# Composition in portraits: *Selfies* and *wefies* reveal similar biases in untrained modern youths and ancient masters*

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**ABSTRACT**
Previous analyses suggest that artists prefer poses showing the left side of the subject's face when composing a portrait, but showing the right side when composing their own self-portrait. There is also some evidence that artists may prefer compositions with key features on the right of the picture. Do these findings generalize to spontaneous, pseudo-artistic productions by individuals with no formal training in painting and art history? To investigate this issue, we tested a sample of 104 British schoolchildren and teenagers (mean age = 13.8 years; 80 females). We analysed posing biases in individual photographic self-portraits ("selfies") as well as of self-portraits including also the portrait of a friend ("wefies"). Our results document a bias for showing the left cheek in selfies, a bias for placing the selfie-taker on the right in wefies, and a bias for showing two left cheeks over two right cheeks, again in wefies. These biases are reminiscent of what has been reported for selfies in adult non-artists and for portraits and self-portraits by artists in the 16th–18th centuries. Thus, these results provide new evidence in support of a biological basis for side biases in portraits and self-portraits independently of training and expertise.

## Introduction

Portraits and self-portraits are an engaging form of visual art that can be enjoyed, and studied, adopting several different approaches (Brilliant, 2004; Calabrese, 2010; Crozier & Greenhalgh, 1988; Ferrari, 2002; Hall, 2014; Woodall, 1997). In this paper, we study factors affecting how visual artists and photographers arrange their subjects in their created image. This is

usually referred to as the issue of composition, and composition has been studied extensively with regard to general theoretical constructs such as balance, dynamics, and harmony (see, for instance, Arnheim, 1954, 1982). However, in the present paper, we focus on one specific aspect, namely, posing choices with regard to the subjects of portraits and self-portraits and in particular the choice of head rotation. Our interest in this issue stems from an intriguing bias that has been found to affect posing choices in portraits and self-portraits, and that may be related to the lateralization of functions in the human brain.

Based on analyses of art history books and exhibition catalogues, several lines of evidence suggest that artists prefer poses showing the left side of the subject's face when composing a portrait, but showing the right side when composing their own self-portrait (LaBar, 1973; Latto, 1996; McManus & Humphrey, 1973; Nicholls, Clode, Wood, & Wood, 1999; Powell & Schirillo, 2009; Suitner & Maas, 2007; Tosun & Vaid, 2014). What causes these biases is at present not completely understood. It has been suggested (Nicholls, 2000; Lindell, 2013 Powell & Schirillo, 2011) that a common cause might be identified in the right-hemispheric specialization for the expression of emotions, which tends to make most of us more expressive on the left side (the *right-hemisphere* hypothesis; Sackeim, Gur, & Saucy, 1978; but see also Prete, Laeng, Fabri, Foschi, & Tommasi, 2015; Torro Alves, Fukusima, & Aznar-Casanova, 2008). In support of this proposal are data confirming asymmetries in facial expressiveness (Blackburn & Schirillo, 2012), as well as historical analyses suggesting that a right bias in self-portraiture emerged when cheap large mirrors became available (Bruno & Bertamini, 2013) and disappeared when photography became widely available (Bruno & Bertamini, 2013; Lindell, 2012). This is consistent with a spontaneous tendency to present the left side for expressiveness, for the mirror reversal will then cause the artist to paint an image presenting the right side of the face (which is the anatomical left side). Although the right-hemisphere hypothesis provides an attractive explanation, other interpretations are possible. For instance, it is possible that studio conventions tended to favour placing a painter's canvas to the right of the subject, as most painters are right handed and this arrangement optimizes the visibility of the subject avoiding occlusion by the hand holding the brush. For a self-portrait, this would entail placing the mirror on the left of the canvas, possibly producing the bias (for discussions of this possibility, see Bruno & Bertamini, 2013; Nicholls et al., 1999). Alternatively, conventions might arise from cultural factors, such as meanings attached to the right and left cheek as symbolizing similarity or distance in status or gender (Humphrey & McManus, 1973; McManus & Humphrey, 1973; Schirillo, 2000; ten Cate, 2002).

In two recent papers, we have suggested that the right-hemisphere hypothesis can be tested by studying selfies (Bruno & Bertamini, 2013;

Bruno, Bertamini, & Protti, 2015). Selfies, as baptized in social media tags, are photographic self-portraits taken by non-professionals. They represent a form of pseudo-artistic real-life behaviour that affords a unique opportunity to test principles of art production in populations uncontaminated by academic training. In addition, they represent a natural experiment that reproduces putative studio settings for artists' self-portraits. This is so because most selfies are taken either while monitoring the image in the preview screen of a smartphone (which presents a mirror image) or while holding a digital camera in front of an actual mirror. In two earlier papers, we reported results consistent with a left side bias (and therefore with lateralized expressiveness) in a large sample of selfies collected in controlled conditions (Bruno & Bertamini, 2013; Bruno, Gabriele, Tasso, & Bertamini, 2014) as well as in even larger sample of selfies spontaneously posted on the photosharing social medium *Instagram* (Bruno et al., 2015).

In this paper, we sought to extend our paradigm in two novel directions. First, we wished to examine selfies in a sample of younger selfie-takers (schoolchildren and teenagers). Our previous work assessed mostly young adults (who post the majority of selfies on digital media, see Tifentale & Manovich, 2014) and a smaller subset of older adults (in the studies that collected in-lab selfies from students but also colleagues and acquaintances). Given that most of these individuals were unlikely to have formal artistic training, left side biases in these populations might have a, possibly innate, psychobiological basis: Most participants may prefer poses presenting their most expressive side (Nicholls et al., 1999). Younger participants, however, are even less likely to have had exposure to art academies or formal training in art history. Thus, if the left side bias reflects psychobiological, as opposed to cultural, factors, we expect to see the same bias that was previously found in adults in the earlier studies. Alternatively, if younger selfie-takers do not show a bias, this would be evidence that the bias may be affected by exposure to cultural factors.

Second, we wished to explore side biases in selfies involving more than one portrayed individual. Specific predictions are harder to make here, but some general expectations can nonetheless be discussed based on potential relationships to painted portraiture. Figure 1 captures this idea. Group selfies, often also called "usies" or "wefies", have also become a widespread spontaneous behaviour. In our study, we asked young participants to first take a standard selfie and then to take a second selfie together with a friend. In the former, the selfie-taker is in a situation somewhat analogous to that of a painter composing a self-portrait. This situation is fully comparable to that of our previous selfie studies. If side biases depend on implicit asymmetries in facial expressiveness, therefore, one might expect to see again a left side bias. In the latter, selfie-takers are placed in a more complex situation. On one hand, they are composing a self-portrait. On the other, they are

**Figure 1.** Selfies and wefies are somewhat analogous to well-travelled genres in the figurative arts. Top: typical selfie and wefie (source: Instagram). Bottom: Rembrandt van Rijn, Self-portrait (detail), and Jan Vermeer, The Procuress (detail – the figure on the far left is believed to be Vermeer's self-portrait). All images are public domain. To view this figure in colour, please see the online version of this journal.

combining this with a portrait of the friend. Several compositional choices become relevant, including the decision whether to place the friend on their left or right side, the decision concerning which side of their own face to present to the camera, and the decision concerning which side of their friend's face to attempt capturing in the image.

With regard to composition, the above situation may to thought to bear some analogy to paintings portraying one or more characters, but including a self-portrait of the artist. Although it was common especially in certain historical periods (see e.g., Calabrese, 2010), to the best of our knowledge this genre has never been studied even in paintings and there are currently no analyses of compositional biases that may be present. Our paper therefore represents the first investigation into how the presence of others may

affect posing biases in portraiture and photography. Some investigators (Gaffron, 1950; Wölfflin, 1928) have suggested that viewers prefer pictures with key content on the right side. Consistent with this proposal, Corballis and Beale (1976) noted that, especially during the Renaissance, portraits of husband and wife were often painted as pairs to be hung with the female on the left and the male (who would typically be considered more important in that period) on the right. This right side preference in composition has been attributed to hemispheric functional asymmetries (Levy, 1976) or to scanning direction in reading (Nachson, 1999). Based on this hypothesis, the position of Vermeer's self-portrait in Figure 1 (bottom right) may reflect a choice to emphasize the picture's main characters and underplay the role of the painter-author. The left positioning of the girl holding the phone in Figure 1 (top right), conversely, may reflect a choice to emphasize the role of the selfie-taker. Because in smartphones the preview image is mirror-reversed, but the image file is saved as taken from a front camera (non-mirror-reversed), a saved image with the selfie-taker on the left signals a preference for a (mirror-reversed) preview image where the selfie-taker is on the right. However, it is currently unknown whether systematic biases of this kind can be reliably detected in corpora of group portraits, and how they might relate to biases stemming from a right-hemisphere predominance for facial expression of emotions.

## Methods

### Participants

A total of 104 schoolchildren and teenagers volunteered to participate in the study. Participant age ranged from 9 to 16 years ($M = 13.8$, SD = 2.27). Eighty participants were females, and nine participants were left-handed. Handedness was determined based on preferred writing hand, which is considered the best single-item self-report measure of handedness (Rigal, 1992). All were recruited during the Big Bang Northwest Science Fair at Aintree racecourse, Liverpool. The event was organized by MerseyStem, part of the Stemnet, a UK-wide ambassador programme to bring science and engineering to life for young people. The event was organized in close collaboration with MerseyStem, for which two of the authors are volunteers (MB and CB).

### Ethics

The study was approved by the University of Liverpool Research Governance Committee (application number IPHS-1314-315) and fully complied with the Ethical Standards of the Italian Board of Psychologists (see http://www.psy.it/codice_deontologico.html). We worked closely with the organizers

MerseyStem, and parents were provided with information about the Fair in advance and signed a form to allow children to take part in a series of scientific activities, this form included information about the taking of photographs. On the day of the event, a specific consent form was signed by the teacher in charge of each class. As the study was run in the UK, approval from the Ethics Committee on Clinical Research of the University of Parma was deemed unnecessary.

## Materials

A large inflatable "pod" was used to provide a controlled surround for selfie-taking (Figure 2). The pod was made of translucent white plastic, which ensured a homogeneous illumination in the inside and a constant, featureless background to each image. A smartphone (iPhone 5) was provided to take the selfies and store them until they could be downloaded. Printed versions of their images were given to all participants.

## Procedure

Before participation, consent forms were presented to the children and the accompanying adults and all relevant signatures were obtained. Experimenters explained that each participant was expected to take two selfies, one alone and one with a friend. We will refer to these two pictures as "solo" and "duet" selfies. We defined duet selfies as a special case of group wefies when only two individuals are portrayed. The choice of the friend was made by the participant after taking the solo selfie, and given the location it was typically one of the other people in the same group who had come to visit the booth. To avoid practice effects, participants were not allowed to serve as friends before taking the solo selfie. Instructions emphasized that both selfies had to be taken while holding the smartphone with both hands, using the smartphone preview screen to select a pose, and using one of the thumbs to record the image. Participants were explicitly encouraged to try out different poses, including three-quarter poses. Care was taken to always also remind the participants not to put their hands in front of the face, and to avoid placing a finger in front of the smartphone camera. Participants were also explicitly told that they could take as much time as they needed to complete the task. Apart from these instructions, participants were free to try different positions for the camera and in some cases these were higher or lower than their line of sight. Nevertheless, the range was limited by arm length and by the need to produce a selfie. Finally, experimenters explained that the solo selfie was to be taken in the "portrait" orientation (longer side of the phone vertical), using either the left or right thumb to record the photograph using the phone touchscreen (this was randomized

**Figure 2.** "Sweaty Betty – the selfie pod" provided a controlled environment for taking the selfies, such that all images had the same homogenous background and that there was no directional illumination. To view this figure in colour, please see the online version of this journal.

across participants), whereas the duet selfie was to be taken in the "landscape" orientation (longer side horizontal) and keeping the phone in the orientation set by the experimenter (camera on the left or on the right, also randomized across participants). Orientations were varied between solo and duet selfies to adhere to standard practice for these kinds of pictures but also, crucially, to minimize compositional carry-over effects from one picture to the other. In addition to the preliminary verbal explanation, experimenters also physically demonstrated how all was to be done, monitored the children

while they took the selfie, and provided additional instruction if needed. Once participants had taken the two selfies, questions about the participant age, handedness, and regular use of a smartphone camera were verbally read and the corresponding responses recorded. This concluded participation. Participants could also watch a brief slideshow explaining the rationale and the aims of the study. All photographs were recorded anonymously on secure digital media, were not made public in any way, and were used along with the demographic information only for the purposes of research.

## Analysis

All pictures were inspected by the second author (in Liverpool) and by an undergraduate assistant (in Parma). The latter was fully naïve to the aims of the study. All selfies were classified into five categories: unambiguously showing the left side, slightly showing the left side, frontal, slightly showing the right side, unambiguously showing the right side. Left and right were defined in relation to the person's face, and the classification was based on criteria developed in our earlier work on solo selfies (Bruno & Bertamini, 2013; Bruno et al., 2015). In the current solo selfies, the two raters produced exactly the same classifications, as expected based on our previous usage of this procedure. However, in duet selfies discrepancies emerged between the two raters in 7 out of 104 images. To resolve these discrepancies, these duet selfies were re-examined jointly by the first and the last author. Re-examination revealed that these discrepancies had arisen due to confusions as to who was the selfie-taker and who was the friend by one the raters. The correct classifications could therefore be readily determined and corrected as appropriate. To test for side biases, we used chi-square tests of goodness of fit to compare the data against the null model $p$ (right side shown) $= p$ (left side shown) $=.5$.

## Results and discussion

Almost all participants (93, corresponding to 90% of the sample) declared that they used a smartphone camera regularly. The large majority (about 80%) of volunteering schoolchildren were females. Because we have no data on the proportions of males vs. females attending the Big Bang Science Fair, we cannot determine if this reflects a greater interest in selfie-taking by female youths in comparison to males, or merely a larger number of females attending the fair. We note, however, that in large-scale analysis of selfies voluntarily posted on Instagram, Tifentale and Manovich (2014) found that females were more likely to post than males, suggesting that selfie-taking is more of a female than a male leisure activity. It is possible that our sample reflects the same trend. However, our interest was not in sex differences in selfie-taking

frequency but in posing biases. To evaluate these biases we compared poses emphasizing the left or right cheek. We will not address frontal poses as these would not reflect the choice between showcasing one's left or right cheek, which is the aim of the present analysis.

## Solo selfies

For solo selfies, raw frequencies of each posing category are presented in Table 1. The distribution shows a clear side bias. Out of the 43 selfies that are unambiguously showing one cheek more than the other ("left" and "right" in the table), 29 (67.4%) show the left cheek, chi-square(1) = 5.2, $p$ = .023. In the 31 poses which are classified as slightly turning to the left or right, 23 (74.2%) are in the "slightly left" category, chi-square(1) = 7.3, $p$ < .008. When choosing a pose for their selfie, children tend to present the left side of their face to the smartphone, resulting in a right-sided preview image (due to mirror reversal), which they record as their selfie by pressing the appropriate button. This is similar to what most painters are believed to have done when producing self-portraits before the invention of photography: presenting the left cheek to a mirror and copying the right-sided mirror image on the canvas. The only difference is that the painter's self-portrait displayed a right-sided pose (but this was presumably the painter's left), whereas for selfies this resulted in a left-sided saved image (correctly corresponding to the participant's left side). This is a consequence of the default setting of the smart phone when using the front camera.

## Duet selfies

For duet selfies, we first of all looked at relative positions in the picture. In the large majority of duet selfies, selfie-takers positioned the friend on their own left, resulting in a preview screen showing the selfie-taker on the right of the image, in turn resulting in a saved picture showing the selfie-taker on the left. Out of 104 images, there were 93 such duet selfies (88.6%). We are unable, at present, to provide a strong explanation for this bias, although we note that it is consistent with earlier proposals that viewers prefer pictures with key content on the right side (Gaffron, 1950; Wölfflin, 1928; see Introduction).

Alternatively, it might be suggested that such a strong bias is due to handedness. Right-handers might be used to holding the phone with their right hand when taking group selfies, holding the phone off to the right in order

**Table 1.** Frequency of each posing category for the solo selfies.

| Left | Slightly left | Frontal | Slightly right | Right | Total |
|------|---------------|---------|----------------|-------|-------|
| 29   | 23            | 30      | 8              | 14    | 104   |

to keep the arm out of the picture, and therefore having the habit of placing friends on their left when taking group selfies. Because of this habit, right-handers might prefer a similar composition in the duet selfies in this experiment. However, this explanation predicts the opposite pattern for left-handers, a prediction that is not borne out by the present data. Although only nine participants reported being left-handed, seven of these still positioned themselves on the left of the picture. Before speculating about other possible causes, we suggest that further data should be collected on duet selfies to determine if the bias generalizes to other participant groups and conditions. It is nonetheless important to take this bias into account when interpreting posing biases, which is what we do next.

To study posing biases in duet selfies, we first looked at poses of selfie-takers. Raw frequencies for each posing category are presented in the row totals of Table 2, where we observed many fewer frontal poses (8) relative to the solo selfies (30). In addition, a side bias is evident again but in the opposite direction relative to single selfies. Out of the 62 selfies that unambiguously showed one side of the face, 43 (69.4%) showed the right side, chi-square(1) = 9.3, $p < .003$.

Next, we looked at poses of friends, whose raw frequencies are presented in the column totals of Table 2. As for the poses of selfie-takers, there was a strong reduction of frontal poses (5) relative to the solo selfies (30). However, in contrast to poses of selfie-takers the poses of friends showed an obvious bias for showing the left side of the face instead of the right. Out of the 72 selfies that unambiguously showed one cheek more than the other, 66 (91.7%) showed the left cheek, chi-square(1) = 50, $p < .00001$. In the 27 cases that were classified as slightly turned, 22 (81.4%) were in the "slightly left" category, chi-square(1) = 10.7, $p < .002$.

The direction of the side biases for selfie-takers and friend suggests that selfie-takers preferred to compose the image such that both portrayed faces were looking towards the centre of the frame. This would tend to occur if the smartphone (and therefore the preview screen) were held more or less in a central position in front of the two portrayed individuals. Assuming

**Table 2.** Frequencies of each posing category for selfie-takers and friends in the duet selfies (L: unambiguously left; SL: slightly left; F: frontal; SR: slightly right; R: unambiguously right).

| Selfie-taker pose | Friend pose | | | | | |
|---|---|---|---|---|---|---|
| | L | SL | F | SR | R | Total (selfie-taker) |
| L | 13 | 3 | 0 | 1 | 2 | 19 |
| SL | 7 | 2 | 3 | 2 | 0 | 14 |
| F | 6 | 1 | 0 | 1 | 0 | 8 |
| SR | 12 | 6 | 1 | 0 | 1 | 20 |
| R | 28 | 10 | 1 | 1 | 3 | 43 |
| Total (friend) | 66 | 22 | 5 | 5 | 6 | 104 |

that both would be looking at the preview to check their pose, this would naturally bring them to rotate the face in the direction of the centre. If selfie-takers prefer to place friends to their left, then the rotation would cause selfie-takers to expose more the right cheek, and the friends to expose more the left cheek. To test this account, we looked at the more complex pattern of frequencies for each observed pair of poses by selfie-takers and friends. These are presented in the body of Table 2. The most frequent pair, by far, is the selfie-taker showing the right cheek and the friend showing the left cheek (28 pairs out of 104 or 26.9%). This confirms a tendency for both individuals to rotate the faces towards the centre of the image, in a context where the friend tends to be on the left of the selfie-taker. However, remarkably even in this much more complex situation a global preference for the left cheek emerges. As many as 13 pairs of seflie-taker + friend duet selfies have both individuals show the left cheek more than the right, whereas only 3 pairs have both of them showing the right cheek. This is a smaller but nonetheless significant bias, chi-square(1) = 6.25, $p < .02$.

We stress that posing choices in duet selfies were not dictated by the nature of the task but seemed to reflect spontaneous tendencies, at least in this group of participants. Task mechanics did not favour a central position of the camera relative to the two people being photographed. On the contrary, it would seem more natural, given that the smartphone was held with two hands, that the selfie-taker would have kept the smartphone in front of him or herself, which would tend to generate frontal poses for the selfie-taker and right-sided poses for the friend, or perhaps some combination of slightly rotated poses. Instead, the most frequently observed pair was, by far, that involving an unambiguous right cheek for the taker and left cheek for the friend, and the left–left pair was much more frequent than the right–right pair. These findings suggest that there may be a tendency for selfie-takers to try to capture the friend's left side and, to some extent, also their own left side in the duet selfies. This speculative conclusion could be examined by counterbalancing the position of the friend in a future study.

## Conclusions

Our results provide new data on compositional choices in naïve self-portraits. In standard (solo) selfies, we found a strong preference for poses showing the left cheek. This bias is similar to previously reported side biases in portraiture and self-portraiture. In particular, these results are consistent with previous adult studies documenting left side biases in selfies (Bruno & Bertamini, 2013; Bruno et al., 2015; Lindell, 2015), in painted portraits (McManus & Humphrey, 1973; Nicholls et al., 1999), and photographed portraits (LaBar, 1973), as well as with studies that documented right side biases (presumably corresponding to the left side after mirror reflection) in painted self-portraits

(Humphrey & McManus, 1973; Latto, 1996) before photography made mirrors less necessary for self-portraiture (Lindell, 2012). In photographs that were both a self-portrait of the selfie-taker and a portrait of a friend (duet selfies), we found a strong preference by selfie-takers to have the friend on their left, resulting in preview screens with the taker on the right and in a head rotation bias for showing the left cheek of the friend and the right cheek of the taker. These results are consistent with previous reports that artists tend to place key content on the right of the image (assuming that selfie-takers would consider their own the key image in the wefie; Gaffron, 1950; Wölfflin, 1928), and with the preference for compositions having objects facing into rather than out of the picture frame, documented not only in artists but also in naïve participants (Palmer, Gardner & Wickens, 2008). Thus, a set of selfies and wefies by modern youths reveals comparable biases to self-portraits and portraits by master painters over the history of the visual arts. Assuming that our group of young selfie-takers had no academic training in painting, portraiture, and art history, these findings therefore support an account of posing preferences in terms of biologically determined asymmetries over an account based on culturally induced conventions.

The current data were collected in a field study at an event spontaneously attended by our participants. Along with the opportunity to recruit participants in the desired age range, this had the advantage that the collected selfies were representative of a typical aspect of spontaneous selfie-taking, that is, recording one's presence at a place or event. However, this form of data collection also carried with it some limitations. The most obvious is that we had only partial control on participant selection. As a consequence, our sample was strongly unbalanced with regard to participant sex (we tested mostly females) and handedness (we had few left-handers). This prevented us from assessing potential moderating effects of these variables. In particular, it has been suggested that the left-cheek posing biases are stronger for portraits of females (Lindell, 2013; Nicholls, Clode, Lindell & Wood, 2002). Given the prevalence of female participants in our sample, our results may be representative of this fact. Future research should therefore balance participant sex in wefies. In addition, because we needed to minimize carry-over effects from selfies to wefies, our design confounded selfie type (solo vs. duet) with phone orientation (portrait vs. landscape) as all solo selfies were taken in portrait orientation and all duet selfies were taken in landscape. Thus, we cannot, on the sole basis of the current results, rule out that differences in posing biases between solo and duet selfies were due to the different orientations. However, we stress that the difference between portrait and landscape was carefully controlled in our earlier selfie work (Bruno & Bertamini, 2013). In that study we observed similar left-cheek biases for solo selfies in portrait and landscape orientations. It would seem reasonable, therefore, to assume that if we could have included a landscape condition for solo

selfies, it would have shown the same pattern as the current portrait condition. This remains an empirical question that could be tested in future studies.

## Acknowledgements

## Disclosure statement

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