciences, 14*(4), 383. https://doi.org/10.3390/brainsci14040383

Radford, A., Kim, J. W., Hallacy, C., Ramesh, A., Goh, G., Agarwal, S., Sastry, G., Askell, A., Mishkin, P., Clark, J., Krueger, G., & Sutskever, I. (2021). Learning transferable visual models from natural language supervision. *ArXiv preprint* arXiv:2103.00020. https://doi.org/10.48550/arXiv.2103.00020

Reymond, C., Müller, C., & Grumbinaite, I. (2019). E-Inclusion: Defining basic image properties for illustrated stimuli in aphasia treatment. *Visible Language, 53*(3), 4–27. https://doi.org/10.34314/vl.v53i3.4652

Reymond, C., Widmer Beierlein, S., Müller, C., Reutimann, R., Kuntner, K. P., Falcon Garcia, N., Grumbinaite, I., Hemm Ode, S., Degen, M., Parillo, F., Karlin, S., Park, S., Renner, M., & Blechschmidt, A. (2023). Naming images in aphasia: effects of graphic representations and photographs on naming performance in persons with and without aphasia. *Aphasiology, 37*(7), 993-1015. https://doi.org/10.1080/02687038.2022.2064421

Rhodes, M. (1961). An analysis of creativity. *The Phi Delta Kappan 42*(7), 305–310. https://www.jstor.org/stable/20342603

Rose, T. A., Worrall, L. E., Hickson, L. M., & Hoffmann, T. C. (2011a). Aphasia friendly written health information: Content and design characteristics. *International Journal of Speech-Language Pathology, 13*, 335–347. https://doi.org/10.3109/17549507.2011.560396

Rose, T. A., Worrall, L. E., Hickson, L. M., & Hoffmann, T. C. (2011b). Exploring the use of graphics in written health information for people with aphasia. *Aphasiology, 25*, 1579–1599. https://doi.org/10.1080/02687038.2011.626845

Rose, T. A., Worrall, L. E., Hickson, L. M., & Hoffmann, T. C. (2012). Guiding principles for printed education materials: Design preferences of people with aphasia. *International Journal of Speech-Language Pathology, 14*, 11–23. https://doi.org/10.3109/17549507.2011.631583

Rossion, B., & Pourtois, G. (2004). Rossion, B., & Pourtois, G. (2004). Revisiting Snodgrass and Vanderwart's object pictorial set: The role of surface detail in basic-level object recognition. *Perception, 33*(2), 217-236. https://doi.org/10.1068/p5117

Selvi-Balo, S., Maviş, İ., & Tunçer, A. M. (2020). 586 Türkçe sözcügün imgelenebilirlik, tanıdıklık ve öznel edinim yaşı norm değerleri. *Dil, Konusma ve Yutma Arastırmaları Dergisi, 3*(3), 301-334. https://dergipark.org.tr/en/pub/dkyad/issue/59228/835975

Snodgrass, J. G., & Vanderwart, M. (1980). A standardized set of 260 pictures: Norms for name agreement, image agreement, familiarity, and visual complexity. *Journal of Experimental Psychology: Human Learning and Memory, 6*(2), 174–215. https://psycnet.apa.org/doi/10.1037/0278-7393.6.2.174

Székely, A., Jacobsen, T., D'Amico, S., Devescovi, A., Andonova, E., Herron, D., Lu, C. C., Pechmann, T., Pléh, C., Wicha, N., Federmeier, K., Gerdjikova, I., Gutierrez, G., Hung, D., Hsu, J., Iyer, G., Kohnert, K., Mehotcheva, T., Orozco-Figueroa, A., . . . Bates, E. (2004). A new on-line resource for psycholinguistic studies. *Journal of Memory and Language, 51*(2), 247–250. https://doi.org/10.1016/j.jml.2004.03.002

Therriault, D. J., Yaxley, R. H., & Zwaan, R. A. (2009). The role of color diagnosticity in object recognition and representation. *Cognitive Processing, 10*(4), 335. https://doi.org/10.1007/s10339-009-0260-4

Thiessen, A., Beukelman, D., Ullman, C., & Longenecker, M. (2014). Measurement of the visual attention patterns of people with aphasia: A preliminary investigation of two types of human engagement in photographic images. *Augmentative and Alternative Communication, 30*(2), 120-129. https://doi.org/10.3109/07434618.2014.905798

Thiessen, A., Beukelman, D., Hux, K., & Longenecker, M. (2016). A comparison of the visual attention patterns of people

with aphasia and adults without neurological conditions for camera-engaged and task-engaged visual scenes. *Journal of Speech, Language, and Hearing Research, 59*(2), 290-301. https://doi.org/10.1044/2015_JSLHR-L-14-0115

Thiessen, A., Brown, J., Beukelman, D., Hux, K., & Myers, A. (2017). Effect of message type on the visual attention of adults with traumatic brain injury. *American Journal of Speech-Language Pathology, 26*(2), 428-442. https://doi.org/10.1044/2016_AJSLP-16-0024

Toğram, B., & Maviş, İ. (2012). Validity, reliability and standardization study of the language assessment test for aphasia. *Turkish Journal of Neurology, 18*(3), 96-103. https://doi.org/10.4274/Tnd.16779

Vigliocco, G., Vinson, D. P., Druks, J., Barber, H., & Cappa, S. F. (2011). Nouns and verbs in the brain: A review of behavioural, electrophysiological, neuropsychological and imaging studies. *Neuroscience & Biobehavioral Reviews, 35*(3), 407-426. https://doi.org/10.1016/j.neubiorev.2010.04.007

Waller, A., Dennis, F., Brodie, J., & Cairns, A. Y. (1998). Evaluating the use of TalksBac, a predictive communication device for nonfluent adults with aphasia. *International Journal of Language & Communication Disorders, 33*, 45–70. https://doi.org/10.1080/136828298247929

Weissling, K. S., & Beukelman, D. R. (2006). Visual scenes displays: Low-tech options. *SIG 12 Perspectives on Augmentative and Alternative Communication, 15*(4), 15–17. https://doi.org/10.1044/aac15.4.15

Zhang, M., Tang, E., Ding, H., & Zhang, Y. (2024) Artificial intelligence and the future of communication sciences and disorders: A bibliometric and visualization analysis. *Journal of Speech, Language, and Hearing Research, 67*(11), 4369-4390. https://doi.org/10.1044/2024_JSLHR-24-00157

Yazar Katkıları/Author Contributions: Şevket Özdemir: Fikir/Kavram, Danışmanlık/Denetleme, Literatür Taraması, Makale Yazımı, Eleştirel İnceleme. **Şükriye Kayhan Aktürk:** Danışmanlık/Denetleme, Literatür Taraması, Eleştirel İnceleme. **Eda İyigün Uzunöz:** Danışmanlık/Denetleme, Literatür Taraması, Eleştirel İnceleme. **Aylin Müge Tunçer:** Danışmanlık/Denetleme, Literatür Taraması, Eleştirel İnceleme.

Çıkar Çatışması/Conflict of Interest: Yazar makalenin hazırlanması ve basımı esnasında hiçbir kimse veya kurum ile çıkar çatışması içinde olmadığını beyan etmiştir. / The author has declared that no conflict of interest existed with any parties at the time of publication.