Hand Preference in Artists: Investigating the Prevalence of Left-Handedness in an Online Instagram Sample

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Summary

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Abstract

Systematic differences between handedness groups could have consequences for everyday life. It might determine preferences in life choices, such as choice of occupation or what recreational activities a person pursues. Empirical evidence suggests that there is a higher prevalence of left- or mixed-handed individuals in professions such as architects and artist. This has led to the assumption that left-handers might have an advantage due to the left-hand being controlled by the right-hemisphere, also dominant for cognitive processes relevant for artistic processing. Thus, the present study aims to investigate the prevalence of left-handedness among visual artists, sampled from the social media platform Instagram (N = 468). The study was operationalized as an observational study, using short video clips (reels) to determine their hand preference for artistic production. We expected to find a higher prevalence of left-handed artists in our sample, compared to the general population (10.6 %). Additionally, we proposed that the number of likes on an artists' post could serve as an indicator of the quality of their artwork, where we assumed left-handed artists work to be of higher quality. Our results revealed a lower prevalence of left-handed individuals among Instagram artists (8.97%) than the predicted estimate for the general population. Further, we found likes to be significant in the opposite direction, but only a small effect size was found. Although, the study provides valuable insights into the prevalence of left-handedness among visual artists, using Instagram as a sampling method may limit its representativeness to the general population. However, based on the planned sample size and preregistration, our result suggests that the prevalence of left-handedness among visual artists on Instagram is unlikely to be higher than in the general population.

Table of contents

Introduction

A core characteristic of the human brain organisation is its hemispheric functional specialisation (Ocklenburg & Güntürkün, 2018b). Prior to the discovery of the left-hemispheric dominance for language in the mid nineteenth century (Broca, 1861), the two hemispheres were thought to be symmetrical in function. While certain functional specialisations are present on the population level, for instance the left hemispheric dominance for language processing, individual deviations from this dominant pattern can be found frequently (Gerrits et al., 2020; Vingerhoets, 2019). Left-handedness is arguably the most salient of these deviations, making up approximately 10% of the population (Corballis, 2009; Papadatou-Pastou et al., 2020; Pfeifer et al., 2022). Right-hand usage has been favoured at the populational level at least since the time of Homo habilis, the ancestor of modern Homo sapiens, two million years ago (Frayer et al., 2016; McManus, 2002). Recent estimations place the emergence of the right-hand bias in the course of the last seven million years (Uomini & Ruck, 2018) and artistic portrayals show a predominance of right-handers for at least 5000 years (Coren & Porac, 1977). The history of left-handedness, on the other hand, is less clear, but evidence from archaeological data on Neanderthals suggest left-handedness may have existed for at least half a million years (Frayer et al., 2012).

Throughout history, left-handedness has had several associations and explanations. Such as being linked to evil and witchcraft in the middle ages (McManus, 2002), to crime and insanity in the nineteenth and early twentieth century (Kushner, 2013a). This association has evidently affected the left-handed population, as up until a few decades ago it was common practice to "retrain" or force left-handed children to use their right hand (Kushner, 2012). Despite attempts throughout history to suppress left-handedness, it has persisted and remains consistent at approximately 10% of the population (Corballis, 2009; Papadatou-Pastou et al., 2020; Pfeifer et al., 2022). While the reason for this handedness ratio is not yet fully understood, studies suggest genetics may play a role, as evidenced by twin and adoption studies (Carter-Saltzman, 1980; Medland et al., 2009; Pfeifer et al., 2022). However, being left-handed in a predominantly right-handed world could have an impact on one's life, and as the explanation for left-handedness changed from superstition to hemispheric functional specialisation, research in the 20th century has associated left-handedness with various negative associations, including learning difficulties, such as dyslexia (Vlachos et al., 2013), disorders, such as schizophrenia (Sommer et al., 2001), autism (Markou et al., 2017), autoimmune disorders (Geschwind & Behan, 1982), deafness (Papadatou-Pastou & Sáfár,

2016), and decreased survival fitness (Coren & Halpern, 1991). Some positive associations have also been reported, such as better performance in fighting sports (Richardson & Gilman, 2019), and higher creativity (Badzakova-Trajkov et al., 2011; Preti & Vellante, 2007). These systematic differences could influence life choices, and it has been proposed that left-handed individuals may be more drawn to creative or artistic occupations, such as artists and architects (Geschwind & Galaburda, 1985). Therefore, the present study aims to investigate whether the prevalence of left-handedness is higher among an online sample of visual artists compared to the general population.

Handedness

Handedness can be defined as the manifestation of skills and activities between the left and right hand (Corey et al., 2001; Ocklenburg & Güntürkün, 2018a) and as it is easily identifiably it is the most studied hemispheric asymmetry (Marcori et al., 2019; McManus, 2019). Entering the keyword "handedness" in PubMed in March 2023 yielded over 64 000 results. This apparently fixed frequency of approximately 90% of the population being right-handed and 10% being left-handed has been observed independently of ethnicity (Papadatou-Pastou et al., 2020), nationality (Dawson, 1977; Perelle & Ehrman, 1994), and history (Bradshaw & Rogers, 1996; Llaurens et al., 2009). However, there are reports of lower prevalence of left-handedness in Asia compared to Europe (Porac et al., 1990), with for instance China reporting less than 1% of the population being left-handed (Kushner, 2013b). Most current experts, nevertheless, seem to agree that between 10 and 12% of humans are left-handed (McManus, 2002), and that reasons for a lower prevalence in some countries is a result of cultural pressure that prefers right-hand usage. Although, depending on the definition, geographic location and historical period, studies have reported a frequency of left-handedness of between 5 and 26% of the human population (Llaurens et al., 2009). Therefore, developing accurate statistical claims about the occurrence of left-handedness is challenging due to the possibility of a significant margin of error (Kushner, 2013b).

There are also other observable variations in handedness ratios that have been noted across different conditions, with a larger percentage of men being left-handed than women (Bryden, 1977; McManus, 2002; Papadatou-Pastou et al., 2008; Papadatou-Pastou et al., 2020; Shimizu & Endo, 1983), individuals of higher socioeconomic status (Faurie et al., 2008), and an increase among younger individuals (Lee-Feldstein & Harburg, 1982). Studies have also identified differences in cognitive and behavioural abilities among different handedness groups, such as cognitive performance (e.g., Prichard et al., 2013), creativity

(Badzakova-Trajkov et al., 2011; Preti & Vellante, 2007), and physical performance (Grouios et al., 2000; Loffing & Hagemann, 2016; Loffing et al., 2012; Richardson & Gilman, 2019), to mention some. Such findings increase scientific interest in the neural mechanisms affecting handedness (Peters & Murphy, 1992) as it clearly implies the existence of asymmetric lateralization in the brain (Marcori et al., 2019). Understanding handedness could, therefore, lead to a better understanding of lateralization in general (McManus, 2019). However, neuroimaging research has typically excluded left-handers from participating in studies, justifying that left-handers can add "noise" to the data and obscure fundamental patterns of brain organization (Banich & Compton, 2018). This exclusionary approach may be counterproductive and could hinder the ability to gain a better understanding of brain organization (Willems et al., 2014).

Despite extensive research over the past few decades, no definitive conclusion has been reached regarding the division in handedness prevalence observed in the population (Marcori & Okazaki, 2020). Researchers have explored various factors that may explain handedness asymmetry, such as sex (Davis & Annett, 1994; Geschwind & Galaburda, 1985; Hampson & Sankar, 2012; Papadatou-Pastou et al., 2008), culture (Jung & Jung, 2009; Kushner, 2013a; Laland et al., 1995; Marcori et al., 2019; Shimizu & Endo, 1983; Teng et al., 1976; Xu & Zheng, 2017), genetics trough twin and siblings studies (Davis & Annett, 1994; Medland et al., 2009; Pfeifer et al., 2022; Sicotte et al., 1999), prenatal influences (Hampson & Sankar, 2012; Paracchini, 2021), and environmental impacts in early life (Bakan et al., 1973; Carter-Saltzman, 1980; Fox, 1985; Ocklenburg et al., 2010). The exact biological mechanisms underlying left-handedness and cerebral asymmetry are not well understood. Earlier, it was believed that a single gene might predispose individuals to left-hemispheric dominance for language and right-handedness (Annett, 1985, 1995). However, recent genetic analysis indicates that handedness is a polygenic trait, which means that it is influenced by multiple genes (Somers, Ophoff, et al., 2015). Furthermore, a large-scale study of over 25,000 Australian and Dutch twin families has shown that while handedness is partially determined by genetics, it is also influenced by non-genetic factors (Medland et al., 2009).

Another hypothesis regarding the neurobiological development of handedness proposes a correlation between handedness lateralization and other cognitive functions (Knecht et al., 2000; Nicholls et al., 2010; Ocklenburg, Hirnstein, et al., 2014). For example, although left-hemisphere dominance for language lateralization is prevalent across the population, a higher proportion of left-handers than right-handers display right-hemisphere dominance for language (Carey & Johnstone, 2014). While approximately 95% of right-

handers exhibit the typical pattern of left-hemisphere language dominance, around 70% of left-handers display this lateralization (Corballis, 2009; McManus, 2019). Resulting in approximately 30% of left-handers to display atypical right-hemispheric dominance for language. Although the degree of handedness does not always reflect the degree of language lateralization (Somers, Aukes, et al., 2015). A linear correlation between degree of handedness and the direction of language dominance have been found, where strongly left-handed participants were almost seven times more likely to demonstrate right-hemisphere language dominance than strongly right-handed participants (Knecht et al., 2000).

Classification of Handedness

The assessment of handedness seems trivial, as individuals readily classify themselves as left, right, or mixed handed. There are, however, several methodological approaches to determine an individual's handedness. It is important to note that defining handedness as a scientific term has proven to be challenging. First of all, handedness can be denoted as both hand preference and hand performance (Ocklenburg & Güntürkün, 2018a; Scharoun & Bryden, 2014), whereas hand preference refers to an individual's subjective preference for using a specific hand for manual activities, and hand performance referring to an individual's objectively superior hand for performing manual activities. Secondly, the categorization of handedness can be considered on either a directional preference, referring to the preferred hand for fine motor activities, left- versus right-handed (Ocklenburg, Beste, et al., 2014), or as a consistency preference referring to the specificity of the preference for using one hand over the other. For instance, if one hand is used for all task as opposed to one hand being used for some tasks and the other hand for other tasks.

There are various methods available to assess handedness, such as self-report measures, performance measures, and observational techniques. Each of these methods has its own strengths and limitations. The issue with having multiple measures of handedness is the difficulty in comparing results across studies that use different techniques (Bryden et al., 2007). Assessing which hand is used or preferred when writing or drawing has long been the most popular and, arguably, most intuitive method of determining handedness (Ocklenburg & Güntürkün, 2018a; Salmaso & Longoni, 1985). This approach is quite common because it is simple, quick, and affordable. Hand preference is usually assessed using questionnaires, as it allows for a quantifiable measure and allowing the subjects to state the hand they prefer to use for the given tasks and activities (Annett, 1970; Bryden, 1977; Steenhuis & Bryden, 1989). The Edinburgh Handedness Inventory (EHI) (Oldfield, 1971), also known as the Edinburgh

Handedness Questionnaire (EHQ), is the most used handedness questionnaire. In this questionnaire, participants are asked to choose which hand they prefer to use for certain tasks. The participants are then classified as left-handers or right-handers based on their responses, which are quantified and scored as a laterality quotient (LQ) for each of the ten items, with values ranging from -100 to +100, where positive values indicate right-hand preference, and negative values indicate left-hand preference (Ocklenburg & Güntürkün, 2018a).

In some cases, it may be more practical to have people complete practical tasks than administering a questionnaire to determine their handedness (Bryden et al., 2007), for instance by having the participants perform the items in the EHI (Ocklenburg et al., 2010). Observing participants' hand preference while performing a variety of tasks provides a more detailed and accurate account of handedness than relying on a single task or observation, such as writing with a specific hand (Bryden et al., 2007). Observational studies of children have found that for different tasks both left- and right-handers often used their non-preferred hand for picking up objects (Steenhuis, 1999) and that for tasks that only required using one hand found results indicating that both right and left-handers use their non-preferred hands to perform a range of tasks (Hildreth, 1948).

Hand performance is also generally measured through a practical test, as this aims to examines objective measurable differences in fine motor skills between the two hands (Ocklenburg & Güntürkün, 2018a). “The pegboard task”, is one of the most commonly used tasks, to measure handedness performance (Annett, 1970). In this task, participants move a row of ten pegs from one side of a board to the other side of the board, and the hand performance is calculated by comparing reaction times between the left- and right-hand. Other practical measuring methods include ‘the circle-marking task’ (Tapley & Bryden, 1985), ‘grip strength task’ (Provins & Magliaro, 1993) and ‘the rapid finger-tapping task’ (Peters & Durding, 1978).

How researchers define and measure handedness is crucial for categorization of participants (Papadatou-Pastou et al., 2020). The focus of handedness research has shifted from comparing the direction of handedness to looking at the degree of handedness (Papadatou-Pastou et al., 2020). However, one issue that arises with this approach is that different studies may use different ways of measuring handedness, which can lead to inconsistencies in how individuals are categorized. For example, someone might be considered left-handed in one study but not in another, depending on the measurement criteria used. A recent meta-analysis by Papadatou-Pastou et al. (2020) found that the highest quantity of left-handers (18.10%) was reported in studies that used a non-right – right classification,

whereas the lowest (9.34%) was reported in studies that used a right – mixed – left classification, illustrating that stricter criteria for left-handedness leads to the occurrence of left-handedness dropping.

Theoretical Background

Handedness has long been the subject of numerous misconceptions and false beliefs, which fall under the umbrella of "neuromythology" (Tallis, 1991). The term "neuromythology" refers to misconceptions about brain research (Macdonald et al., 2017). One popular neuromyth is the concept of "brainedness," which proposes that individuals can be categorized as either "left-brained" or "right-brained," with right-brained individuals considered to be more creative and left-brained individuals more analytical (McManus, 2019). According to Corballis (1980), research on laterality have been plagued by myths, where the myths often arose from the symbolic associations with asymmetry, with right being seen as universally good and left as bad. For instance, left-handedness are often referred to as sinister, which comes from a Latin word of the same spelling meaning “on the left side” (Merriam-Webster, n.d), but by the English definition has a negative connotation, meaning something evil or leading to ill fortune. Further, it has given root to other English words, such as the adjective sinistral (left-handed) and the adverb sinistrad (toward the left side), while right-handedness, referred to as the Latin word dexter “on the right side”, have given rise to English words with largely positive meanings, such as dexterity and ambidextrous.

In the first decade of the 20th century, two significant researchers made an effort to shed light on the causes and consequences of left-handedness throughout human history (Kushner, 2013a). The first, Cesare Lombroso, a physician from Turin who is frequently referred to as the founder of contemporary criminology, tied left-handedness to criminality, insanity, and feeble mindedness. Lombroso's theory of left-handedness was based on several contemporary scientific explanations for the causes of pathological behaviours. Such as the discoveries of brain asymmetry, which led to his subsequent assumptions that the left, more civilized, hemisphere was superior to the right, the seat of more primitive behaviours (Harrington, 1987). The neurobiological atavism of Lombroso concentrated on hemispheric differences, where Lombroso claimed that among "primitives", the right hemisphere, which controls the left side, was preferred to the left hemisphere, controlling the right-side. The second, Robert Hertz, a French sociologist, opposed Lombroso's claims and argued that the predominance of right-handedness was a cultural construct driven by the fundamental human desire to comprehend the world through binary oppositions, where the right being perceived

as good and the left as bad (Kushner, 2013a). According to Hertz, eliminating prejudice against left-handedness would open up access to both hands and hence both hemispheres, arguing that the outcome would free up suppressed abilities and creativity (Hertz, 1960).

Investigations into the causes and effects of left-handedness have, up until this point, been influenced by the perspectives of Lombroso and Hertz (Kushner, 2013a). While Lombroso's claims may seem absurd in modern times, they reflect ancient prejudices about left-handedness that have persisted throughout history (Coren, 1992b; McManus, 2002). Lombroso was affirming his claims with ‘‘modern’’ scientific methods, at the same time stating how individuals could be seen as untrustworthy in the community solely on the fact of them being left-handed (Lombroso, 1903, p. 444). According to Kushner (2013a), Lombroso's ideas have had a greater influence on our current perceptions of left-handedness than Hertz's anthropological theories. While Hertz theories on handedness, it being a result of cultural influence, has been opposed by research on genetics and environmental factors as the cause of left-handedness (McManus, 2019). Lombroso’s views, on the other hand, have been argued to connect the historical discrimination against left-handers to the claims made by researchers in the twentieth- and now twenty-first century (Kushner, 2013a). In the 1980s and 1990s, research found associations between left-handedness and autoimmune diseases, psychiatric disorders, mental retardation, and learning disabilities (Coren, 1989, 1992a; Geschwind & Behan, 1982). Kushner (2013) further argues that Lombroso's claims regarding the negative effects of left-handedness is still evident in present-day research. For example, recent studies have shown that left-handed children performed worse on almost all measures of development (Johnston et al., 2009) and that left-handed adults have been found to score lower on cognitive ability (Nicholls et al., 2010).

While Kushner (2013a) argued that Lombroso's influence has had a greater impact on modern research, one could also argue that Hertz (1960) idea of eliminating prejudice towards left-handedness would free up both hemispheres and lead to more creativity, along with the neuromyth of brainedness, may have had an impact on research on handedness and creativity. Studies have shown that left-handers score higher on creativity compared to right-handers (Badzakova-Trajkov et al., 2011) and that mixed-handers are significantly more creative than those who prefer only one hand (Shobe et al., 2009). However, other studies have found no significant association between handedness and creativity (Abbasi et al., 2011; van der Feen et al., 2020). For example, van der Feen et al. (2020) found that left-handed individuals rated themselves as more artistically inclined but were less creative in problem-solving and equally artistically creative compared to right-skilled individuals. Similarly, a study by Abbasi et al.

(2011) found no significant difference in creativity between left-handed and right-handed students in a group of 200 guidance school students. However, the notion that left-handers are more creative or talented is a recurring theme in popular accounts of left-handedness, and numerous websites list famous left-handers as evidence (Denny & Sullivan, 2007), for instance claims of Leonardo da Vinci being left-handed (McManus & Drury, 2004).

Handedness and Occupation

The hypothesis that handedness might have an impact in career choices, where left-handedness, or non-right handedness, are more common in the fields of art and architecture, arose from the observed systematic differences in handedness groups (Geschwind & Galaburda, 1985). For instance, Peterson and Lansky (1974) conducted two studies to investigate the prevalence of left-handedness among architects and architecture students, as well as whether left-handed individuals showed more spatial flexibility. In the first study, they surveyed 484 male students and 17 male faculty members in the Department of Architecture at the University of Cincinnati and found that both groups had a higher proportion of left-handed individuals than expected. Specifically, 5 of 17 faculty members (29.4%) and 16.3% of students were left-handed. The second study involved designing a space maze within an 18-inche square, entering at one corner, and exiting at the diagonally opposite corner, and while there was no significant difference in solving the maze between left- and right-handed students, left-handed students did perform better overall. The authors concluded that both groups tend to be more often left-handed than would be "normally" expected and suggested that the association between left-handedness and greater spatial competence, possibly linked to right-hemisphere dominance, may explain their findings. Additionally, in a subsequent study, Peterson and Lansky (1977) found that more left-handed architecture students successfully completed their 6-year program compared to their right-handed classmates. Several studies have found similar findings in support for this. Peterson (1979) found that majors in music and the visual arts had a higher proportion of left-handed individuals compared to majors in science. Mebert and Michel (1980) discovered significant differences in responses between the art and non-art groups using Annette's questionnaire. In Götestam (1990) study, left-handedness was more prevalent among architecture and music students, with both left- and mixed-handedness being more common, compared to students in the general study group. Schachter and Ransil (1996) investigated handedness distribution across nine professional groups and found that architects and lawyers had the highest proportion of

left-handed individuals, while orthopaedic surgeons, mathematicians, and librarians were mostly right-handed.

The reason for left-handed individuals seeking out more artistic occupation can be explained by considering the hypothesis that the left hand is controlled by the right hemisphere, which is dominant for a set of cognitive functions considered relevant for artistic processing, such as visuo-spatial attention and visual imagery (Heilman & Acosta, 2013), which in turn are dominantly controlled by the right hemisphere (Heilman & Acosta, 2013; Vingerhoets, 2019). The right hemisphere appears to be more important than the left for performing certain forms of spatial cognition (Heilman & Acosta, 2013). The ability to visualize and create various shapes is considered crucial for artistic production, and it has been found that the right hemisphere is dominant in determining the spatial relationship between lines (Hamsher et al., 1992). Additionally, the creation of visual art often involves rotating objects in visual space, a task that has been shown to rely on the right hemisphere. For example, a study conducted two experiments where participants were asked to mentally visualize an object, rotate the image, and determine if it matched a second image (Ditunno & Mann, 1990). The first study, which assessed right-handed individuals, found a significant advantage for accuracy in the left visual field - right hemisphere. In their second experiment, they compared patients with right and left parietal lesions and found that those with right parietal lesions were more impaired in this task than those with left parietal lesions, further underlining the dominance for the right-hemisphere for visuospatial tasks.

Artistic creations often originate from the imagination rather than reality, making visual imagery a crucial aspect of artistic production (Heilman & Acosta, 2013). Lesion studies have demonstrated that some patients can maintain visual imagery despite having bilateral lesions in their primary visual cortex, causing them to be cortically blind (Chatterjee & Southwood, 1995). Although, when it comes to perception and imagery, there are differences between the left and right hemispheres. Object agnosia, the inability to recognize objects, can be linked to lesions on the left ventral temporal-occipital area (Feinberg et al., 1986), while prosopagnosia, the inability to recognize faces, can be linked to lesions on the right ventral temporal-occipital area (Damasio et al., 1990). Bowers et al. (1991) discovered later that individuals with left ventral posterior temporal-occipital lesions have impaired object imagery, while individuals with right hemisphere lesions have impaired emotional facial imagery. Therefore, activation of the left hemisphere's object representations is crucial for object imagery, while the right hemisphere's activation of facial images and emotional expressions is important for emotional facial imagery. Further, in a study with subjects with

right hemispheric injury, the participants were presented with pictures of common objects from both typical and unusual angles (Warrington & James, 1988). The researchers found that patients with right hemisphere parietal lesions had difficulty recognizing objects from unusual views, but not from traditional views. Similarly, another study found that patients with right hemisphere posterior lesions had trouble matching faces shown in different views (Hamsher et al., 1979). This suggest that although both hemispheres appear to be involved in imagery, the right hemisphere may play a greater role in spatial imagery transformations (Heilman & Acosta, 2013).

The evidence presented supports the idea that artistic production relies on right-hemispheric cognitive processes. Therefore, the use of the left hand as the dominant hand for artistic output can be considered a direct expression of the right hemispheric functions associated with artistic processing, while dominant right-handed individuals rely on an indirect expression requiring additional interhemispheric exchange of information. This direct expression could make artistic processing and production feel easier and subsequently increase the quality of artistic expression in left-handed individuals, which in turn could lead to a preferential selection and a higher prevalence of left handers in the visual arts. However, other studies have found no such association between occupation and handedness. Where one study found no significant differences in the proportion of left- and right-handers in visuospatial fields, such as architecture and art, and verbal fields, like law and psychology (Shettel-Neuber & O'Reilly, 1983). While another found that left-handers where not overrepresented among architects (Wood & Aggleton, 1991), and when sex was studied separately, no effect between groups of studies was found (Cosenza & Mingoti, 1993). However, as handedness can be a factor for determining occupation, other factor such as social economic status can influence possibilities to seek out certain profession, as it in some countries requires money to attend university. Investigating recreational activities could be a more plausible way to investigate whether left-handed individuals seek out more artistic hobby activities. Although, studies that have investigated recreational activities have found mixed findings, where mixed handedness has been found to be more common among individuals preferring artistic activities (drawing, playing instruments, handcraft) (Giotakos, 2004). Additionally, a survey of more than 20 000 individuals (56% left-handed) found that there was no significant differences between time spent on artistic activities between right- and left-handed individuals (van der Feen et al., 2020). The reasons behind these mixed findings can be due to the use of different methodological approaches, different target sample or differences in sample size or test power.

Aim of Study

The above reviewed literature illustrates how left-handedness have been associated throughout history, and how more recent research has indicated that systematic differences between handedness groups might influence career choices. However, research has produced mixed findings with regards to both the relationship between occupation and left-handedness, as well as the supposed link between left-handedness and creativity. Due to the subjective nature of creativity, particularly in terms of originality, it is challenging to quantify and measure. As a result, this study will not take creativity into account. Additionally, collecting data to assess the originality or novelty of artwork can also be a complex task as it can be subject to the observers' personal bias or perspective. Handedness, on the other hand, is easily measured or identified by an observer (Bryden et al., 2007) and as social media platforms have increased and expanded, it can be considered a source for conducting research (Laestadius, 2016). In 2020, Instagram added reels to their platform (Instagram, 2020) and with Instagram being a popular platform for advertising and promotions (Instagram, 2023a), it is reasonable to assume that artists use social media to showcase their work. As artists often actively perform their artistic activities on these platforms, their handedness can be easily identified.

Thus, the study is operationalized as an observational study, designed to determine the hand preference of artists who present their work as short video clips (reels) on the social media platform Instagram. The aim of the present study, based on the presented research, is to examine the prevalence of left handedness among individuals who are engaged in visual artistic activities. Two hypotheses emerged: I) Left-hand preference is more common in online visual artists than in the general population, and II) Left handers' art is of higher quality. To test the first hypothesis, we utilize an estimate from a recent meta-analysis, which suggests that 10.6% of the population is left-handed (Papadatou-Pastou et al., 2020). For the second hypothesis, we assume that the number of likes an artist receives on their posts can serve as an indicator of the quality of their work. Specifically, we assume that a higher average number of likes per post since upload, indicates that an artist's work can be considered of being of higher quality. The study was preregistered in an open science framework (https://osf.io/vrz9c), to ensure transparency and credibility of the research (Lakens, 2022).

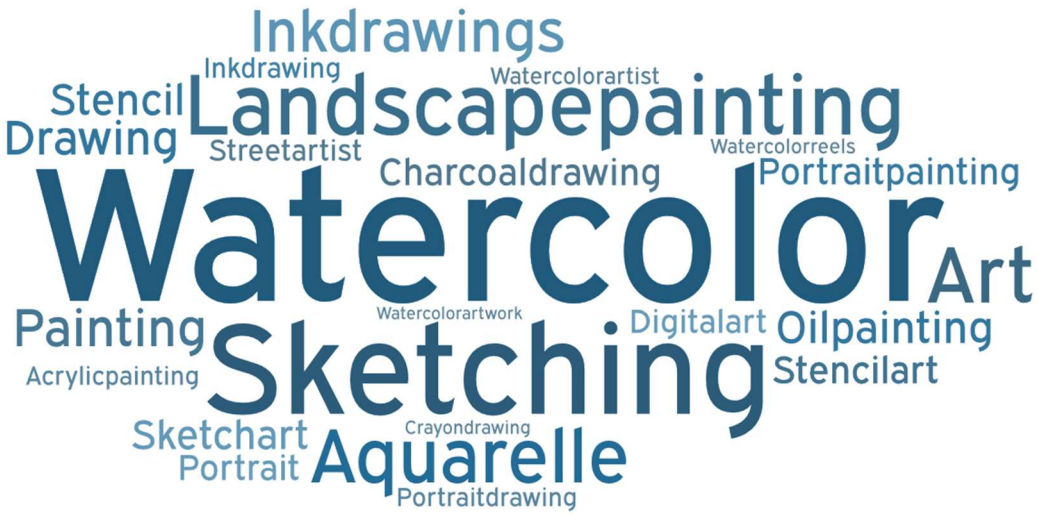
Method

Sample

The total sample size for all ratings of participants in this study was N = 575 (male = 142, female =250, other = 183; note: "other" refers to participants for which the sex could not be defined by the information provided on Instagram). Following the preregistration, participants with less than five reels registered was excluded from the main analysis. This resulted in the sample size being reduced to N = 468 (male = 120, female = 208, other = 140). This sample size achieved the below mentioned test power of .80 (see sample size rationale). Further, the population from which the sample was drawn from included all visual artists that had a public Instagram account and as the study was purely observational no informed consent was necessary (see ethical considerations). The identification of relevant accounts was based on search terms that specified visual artistic activities (e.g., #painting, #drawing). 23 different search terms were used with different frequency (see figure 1). The search terms were ad-hoc chosen by the raters.

Figure 1

Word cloud of search terms used.



Note: Word cloud depicturing the search terms used, with larger letters illustrating more frequently used search terms. Image created using WordArt.

Sample Size Rationale

To determine the number of observations required, an a priori power analysis was performed based on the minimal difference in the proportion of left handers between artists and the general population. A recent meta-analysis (Papadatou-Pastou et al., 2020) estimates that 10.60% of the general population is left-handed. The authors report some variability in

the data, with the estimate for women to be 9.53% [CI95: 8.75%, 10.30%] and for men to be 11.62% [CI95: 10.66%, 12.60%]. In an extreme case, with only male participants, the percentage of left-handers in the population could be up to 12.60%. In this study we considered that at least 14.6% (2% more than the male upper CI limit) of the population we were sampling from to be left-handed. Relating the distribution of interest to the expected proportions, the minimal effect size of interest was calculated to Cohens W = 0.13, which further was used to determine the sample size needed using the R package "pwr". A power of .80, with a significant level of .05 is reach using N = 465 observations.

As the first hypothesis required a higher number of observations than the second, the sample size planning was based on considerations regarding hypothesis I. However, a sensitivity power analysis was nevertheless performed using G*power. Assuming we would get 10.6% left-handers (ca. 50 out of the 465 research subjects) the sensitivity power analysis suggest we would be able to exclude effects above Cohen's d = 0.37, with a power of .80, .05 alpha error and a one-sided t-test, given a null finding. This was considered appropriate, as only medium effect sizes (d = 0.5 and above) are considered relevant (Cumming, 2012)

Data Collection Procedure

The data was collected using an Instagram account (rater-account) created for this purpose and systematized using a protected online data collection system provided by UiO (Nettskjema). Three different raters contributed to the data collection, and as multiple observers were used the interrater reliability, or agreement, was evaluated using Cohen's Kappa and Fleiss' Kappa before data collection started. The agreement for the classification of handedness was examined by having all raters assess one reel from the same 50 individuals. Further, using the 'irr' package in R the Cohen's Kappa was calculated for each pair of raters (the pairwise Cohen's Kappa were κ = 1, .898, and .898 for the three rater combinations). All pairwise Cohen's Kappa scores indicate acceptable agreement between the raters, as a Cohens kappa equal to, or above, .70 is considered acceptable for observational studies (Bordens & Abbott, 2011). As handedness in this study is considered a categorical variable, Fleiss' Kappa is an index of inter-rater agreement between three or more raters that can be used on categorical variables. This was also calculated using the same R package ('irr'), and found to be κ = .934, which indicate excellent agreement between the raters (Fleiss et al., 2013).

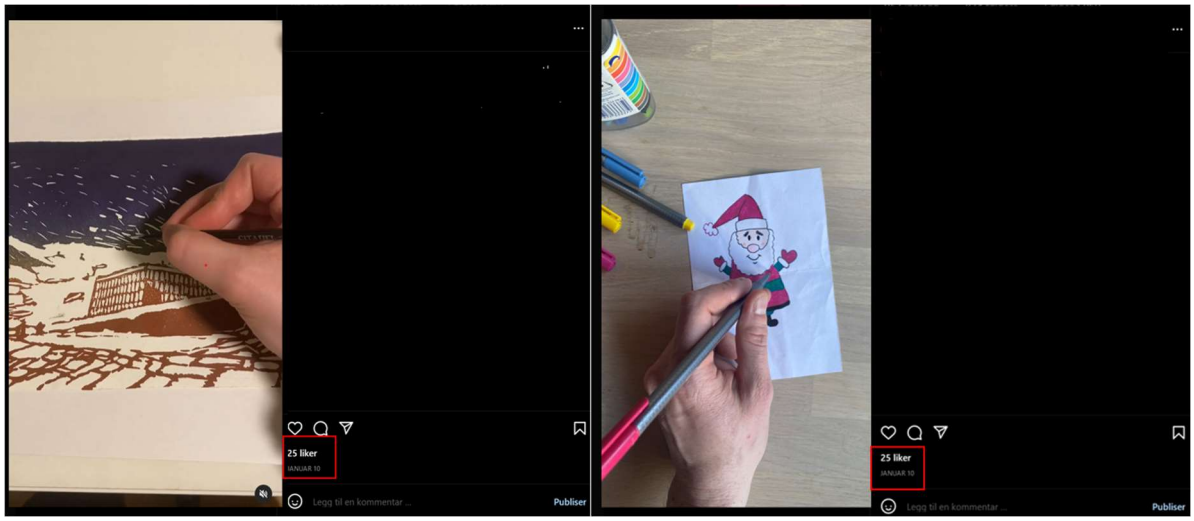
For each search term used, the list of results was explored starting with the topmost recent post and moving results-by-results downwards. The identified accounts were examined

to check whether a) video clips (reels) where available and b) the person owning the account was the artist shown in the videos. If both criteria were met, the data collection aimed to determine the research subject's handedness based on the manual preference exhibited in the uploaded reels. Per research subject the classification of handedness was based on 5 reels for each of which the rater evaluated whether the shown manual activity was performed with the "left", "right", or "both" hands (see Fig. 2). The instruments used to perform the artistic action (e.g., brush, pen, fingers, spray can) was also noted for each reel. Additional information recorded per reel was the number of likes and the number of days since it was uploaded. Further information about the artists account recorded was the number of account followers, the sex (male/female/other), and the country of origin (if available). To ensure that each research subject was only evaluated once, the rater account would then follow the evaluated account.

Figure 2

Example screenshots of reels with left- and right-hand.

A B



Note: A) Example screenshot of a reel showing "painting" activity with a "brush" using the right hand. B) Example screenshot of a reel showing "drawing" activity with a "pen" using the left-hand. The images were created by the author for illustration purposes only.

Handedness Classification

For the present study, participants were categorized as either left-handed or right-handed based on the five reels collected from each participant, with the classification determined by the consistency of hand use for the artistic activity recorded. Specifically, to be classified as left or right-handed, at least three out of five reels needed to show consistent

hand use for the recorded activity. That is, to be classified as left-handed three or more reels needed to be performed with their left-hand.

Statistical Analysis

The data recorded through the data collection system provided by UiO (Nettskjema) was first extracted to a csv file, cleaned, and transferred to a R-script. All analysis were done using R version 4.2.2.

Main Analysis

Following the preregistration, the analysis for the first hypothesis was conducted as a Chi-Square goodness of fit test to assess the proportion of left-handed visual artists compared to left-handed individuals in the general population. The estimate for the general population was based on a recent meta-analysis by Papadatou-Pastou et al. (2020) that estimates that 10.60% of the general population is left-handed.

For the second hypothesis, we assumed that the number of likes could be taken as an indicator for the quality of the artists artwork. That is, the higher the average likes per day, the higher quality the art holds. In accordance with the preregistration, a between-subject one-sided t-test was performed by comparing the 'Likes Per Day' for left-handed participants to right-handed participants 'Likes Per Day'. Closer inspection of the summary statistics for the variable 'Likes Per Day', it was discovered that the data was not normally distributed. Therefore, the t-test that was conducted was not sufficient, and non-parametric testing was deemed necessary. Although this was not originally planned according to the preregistration, a Wilcoxon Sum Rank test was performed to further explore the data.

Exploratory Analysis

Following the preregistration, potential moderation effects of sex effects would be explored if enough data on sex was available. However, as too many participants were marked as "other", we were not able to perform such analysis. Although not preregistered, to further explore the dataset we investigated whether the number of followers could be taken as an indicator for the quality of the artwork. Upon inspection, we found that the data for the number of followers were also not normally distributed. Consequently, we performed a Wilcoxon rank sum test with 'Number of Followers' as the dependent variable to further explore the dataset.

As described in the introduction, how left-handers have been classified between studies have varied (Papadatou-Pastou et al., 2013), where more lenient criteria has resulted in

higher proportion of left-handers (Papadatou-Pastou et al., 2020). To further investigate handedness among artists a second exploratory analysis was performed with a more lenient criteria for inclusion, being that 3 or more reels required to be included, where 2 or more needed to be recorded with the left-hand to be classified as left-handed. The number of participants for this analysis was then increased to N = 534 (male =133, female = 235, other = 166). The data set was preprocessed based on this criteria, and a chi square goodness of fit test was performed to assess the proportion of left-handed visual artists compared to the same estimate of 10.6% left-handed individuals in the general population (Papadatou-Pastou et al., 2020).

Ethical Considerations

Research ethics for internet research are, in general, the same as it is in other areas. That is, like all other humanities and social science research on and with people, it is mainly about ensuring the dignity and integrity of the participants (Ess, 2015). Ethical considerations to take into account when conducting research using social media, in this instance Instagram for data collection, also needs to ensure that no harm is to come to the participants and that the research subjects are aware of their participation. Although, following the guide for Internet Research Ethics by the National Committee for Research Ethics in the Social Sciences and the Humanities (NESH, 2019), no informed consent is required for this project. This is because it is reasonable to assume that the research subjects are aware that the videos or post uploaded to a public account on Instagram is accessible in the public sphere. The username for the accounts used in the data collection was not recorded and the reels was neither downloaded nor saved. The data collection is only observational and does not include any information that can be considered sensitive (Datatilsynet, 2019). It also appears to be no special vulnerability related to the research-subject group. Based on the data collected it will not be possible to identify the subjects. Further, the study was approved by the internal ethical review bord of the Department of Psychology, University of Oslo (UiO; Reference number 2332235).

Results

Main Analysis

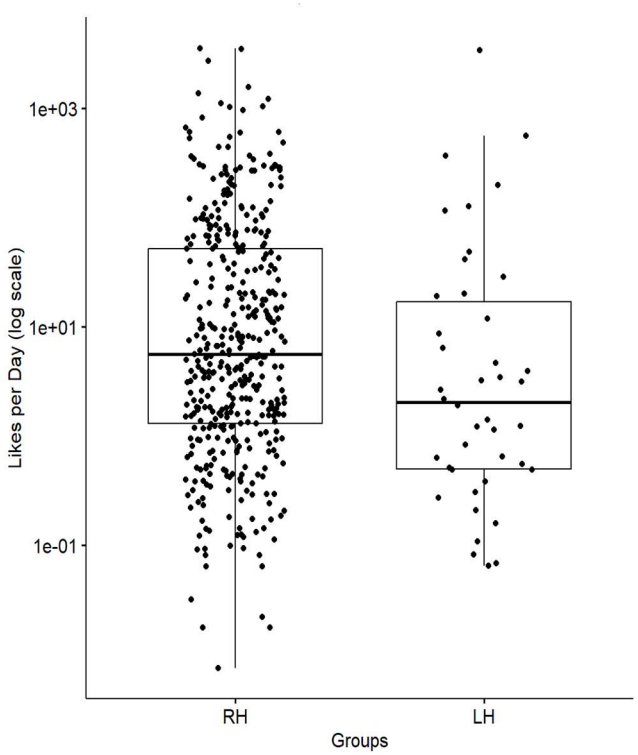
From the Chi-square goodness of fit test that was run, the proportion left- and right-handed Instagram artists did not deviate from the expected distribution, $\chi^2_{(1,468)} = 1.3015$, $p = .2533$, effect size Cohens' $W = .0528$. The proportion of left-handed artists was, in fact, numerically lower than the expected proportion. The observed proportion was found to be

8.97% left-handers and 91.03% right-handers, compared to the expected proportion of 10.60% left-handers and 89.40 right-handers.

For the between subject t-test, no significant difference in means (M) for likes per day between left-handed (M = 119.190, SD = 531.227), and right-handed visual artists (M = 92.726, SD = 325.232); $t(44) = .31705$, $p = .3764$, $d = 0.0475$, was found. However, since the "Likes per day" variable was not normally distributed, as described in the method section, a Wilcoxon rank sum test was performed. The median (Mdn) Likes per day for left-handed artists was 2.04 (interquartile range (IQR) = 16.712), whereas the median Likes per day for right-handed artists was 5.59 (IQR = 50.706). The Wilcoxon test showed that the difference between the groups was significant in the opposite direction than our hypothesis ($W = 0894$, $p = .02$, $r = .108$) with right-handed artists having more likes per day, as illustrated by Figure 3.

Figure 3

Box plot of the distribution of Likes per Day for Right (RH) -handed and left-handed (RH) Instagram artists.



Note: The figure displays the distribution of Likes per Day for right-handed (left box) and left-handed (right box) visual artists. Median value is indicated by the black horizontal line. The comparison of the means was statistically significant (W = 10894, p = .02, N = 468; for details see text).

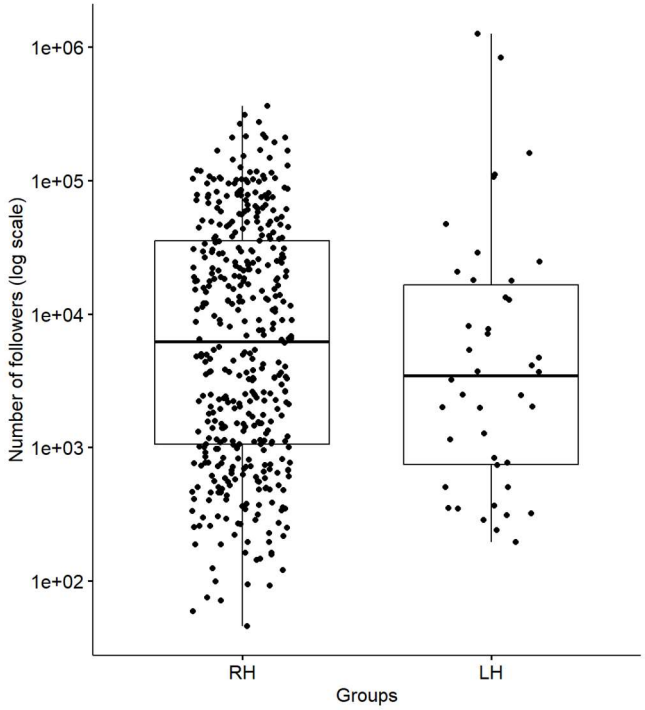
Exploratory Analysis

Followers as Dependent Variable

To further examine the dataset, a Wilcoxon rank sum test was performed with followers as the dependent variable. The median Followers for right-handed artists was 6211.4 (IQR = 34175.5), whereas the median Followers for left-handed artist was 3450.5 (IQR = 15808.0). The Wilcoxon test showed that the median difference is opposite to our hypothesis, but the Wilcoxon test did, however, show no significant difference between the groups (W = 10078, p = .18, effect size r = .0626; see Fig. 4).

Figure 4

Box plot of the distribution of number of followers for right- and left-handed visual artists.



Note: The figure displays the distribution of Number of followers for right-handed (left box) and left-handed (right box) visual artists on Instagram. Median value is indicated by the black horizontal line. The comparison of the means was statistically significant (W = 10078, p = .18. N = 468; for details see text).

Increased Sample Size

With an increased sample size of N = 534, the proportion of left-handed artists increased from 8.97 % to 9.18 % with a more lenient criteria for left-handedness (3 or more reels required to be included, where >2 to be classified as left-handed). However, the Chi-square test performed showed that the observed proportion left- and right-handed Instagram artists still did not deviate from the expected distribution, $\chi^2(1,534) = 1.1426$, $p = 0.2851$, W=

0.0463. The observed proportion of left- and right-handers for the increased sample size was found to be 9.18% and 92.82%, respectively.

Discussion

The findings from the statistical analysis provided evidence that contradicted what we predicted in our hypothesis. We found a lower proportion of left-handed individuals among Instagram artists, 8.97%, than the predicted 10.6 % estimate for the general population. Indicating that the prevalence of left-handed artists is not higher compared to the population. This finding was also supported by the results from the exploratory analysis, where we were more lenient with the exclusion criteria. Although the percentage of left-handed individuals increased to 9.18%, it remained below the prevalence found in the general population. For our second hypothesis, the number of likes per day for right-handed artists was significantly higher than the likes per day for left-handed artists, although only a small effect size was found (r = .108). This is also contrary to our hypothesis, suggesting that left-handed artists' work cannot be considered of higher quality than that of right-handers in our sample. Additionally, in the exploratory analysis, there was no significant difference observed in the number of followers between the two groups. Indicating no apparent difference in the perceived quality of art produced by left- and right-handed artists in our sample.

Left-Handedness and Artistic Production

Considering the hypothesis that the left hand is controlled by the right hemisphere, which is dominant for a set of cognitive functions considered relevant for artistic processing, such as visuo-spatial attention and visual imagery (Heilman & Acosta, 2013). Left-handedness should be more prevalent among artists due to the possible direct expression of artistic processing in the right hemisphere. The lower prevalence of left-handedness observed in the present study contradicts previous findings in artists (Mebert & Michel, 1980) and architects (Peterson, 1979; Peterson & Lansky, 1974; Peterson & Lansky, 1977). This could suggest that the direct expression of right hemispheric functions associated with artistic processing through the use of the left hand may not be a significant factor in the prevalence of left-handedness in the visual arts.

Although research has shown that visuospatial attention is primarily controlled by the right hemisphere (Heilman & Acosta, 2013; Vingerhoets, 2019), left-handers with atypical lateralization for language have been found to have visuospatial attention in their left hemisphere (Cai et al., 2013). Cai et al. (2013) found that lateralization in speech production

was associated with lateralization of spatial attention in the opposite hemisphere. All, but one, of left-handers who were left-lateralized for speech exhibited right-lateralized for spatial attention, whereas all left-handers who were right-lateralized for speech exhibited left-hemispheric dominance for spatial attention. Others have found no difference in visuospatial task when examining patients with right or left hemispheric injury that were either right or left-handed (Masure & Benton, 1983). It is important to note that in Cai et al. (2013) study the participants were pre-screened and selected based on their speech lateralization to ensure sufficient variability in the lateralization indices of the study sample (Willems et al., 2014). However, since variability in speech lateralization is more common for left-handers than for right-handers, they are an obvious target population for these studies. Although, pre-selection of a study sample raises the question of whether the findings will generalize to the whole population, including both left- and right-handers (Willems et al., 2014).

These findings suggests that left-handers may have a reverse lateralization for visuospatial attention compared to right-handers. This is further supported by evidence in lesion studies, that have found left-handers with left-hemispheric damage to exhibit more severe visuospatial deficits than right-handers (Borod et al., 1985). These findings contradict the assumption that the higher prevalence of left-handedness among artist is a results of the left-hands direct expression of the right hemispheric functions associated with artistic processing, at least for visuospatial attention. It should be noted that the majority of left-handers do not exhibit atypical lateralization of language, where research has shown that approximately 70% of left-handers have language lateralized in the left-hemisphere (Corballis, 2009; McManus, 2019). As demonstrated in Cai's study, left-handed individuals with left-hemispheric dominance for language, exhibited right-hemispheric dominance for visuospatial attention. Therefore, the potential benefits for left-handed individuals with right-hemispheric visuospatial attention may still exist. However, since our study was observational, it cannot provide conclusive evidence for this hypothesis, and further investigation using imaging techniques is necessary to examine this possibility.

It is important to note that the sample in this study was limited to visual artists on Instagram. Therefore, it may not be representative of all visual artists or to the general population (see limitations). However, our findings support previous research that have found no difference in the prevalence of left-handers among artist and architects compared to other occupations and study direction (Cosenza & Mingoti, 1993; Shettel-Neuber & O'Reilly, 1983; Wood & Aggleton, 1991). As this is an observational study, direct comparisons to other studies using different methods for assessing handedness may not be suitable. Our findings

suggest that there is not a higher prevalence of left-handed artist than in the population. Further, it suggests that the prevalence of handedness is not necessarily a direct expression of these functions, or at least not in the context of determining prevalence among visual artist in an online sample. It is possible that the prevalence of left-handedness in visual artists is influenced by factors other than artistic processing, such as the demographics of Instagram. Further research using a more diverse sample of visual artists could provide more insight into the prevalence of left-handedness in the visual arts and its potential relationship with the right hemisphere's functions associated with artistic processing.

Likes and Followers as Indicator of Quality of Artwork

The idea that left-handers possess greater creativity and talent has often appeared in popular narratives on left-handedness (Denny & Sullivan, 2007). Additionally, the assumption that left-handers have a more direct route for artistic processing could lead to easier production and increase quality of the artistic work. This is supported by research showing that left-hander score higher on creativity (Badzakova-Trajkov et al., 2011), as well as the observed higher prevalence among artists (Mebert & Michel, 1980; Peterson, 1979). Therefore, it can be assumed that if left-handers are indeed more creative and have a benefit through a more direct route compared to right-handers who rely on an interhemispheric exchange of information, their work should hold a higher quality than that of right-handed artists.

To measure this in our sample we considered that number of likes could be taken as indicator of the quality of the artwork. In contrast to our initial hypothesis, the results of our study revealed that right-handed artists received significantly more likes on their artwork compared to left-handed artists, although only a small effect size was found (r = .108). We conducted additional analysis to investigate if the number of followers could serve as an indicator of the quality of the artwork produced by the artists. We found no significant difference between the number of followers of right-handed and left-handed artists. This finding, combined with the lower prevalence of left-handed artists found in our sample, does not support the assumption that left-handers have an advantage in artistic processing and production, resulting in higher quality and a preferential selection of left handers in the visual arts. As previously stated, due to the observational nature of our study, it is unable to provide definitive evidence for this hypothesis. Further research is needed to explore this possibility in greater detail.

Additionally, it is important to note that likes can be considered a measure of popularity, rather than quality. Therefore, one possible explanation for the lack of association is that social media platforms such as Instagram may not be the best way to measure the quality of artwork. There may be other factors at play that influence the number of likes and followers, such as the use of hashtags or engagement with other users, which have nothing to do with the quality of the artwork itself. For instance, it is possible to add up to 30 hashtags in one post (Instagram, 2023b), which can increase the visibility of the post on the platform. Another possible explanation is that the quality of artwork is inherently subjective and cannot be objectively measured by the number of likes and followers alone. What one person considers to be high-quality art may be different from what another person considers to be high-quality art. Therefore, measuring the quality of art solely based on the number of likes and followers may not be a reliable indicator of quality.

Observation as Method for Assessing Handedness

Using an observational method to investigate handedness has the advantage of being naturalistic. For this study it means that the hand observed during the artistic activity is likely to be the preferred hand for said activity. It is therefore reasonable to assume that the hand an artist uses to perform an activity is their preferred hand for that specific activity. To test our hypothesis about left-handers' engagement in visual artistic activities, it is beneficial to investigate in a natural setting with no time constraints (Bryden et al., 2007) or possibilities of being influenced by biases or common beliefs about creativity and left-handedness (Baas et al., 2015). Observations may provide a more accurate measurement of hand preference compared to questionnaires that rely on self-report, which rely heavily on the subjective interpretation of the items and beliefs (Bryden et al., 2007). At the same time, it is important to note that our results cannot be taken as hand preference in general, as it only investigate one or two of the manual activities (drawing/writing) that are usually requested by a typical multi-item questionnaire (Annett, 1970; Oldfield, 1971). Since this study utilized an observational method for assessing handedness, it may not be directly comparable to other studies that rely on questionnaires (Bryden et al., 2007). This is because observational studies may only capture a limited set of behaviours or actions that may not reflect the full range of handedness-related behaviours. However, the aim of this study was to investigate hand preference among artists, and it could be argued that their hand preference for other activities is not relevant for this study.

Another potential issue with using videos as method for assessing handedness is the possibility of mirroring in the Instagram videos. In some cases, the video may be mirrored, which would result in the hand recorded by the rater being the opposite hand, were a right-handed individual could appear to be left-handed and vice versa. While the raters tried to carefully check for hints for a possible reversal (e.g., inversion of writing in the video background) it cannot be excluded. However, a systematic effect on our findings can only be predicted assuming that it is more often done in one of the two handedness groups than in the other, and that this happened frequently.

Social Media for Sampling

Instagram has over 1 billion users (Kemp, 2023), providing a large pool of potential participants for research. Instagram started as a platform that was meant for sharing pictures with friends and family, but has also become a platform that is commonly used to promote brands or sell products (Instagram, 2023a). Therefore, one can assume it is an ideal place for artists to showcase their work. For instance, a survey of art buyers showed that in 2020, 87% of surveyed art buyers claimed to use Instagram to find new artists (Statista, 2022). This indicates that for sampling artists, Instagram might be a good sampling pool. Further, Instagram users come from a variety of backgrounds and demographics (Laestadius, 2016), allowing researchers to access a more diverse sample than of traditional recruitment methods.

There are potential limitations to using Instagram as a sampling method, such as its lack of representativeness for the general population. As approximately 85% of Instagram users are under 45 years old (Dixon, 2023a), the platform has a younger demographic. Additionally, Instagram has a higher proportion of users with lower income and educational levels (Duggan, 2015). Although the platform has a more diverse racial and economic user base compared to other social media platforms (Laestadius, 2016), it is skewed towards younger users and cannot be considered representative of the entire population. Therefore, it is important to take this into consideration when generalizing findings from Instagram data to the broader population.

Limitations

The results of our study showed a lower prevalence of left-handedness among online visual artists compared to what previous studies have found among artists (Mebert & Michel, 1980; Peterson, 1979) and architects (Peterson, 1979; Peterson & Lansky, 1977), as well as the estimate for the general population (Papadatou-Pastou et al., 2020). Multiple reasons for

this deviance may be discussed. Firstly, we were not able to control for sex effects, which may have influenced our findings. Where we were able to determine the participants sex, from the information provided in their accounts, we found a larger percentage of females, who are less likely to be left-handed compared to males (Papadatou-Pastou et al., 2008; Papadatou-Pastou et al., 2020). Peterson and Lansky (1974; 1977) only included male participants, which may have influenced their findings, resulting in the high prevalence of left-handed artists. Nevertheless, the prevalence of left-handedness among architects was significantly higher than that found in the general population, and sex alone cannot explain this difference, as the effect of sex on handedness has been found to be small (Papadatou-Pastou et al., 2020). This is further supported by Peterson (1979) study which included female participants and found a higher prevalence of left-handers in the visual arts field (12.24%). For our study, we found no evidence for a higher prevalence of left-handed visual artists, although not controlling for sex, it has likely not affected our results substantially.

Secondly, it is worth considering that education and socioeconomic status may influence handedness, as higher education has been associated with a higher prevalence of left-handedness (Faurie et al., 2008). This may partially explain why the architects and artists from these studies have been found to have higher rates of left-handedness, as they typically have higher levels of education and socioeconomic status, which is especially relevant considering the cost of higher education in the United States (Hanson, 2023). Although Instagram is considered to have a more diverse user base compared to other social media platforms (Laestadius, 2016), Instagram also has a higher proportion of users who earn less than $50k and do not hold a college degree (Duggan, 2015). This could have influenced our findings, as socioeconomic status has been demonstrated to influence handedness (Faurie et al., 2008). There is, however, an argument to be made that having the means to record yourself whilst drawing might indicate a comparably high status of the Instagram users in our sample. While our study did not control for education or socioeconomic status, it provides insight into the prevalence of left-handedness in a sample of visual artists on Instagram.

Third, it is important to consider the potential cultural effects on our results as Instagram is used by individuals worldwide. Studies have shown that the prevalence of left-handedness is lower in Asia compared to North America and Europe (Porac et al., 1990). The lower prevalence is likely due to cultural pressures against left-hand use, as evidenced by studies demonstrating that only 3.5% of schoolchildren in China (Teng et al., 1976) were left-handed. In contrast, 6.5% of schoolchildren of Asian descent living in the United States at the same time were found to be left-handed (Hardyck et al., 1975). However, as our study did not

control for country of origin, we cannot draw a definite conclusion about the relationship between culture and handedness in our sample. This study relied solely on the information available on the participants Instagram accounts, which does not always confirm the user's country of origin. The country available on their profile might be where they live rather than their country of origin. Based on the available data on country within our sample, assuming it represents the participants' country of origin, it appears that the majority of analysed accounts originated from the United States, followed by India. This is in accordance with statistics detailing which countries has the highest number of Instagram users, with India having the highest and the United States coming in second (Dixon, 2023b). However, considering that a study in India found only 3.98% of 3,698 participants to be left-handed (Suar et al., 2013), this could have influenced our results, particularly since information on country was not available for a large percentage of our participants. Nonetheless, for the accounts in our sample that did have information on country available, the majority of these were from western countries, suggesting that cultural influences on handedness may not have impacted our findings significantly.

Finally, age has been found to potentially moderate handedness, as demonstrated by cross-sectional studies that have found a decrease in left-handedness with increasing age (de Kovel et al., 2019; Jung & Jung, 2009; Preti et al., 2011). For instance, one study found that the proportion of left-handers was nearly twice as high in individuals under 40 years of age compared to those over 40 years of age (Lee-Feldstein & Harburg, 1982). This finding is likely due to the practice of retraining left-handed children to use their right-hand up until the mid-twentieth century (Kushner, 2012). For instance, a 1993 study conducted in Norway discovered that 2.69% of participants aged 21-30 had experienced forced switching, compared to 6.75% of those aged 80-101 (Hugdahl et al., 1993). The lower prevalence of left-handers in our sample may suggest that our sample has a higher age range. However, given that Instagram's user base is predominantly young, with about 85% of users estimated to be under 45 years old (Dixon, 2023a), this is likely not the case. Considering the age for Instagram users, we would have expected a higher proportion of left-handed individuals in our sample. This we did not find, and as it is unlikely that people under 45, particularly those from Western countries, have experienced forced switching or retraining, it is unlikely that age have had a significant impact on our results.

As previously stated, it may not be appropriate to compare the findings of this observational study with research on occupation due to the lack of information on the participants' formal education in artistic fields. Being an artist does not necessarily require

formal education, thus, it may be more appropriate to compare with studies that have investigated recreational activities. To our knowledge, few studies have investigated this, making comparisons difficult. For example, a study by Giotakos (2004) found that mixed-handers were more inclined towards artistic hobbies, but our analysis focused on the classification of handedness into left-handers and right-handers, making it difficult to make a direct comparison. Another study, by van der Feen et al. (2020) found no significant differences in the time spent on recreational activities between left-handers and right-handers, which can be considered to be consistent with the results from this study. However, van der Feen et al. (2020) also found that left-handers rated themselves as more creative, which is consistent with the common belief that left-handed people are generally more creative. Although, it might have been a result of the participants biased perception of their own creativity (Baas et al., 2015), rather than a measure of creativity itself. Assuming that left-handers are more inclined to perceive themselves as more creative or artistic, this should have led to a higher percentage of left-handed artists in our sample. However, this was not the case, as our results suggest that left-handers are not more likely to pursue artistic activities. It is important to acknowledge that the relationship between creativity and handedness is complex and not yet fully understood. While some studies have found a correlation between left-handedness and creativity (Badzakova-Trajkov et al., 2011), others have not found a significant association (Abbasi et al., 2011; van der Feen et al., 2020).

Taking all this into consideration, the results provide insight into hand preference among visual artists in an Instagram sample. This study did not control for potential moderation effects of handedness such as sex, cultural effects, and socioeconomic status, it might therefore not generalize to the general population. However, it highlights the possibility of using social media as a sampling pool for research on handedness. Future studies should aim to control for these factors and investigate the relationship between handedness and demographic variables in more detail. Combining an observational method with a handedness questionnaire, such as the EHI (Oldfield, 1971), could further improve the comparability of the results with those of other studies, while maintaining the advantage of a naturalistic setting.

Conclusion

The current study aimed at investigating the prevalence of left-handedness among online visual artists. Based on research that have found certain professions to have a higher prevalence of left-handed individuals, such as artists (Mebert & Michel, 1980; Peterson,

1979) and architects (Peterson & Lansky, 1974; Peterson & Lansky, 1977), we expected the proportion of left-handers to be higher than in the general population. This we were, however, not able to confirm. While keeping the discussed limitations in mind, the planned sample size together with the preregistration, allow us to conclude that an increased prevalence of left handedness in visual artists is unlikely.

Further, we investigated whether likes and followers could be taken as an indicator of the quality of the artists' work. For likes, the result was significant in the opposite direction, with right-handers having on average more likes, but for followers no significant effect between the groups was found. While it is important to note that likes and followers may not be the most accurate measures of artistic quality, our findings suggest that there is no evidence to support the notion that left-handers produce higher quality art or that there is a greater representation of left-handers in the visual arts. However, since our study was observational, it cannot provide conclusive evidence for this assumption, and further investigation is necessary to examine this hypothesis.

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