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Differences over time in head orientation in European portrait paintings

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## Abstract

There is evidence for a tendency for European portrait paintings to have the head oriented so that the left side of the face is visible more than the right side. This is particularly the case for female sitters. There is evidence that the left side of the face shows emotion more than the right side does, so it has been proposed that there is a tendency for artists or sitters to want to show more of the emotionality of the sitter. It is shown here that the left-side tendency varies by date. In two studies, large samples were drawn from European gallery collections (study 1) and the National Portrait Gallery in London (study 2). The studies showed a strong left side tendency before 1600, absence of the tendency in the seventeenth and eighteenth centuries, and some recurrence of it in the nineteenth and twentieth centuries, modulated by changing gender differences. These findings show that cultural, historical, or art-historical factors are likely to be involved in determining tendencies in head orientation as well as psychological ones.

Keywords: Left side bias; perception; emotion; lateral asymmetry; art; portraits.

## Differences over time in head orientation in European portrait paintings

European portrait paintings (other than self-portraits) in which the sitter is not directly facing the viewer tend to show the left side of the sitter's face more often than the right side (Conesa, Brunold-Conesa, & Miron, 1995; Gordon, 1974; Lindell, 2013; McManus & Humphrey, 1973; Nicholls, Clode, Wood, & Wood, 1999; Nicholls, Wolfgang, Clode, & Lindell, 2002; Powell & Schirillo, 2009). This left side tendency, as it will be called, appears more pronounced for female than for male sitters [Gordon, 1974; McManus & Humphrey, 1973]. The same tendency has been found in photographs (LaBar, 1973; Lindell, 2017) and in the photographic self-portraits known as "selfies" (Manovich, Ferrari, & Bruno, 2017). This paper reports evidence that the tendency has changed on a time scale of centuries. To establish terminological conventions, "left side tendency" and "left orientation" mean that the head is turned so that more of the left side than the right side is visible, and vice versa for "right side tendency" and "right orientation".

The most favoured explanation for the tendency at present is the hypothesis of a hemispheric specialisation effect (Lindell, 2013; Powell & Schirillo, 2009). The right hemisphere dominates in expression of emotion and the right hemisphere innervates the left side of the face predominantly. Consistent with this, the left side of the face shows emotion more than the right side (Lindell, 2013). Viewers perceive more emotion when looking at a left-side orientation than at a right-side orientation, even when the images were created by lateral inversion and therefore identical in content (Nicholls et al., 2002). The hypothesis would be that the left-side tendency occurs because sitters or artists want to portray something of the sitter's emotionality or a more pleasing view of them. It has been argued that academics, particularly scientists and engineers, might want to present a less emotional

view of themselves (or the artist painting them might want to present them that way), and evidence of either a right side tendency or no significant tendency either way has been interpreted as supporting that (Churches, Callahan, Michalski, Brewer, Turner, Keage, Thomas, & Nicholls, 2012; Lindell, 2013; Nicholls et al., 1999). Other proposed explanations refer to bias due to handedness of the artist, given that most artists are right-handed (McManus & Humphrey, 1973; Lindell, 2013), to a tendency to find left-side portraits more aesthetically pleasing (Blackburn & Schirillo, 2012), and to a desire of the artist to represent the social relationship between them and the sitter (Humphrey & McManus, 1973). There is, however, little if any support for these alternatives (Chatterjee, 2002; Lindell, 2013; McManus & Humphrey, 1973; Nicholls et al., 1999; Powell & Schirillo, 2009; Manovich et al., 2017; Frimer & Sinclair, 2016; Tosun & Vaid, 2014).

Historical trends in the left-side tendency have previously been investigated in two studies. A significant right-side tendency was found in a sample of portraits of male university professors (ten Cate, 2002). The tendency was strongest in the earliest time period (pre-1660), weakened over time and eventually disappeared in the period 1821-1900. It has been argued, however, that male academics or their painters might prefer to show the less emotional right side of their faces (Churches et al., 2012), so it cannot be assumed that this historical trend in an unrepresentative sample would hold for portraits in general. Grüsser, Selke, and Zynda (1988) studied a sample of 933 portraits obtained by "visits to museums in Central Europe" (p. 280). They found a strong left-side tendency in the earliest period (fifteenth century) falling to approximate equality of right and left side orientation in the seventeenth century, and an increasing left-side tendency again up to the nineteenth century. The results are presented as a graph of percentages with no sample size information and there is no statistical analysis, so it is not clear whether the apparent historical trends are chance

phenomena or not. In view of this suggestive but inconclusive evidence, the present research sought evidence for change over time in samples from major European art galleries.

There is no reason to doubt the evidence for laterality effects in both expressing and perceiving emotion. The influence of hemispheric specialisation is likely to be constant over a long historical period. For that reason, hemispheric specialisation might contribute to an explanation for an overall left-side tendency, but would not be able to account for historical variation in that tendency. Since history is not a well designed experiment, it would be difficult to find a compelling explanation for any historical tendency that was observed. However, the first step is to assess whether there really is such a tendency or not. The findings of the two relevant studies are not conclusive for the reasons discussed in the previous paragraph. Firm evidence for a historical trend would at least show some involvement of cultural and historical factors, which could then be further elucidated by closer scrutiny of art history. The aim of the present study was to obtain such evidence, using two different and large samples of European portraits from complete gallery collections that have not been subject to editorial or curatorial selection.

## Study 1

### Method

The material for this study was drawn from several published collections: the complete paintings in the Louvre (Lessing, Pomarède, & Grebe, 2011) the complete paintings and frescoes in Florence between 1250 and 1743 (King & Grebe, 2015), the complete illustrated catalogue of the National Gallery London (Baker & Henry, 1995), and a

volume of paintings from the Prado (Museo Nacional del Prado, 2016). Using complete gallery collections avoids the dangers of selection bias in published edited collections (Morin, 2013), though of course it is impossible to avoid accidents of survival and effects of choices made in acquisitions by the gallery. The sample was restricted to paintings, to portraits of single sitters, and to works dated prior to 1900 (because the galleries in the sample have only a handful of portraits from the twentieth century). Excluded were self-portraits, genre scenes, caricatures, and equestrian portraits; also portraits in which head orientation or gaze direction could not be ascertained or the nationality of the painter was not given. The result was a sample of 897 single-figure portraits. There were 616 portraits of men (68.7%) and 281 of women (31.3%).

For each portrait, head orientation, gender, date of portrait, body orientation, and nationality of artist were recorded. Body orientation is the subject of a separate study and will not be further considered here. Head orientation was recorded by the author as left (i.e. left side of face favoured), right, or frontal. The following criteria were used, the versions shown here being those written for the blind coder in the reliability check to use:

"1. If only one ear is visible and there is nothing obscuring the other ear, then that is the side that should be chosen. If there is an obvious difference in the amount of each ear that is visible, the more visible ear is the side that should be chosen.

2. If one or both ears are obscured by hat or hair, look at the area of skin visible on each side of the face. If more is visible on the left side then the judgment should be left, and vice versa if more is visible on the right.

3. Visible displacement of features to one side or the other - this includes angle of nose, displacement of chin, mouth, and/or eyes to one side."

In addition, two cues that should not be used were listed:

"1. Ignore gaze direction: gaze direction and head orientation are often not aligned, so the former is not a valid cue to the latter.

2. Lighting cues should not be used: oblique lighting is often represented in a painting, so that one side of the face is depicted as illuminated more than the other. Do not be influenced by this."

For a reliability check, fifty paintings were randomly selected from each of the Louvre and National Gallery collections. For this purpose two random sequences of numbers up to the number of pages in each book were generated and the first fifty numbers in each random sequence were selected as identifying portraits for the reliability check. If there was no portrait on a page in the random sequence, a search proceeded forward to the next page that had a portrait. If there was more than one portrait on a page, the first one in the numbered list for that page was selected. Each painting was coded for head orientation by a coder blind to the aims of the study, previous research findings, and the judgments made by the author. The coder's judgments agreed with those of the author in 99 out of 100 portraits.

## Results

Overall results, divided by gender, are shown in Table 1. Comparing left and right orientation, there was a significant tendency to favour left orientation,  $\chi^2(1) = 30.26, p < .001$ , consistent with previous findings. Again considering just left and right head orientation, the left side tendency was significantly greater for female sitters than for male sitters,  $\chi^2(1) = 18.22, p < .01$ , with 70.6% of female portraits and 54.7% of male portraits having a left side orientation, also consistent with previous findings. The left side tendency was significant for both female sitters,  $\chi^2(1) = 42.92, p < .01$ , and male sitters,  $\chi^2(1) = 4.90, p < .05$ .



To assess a possible historical trend, paintings with left or right head orientation were divided into date ranges of fifty years, with a pre-1500 category at the outset. Figure 1 shows percentages of that sample that had a left side orientation in each of the fifty-year periods. The figure shows that the strongest left-side tendency occurred in the earliest period (pre-1500), that there was a steady decline in the tendency up to about 1700, where a right-side tendency dominated, and that it hovered around 50% after that. The trend shown in the graph resembles that found by Grüsser et al. (1988), suggesting that both sets of findings reflect a genuine historical trend.

Numbers of paintings in each 50 year period, in order from pre-1500 to 1851-1900, are 70, 169, 106, 130, 55, 24, 76, 58, and 21. These are too small for meaningful statistical comparisons, so periods of 100 years, again with a pre-1500 category, were used for statistical analysis. Results of all paired comparisons using the  $\chi^2$  test are reported in Table 2. The results show a clear divide. There were significant differences between pre-1600 periods and post-1600 periods in all six analyses, and no other significant differences. In all cases the results showed a significantly stronger left side tendency for pre-1600 paintings than for post-1600 paintings. Analyses of individual centuries showed significant left side tendencies for the pre-1500 period,  $\chi^2(1) = 18.52, p < .001$  and for 1501-1600,  $\chi^2(1) = 35.64, p < .01$ , but no significant difference in the other periods: for 1601-1700,  $\chi^2(1) = 0.44$ ; for 1701-1800,  $\chi^2(1) = 1.44$ ; and for 1801-1900,  $\chi^2(1) = 0.01$ . In pre-1600 paintings, 70% have left side orientation,  $\chi^2(1) = 52.82, p < .01$ . In post-1600 paintings, 50% have left side orientation,  $\chi^2(1) = 0.02$ . In short, the left side tendency is confined to the period before 1600.

An original aim of the study was to assess possible differences between artists of different nationalities. This proved problematic because the sample size for most nationalities

was not large enough. However, it was observed that the left side tendency was stronger in Italian paintings than in paintings by artists of other nationalities, so a simple statistical comparison between portraits by Italian and non-Italian artists was carried out. Of 288 Italian paintings classified as either left side or right side, 199 (69%) were left side, and the difference is statistically significant,  $\chi^2 (1) = 42.02, p < .01$ . Of 481 paintings by artists of other nationalities classified as either left side or right side, 259 (54%) were left side, and the difference is not statistically significant,  $\chi^2 (1) = 2.84$ . The comparison between Italian and non-Italian paintings is also significant,  $\chi^2 (1) = 17.39, p < .01$ .

### Discussion

This study has found evidence for significant change in head orientation across the history of European art from the middle ages to 1900. In the earliest part of this period, heads in portraits were predominantly turned to reveal more of the left side of the face, and this tendency declined up to and was briefly reversed in the seventeenth century. Since then and up to 1900 there has been no consistent tendency either way.

Although the historical trend shown in Figure 1 is similar to that found by Grüsser et al. (1988), it is difficult to carry out direct statistical comparison between the two studies because of the paucity of information in the paper by Grüsser et al. (1988). Accordingly, a second study was carried out using the complete illustrated catalogue of the National Portrait Gallery, London (Simon & Saywell, 2004).

### Study 2

### Method

Almost all works of art in the National Portrait Gallery are by British artists and depict British sitters, whereas the art sampled in study 1 was almost entirely continental European. All single-sitter portrait paintings were sampled, subject to the same criteria as in Study 1. There were 2011 paintings of men (87.9%) and 276 of women (12.1%). For each portrait, head orientation, gender, and date of portrait were recorded. Head orientation was judged using the same criteria as in Study 1.

### Results

Overall results, divided by gender, are shown in Table 3. Comparing left and right orientation, there was a significant tendency to favour left orientation,  $\chi^2(1) = 20.66, p < .001$ . The left side tendency was significant for female sitters,  $\chi^2(1) = 40.78, p < .01$ , and for male sitters,  $\chi^2(1) = 6.52, p < .05$ . The left side tendency was significantly stronger in female than in male sitters,  $\chi^2(1) = 26.91, p < .01$ . These results are similar to those of Study 1.

Changes over time with periods of 50 years are shown in Figure 1, where they can be compared with the results of Study 1. There are few pre-1550 portraits in the National Portrait Gallery so the historical picture is curtailed at that end. However, the graph still shows a sharp decline from a high proportion of left side orientation at earliest times to a low in the seventeenth century, followed by a slight increasing tendency up to the end of the twentieth century. The similarity between the results of the two studies is striking and indicates a common trend across European portraiture over the whole historical period. The

correlation between the two samples for periods where both provided data was found to be  $+0.70$  ( $p = .05$ ).

Numbers of paintings in each 50 year period, in order from pre-1550 to 1951-2000, are 31, 73, 117, 162, 200, 333, 453, 246, 280, and 119. For purposes of analysis, 100-year periods were used, as in Study 1, including a pre-1600 category. Results of all paired comparisons using the  $\chi^2$  test are reported in Table 4. The results show that the left side tendency was significantly stronger in the pre-1600 period than in all other periods except for 1901-2000. The period 1601-1700 showed a significantly lower proportion of left side orientation than all other periods except 1701-1800. The period 1701-1800 showed a significantly lower proportion of left side orientation than the period 1901-2000. Analysis of data for individual centuries revealed a significant left side tendency for the pre-1600 period,  $\chi^2(1) = 11.12, p < .01$ , no significant difference for 1601-1700,  $\chi^2(1) = 0.60$  or for 1701-1800,  $\chi^2(1) = 0.68$ , and significant left side tendencies for 1801-1900,  $\chi^2(1) = 8.04, p < .05$ , and 1901-2000,  $\chi^2(1) = 19.86, p < .01$ . These results all fit with a trend in which the left side tendency is absent in the period 1601-1800 and gradually returns over the succeeding centuries.

#### Gender differences over time: a combined analysis

The historical trends shown in Figure 1 do not differentiate genders because the sample of female sitters in each study was relatively small. Combining data from the two studies, however, does allow historical trends to be analysed for each gender. Figure 2 shows data for fifty-year periods for each gender. The figure shows that the trend in Figure 1 holds

for male sitters only. There is no sign of a dip in left side orientation in the seventeenth century for female sitters. This is backed up by statistical analyses.

Following the convention in the separate analyses for Study 1 and Study 2, data were analysed by centuries. Beginning with comparisons between gender, female sitters showed a higher proportion of left orientation than males in the periods pre 1600,  $\chi^2(1) = 9.69, p < .01$ , 1601-1700,  $\chi^2(1) = 66.92, p < .01$ , and 1701-1800,  $\chi^2(1) = 3.91, p < .05$ . There was no significant gender difference in the period 1801-1900,  $\chi^2(1) = 0.50$ . For female sitters there was a significant left side tendency in each historical period: for pre 1600,  $\chi^2(1) = 44.16, p < .01$ ; for 1601-1700,  $\chi^2(1) = 43.75, p < .01$ ; for 1701-1800,  $\chi^2(1) = 5.26, p < .05$ ; and for 1801-1900,  $\chi^2(1) = 5.26, p < .05$ . For male sitters there was a significant left side tendency in the pre-1600 period,  $\chi^2(1) = 27.76, p < .01$ . There was a significant right side tendency in the period 1601-1700,  $\chi^2(1) = 24.04, p < .01$ . There was no significant difference in 1701-1800,  $\chi^2(1) = 0.14$ . There was a significant left side tendency in the period 1801-1900,  $\chi^2(1) = 5.82, p < .05$ .

Summarising, the left side tendency for female sitters is perhaps less pronounced after 1700 than before, but is present in all periods. For male sitters, a strong left side tendency before 1600 reverses to a strong right side tendency in the seventeenth century, with no significant difference in 1701-1800, and a significant left side tendency in 1801-1900. The contrast in the seventeenth century between the strong left side tendency for females and the equally strong right side tendency in males is striking and unique in the historical record in the present data.

In two studies, head orientation in portraits was assessed for complete gallery collections of continental European galleries (Study 1) and the National Portrait Gallery, London (Study 2). Both studies show that the left side tendency - a tendency for the sitter's head to be oriented to the right, exposing more of the left side than the right side of the face - was strongest in the earliest period of European portraiture, prior to 1600. The left side tendency declined steadily and was absent or reversed in the seventeenth and eighteenth centuries, and then gradually increased through to the twentieth century. The trend, found in both studies, resembles that reported by Grüsser et al. (1988). The overall trend was modulated by a strong effect of gender. For male sitters, there was a reversal to a significant right side orientation in the seventeenth century, while for females a strong left side tendency continued through that period. There is some degree of resemblance to the trend in figure 13 in Grüsser et al. (1988), but statistical analysis of their data ~~from that study~~ is not possible ~~because of~~ due to lack of sample size information.

Discrepancies among head orientation tendencies have been found in previous studies, as there is some evidence of left side tendencies ~~Significant left side tendencies have been found in several studies~~ (Conesa et al., 1995; Frimer & Sinclair, 2016; Labar, 1973; Lindell, 2017; McManus and Humphrey, 1973; Nicholls et al., 1999). ~~Significant, some evidence of~~ right side tendencies ~~have also been found~~ (Burkitt, Saucier, Thomas, & Ehresman, 2006; Churches et al., 2012; Frimer & Sinclair, 2016; Nicholls et al., 1999; ten Cate, 2002; Uhrbrock, 1973), and ~~there have been some non-significant results~~ some evidence showing no significant difference either way (Churches, Feuerriegel, Callahan, Wells, Keage, Keage, Kohler, Thomas, & Nicholls. 2014; González, 2012; Manovich et al., 2017). The present results, along with the variation in results of previous studies, suggest that the explanation for tendencies in head orientation in portraits can be found in cultural, historical,

or specifically art-historical factors rather than or in addition to strictly psychological ones.

Research does show that the left side of the face expresses emotion more than the right (Lindell, 2013), and that viewers see more emotion in the left side than in the right (Nicholls et al., 2002), but that does not necessarily mean that that accounts for head orientation tendencies in portraits in any historical period.

So far, only one hypothesis has been proposed to account for the historical trend ~~shown~~found ~~initially~~ in the study by Grüsser et al. (1988) and ~~now confirmed~~ in the present study. Chatterjee (2002) argued that the key factor is the artists' conceptualization of agent and recipient of action. Chatterjee proposed a general tendency for right-handed people "to conceptualize agents of actions to the left of where they conceptualize recipients of actions" (p. 33). In the relationship between artist and sitter, the artist is the agent and the sitter is the recipient, so for a right-handed artist the sitter is placed in a conceptual space to the right of the artist. This would presumably imply a right-facing orientation for the sitter, favouring the left side of the face, so that the recipient is facing the agent. Chatterjee argued that the left side tendency has decreased for women from the fifteenth century to the twentieth century, and that this reflects a cultural shift to viewing women as less passive.

There are three problems with that argument. One is that it predicts the opposite of a left side tendency for left-handed artists, and a left side tendency has been shown at least for two left-handed artists (Nicholls et al., 1999). Second, as Figure 2 illustrates, the change over time in the left side tendency differs for male and female sitters, so an argument concerning women only does not explain all the data. Third, the decline in the left side tendency for female sitters over time is by no means as strong in the present data as it appears to be in figure 13 in Grüsser et al. (1988), which may have been the data on which Chatterjee's

argument was based, ~~and. Instead, the current study demonstrated a continued~~ a significant left side tendency ~~has continued~~ for female sitters throughout the periods investigated ~~here~~.  
——— ~~Interpretation of historical trends can never be more than conjectural. Hypotheses in psychology can be tested by means of experimental manipulations with suitable control groups to isolate factors of interest. There cannot be experimental manipulations on history: at best, data from history conform to simple quasi-experimental designs with no control group and multitudes of confounding variables (Box, Jenkins, & Reinsel, 2008; Cook & Campbell, 1979). Correlates can be identified, but not causes. Sometimes hypotheses can be disconfirmed. For example the hypothesis that the left side tendency is associated with right-handed artists is disconfirmed by evidence that it occurs in the work of left-handed artists as well (Nicholls et al., 1999). Further investigation of historical factors would be valuable by way of increasing the number and complexity of possible explanations for the tendency, but the actual involvement of those factors can never be more than a matter of plausible speculation.~~

The results of Study 1 revealed a significant left side tendency in portraits by Italian artists but not in portraits by artists of other nationalities. This is consistent with other published results. A significant left side tendency in portraits by the Italian artist Raphael has been reported (Nicholls et al., 1999), while other studies have found no significant left side tendency for non-Italian artists, Holbein (Grüsser et al., 1988), Cranach (Grüsser et al., 1988), and Rembrandt (Humphrey & McManus, 1973; Schirillo, 2000). Establishing differences between artists of different European nationalities would require a much larger sample, and it would require national differences to be differentiated from the historical trends shown here: it may be relevant that portrait painting flourished earlier in Italian art than in other countries. However, it is suggestive of a further possible cultural influence on



head orientation that would be worthy of further study. An ideal analysis would differentiate effects due to nationality of artist, gender of sitter, and historical period, but that would require a sample much larger than that in the present research.

Dividing the samples by centuries allows statistical analysis of historical trends. The drawback, of course, is that divisions by century do not necessarily correspond to periods of rapid change in artistic practice. Tendencies in portraits in the 1591-1600 and 1601-1610 decades are likely to be more similar than tendencies in the 1601-1610 and 1691-1700 decades but, in the present study, the former two are in different categories and the latter two are in the same one. The problem is unavoidable. More fine-grained analysis, perhaps with decades as categories, could reveal much about the speed of change in different periods, but would require a sample size at least ten times larger than that used here, with adequate representation of every decade in the sample. That would be very difficult to obtain.

It is almost impossible to test hypotheses that call on cultural, historical, or art-historical factors because many such factors are effectively confounded with each other and they cannot be experimentally manipulated. Correlates can be identified, but not causes. Nevertheless, the present results show that the the hypothesis of asymmetric expression of emotion in the face cannot be a complete case for a purely psychological explanation of tendencies in head orientation ~~is not strong~~, and that any plausible explanation should be able to account for the observed changes over time, and the interaction with gender.

Declaration of interest

The author reports no conflict of interest.

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Table 1

Head orientation by gender, Study 1

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Head orientation

Gender	Left	Right	Frontal	All
Female	178	74	29	281
Male	302	250	64	616
All	480	324	93	897

Table 2

$\chi^2$  values for each pair of hundred-year periods, Study 1

1501-1600	1601-1700	1701-1800	1801-1900
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Pre-1500	1.57	16.28**	6.96*	10.91**
1501-1600		19.22**	4.63*	9.24**
1601-1700			1.84	0.07
1701-1800				0.77

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Note. \* =  $p < .05$ ; \*\* =  $p < .01$ .

Table 3

Head orientation by gender, Study 2

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Head orientation

Gender	Left	Right	Frontal	All
Female	161	65	50	276
Male	948	840	223	2011
All	1109	905	273	2287

Table 4

$\chi^2$  values for each pair of hundred-year periods, Study 1

1601-1700	1701-1800	1801-1900	1901-2000
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Pre-1600	10.60**	7.44*	4.45*	0.94
1601-1700		1.23	4.74*	12.10**
1701-1800			1.56	8.12**
1801-1900				3.48

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Note. \* =  $p < .05$ ; \*\* =  $p < .01$ .

### Figure captions

Figure 1. Percentage left side orientation over time, both studies. Note: "NPG" = National Portrait Gallery.

Figure 2. Gender differences in left side orientation over time, data from both studies combined.

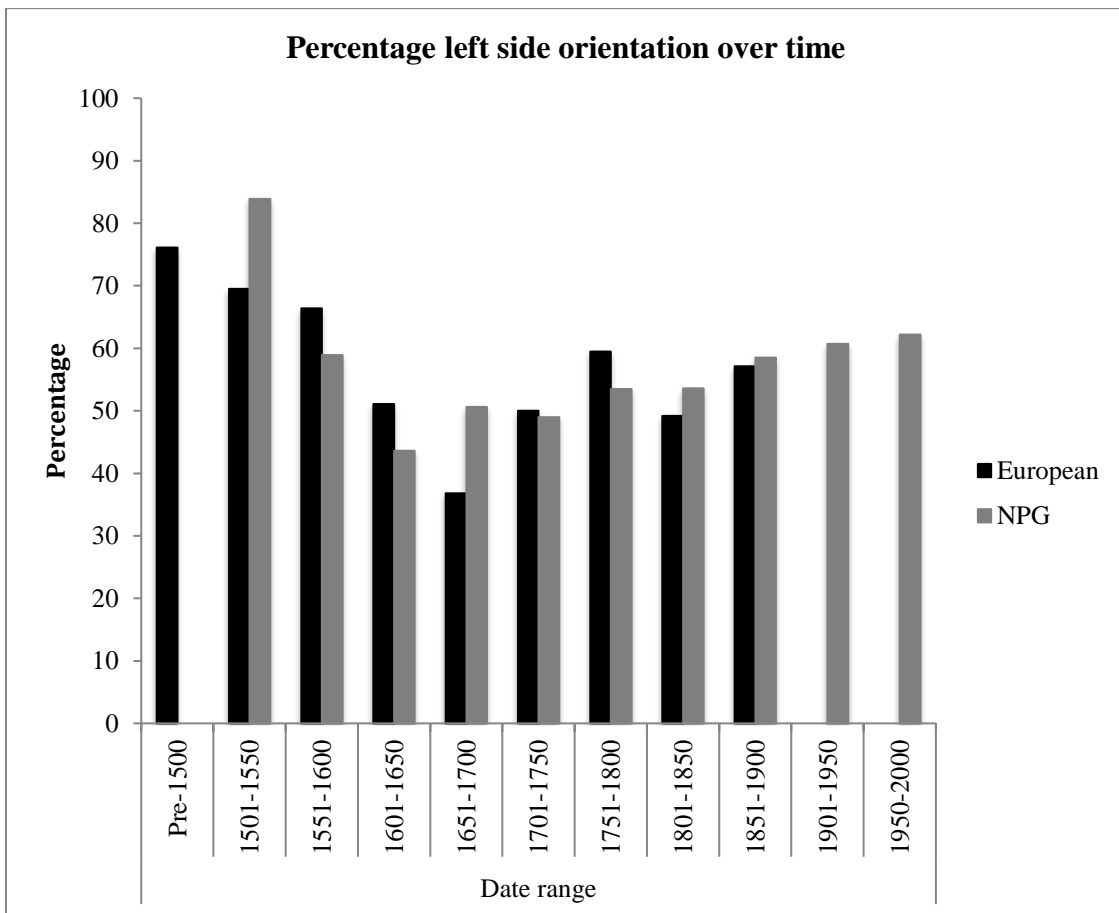


Figure 1

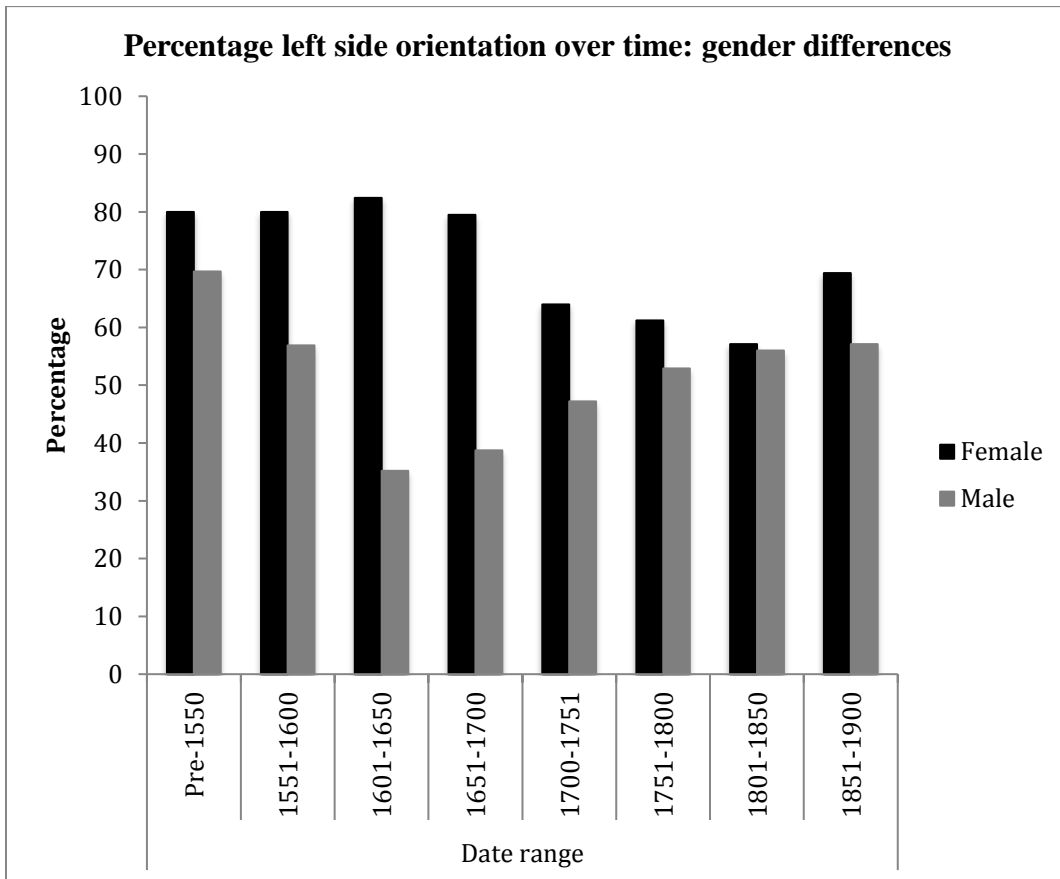


Figure 2