CHAPTER 13: THE SIGNIFICANCE OF THE LEFT CHEEK

Summary

A detailed statistical account is given of the use of right and left cheeks in Western art, concentrating particularly on works from the Italian Renaissance and the Mediaeval period. It is suggested that choice of right or left cheek is not just a result of mechanical constraints or chance processes, but represents the expression of a left-right 'symbolism', the left cheek being used to portray individuals who are different or distant from the artist.

The possible origins of this phenomenon (as well as other left-right symbolisms in the iconography of the Crucifixion) are considered and it is suggested that an underlying brain asymmetry might be the fundamental asymmetry and that the particular orienting event of Christ's actual crucifixion, and its record in the form of the Shroud of Turin, might have 'crystallised' the phenomenon in the Western artistic tradition.

"There is no obstacle but the inertia of tradition to prevent aesthetics from undertaking an extensive program of direct comparative observations ... It would imply an effort to make all general theories grow directly out of detailed analyses of works of art, instead of being merely illustrated with occasional examples as in most past and present writing on aesthetics".

Munro (1956)

"The value of research depends upon the field where it is carried out ..... The most meagre adept may make elaborate statistics of the number of times in the art of the middle ages our Lord blesses with three fingers, how many times with two and a half, and how many times with two only; or how frequently St. Catherine has her wheel, or St. Andrew his cross, to right or again to left".

Berenson (1950)

13:1 Introduction

The research in this paper represents the final product of an initial chance observation, followed by several years of exploration, discovery and much interim speculation and theorising, mostly acting upon intuition, allowing the data to develop in its own way. To present the results other than chronologically and autobiographically would be once more to compound the lie which Medawar (1963) tells us is implicit in most scientific writing. It would also destroy the excitement of the covert detective story which much science represents.

To quote the master of that genre, "The world is full of obvious things which nobody by any chance ever observes" (Conan Doyle, 1902). By chance alone I was fortunate to observe one such obvious thing: the rest fell into line with a certain inexorable logic of its own.

13:2 Portraits

In 1971 I was carrying out some work on the shapes of pictures and required for completeness a large series of several hundred portraits. The college library had just acquired a copy of Roy Strong's 'The English Icon', which I borrowed and tabulated its contents. For reasons which I am unable to explain, possibly for completeness also, I noted down whether the subject of each portrait was facing to the left or the right (or to put it less ambiguously, whether the subject was showing his left or right cheek to the observer). To my surprise I found that there was a significant excess of left cheeks. More importantly however this excess was significantly greater in female subjects than in male. Our first reaction to this data was to think in terms of some simple mechanical factor, possibly related to the right-handedness of the artist, but such explanations were confounded by the sex difference. I spent the next few months in collecting a larger series of data, containing amongst other things, the entire public collection of the National Portrait Gallery, London. The results of this study are shown in Figure 13:1. In our paper (McManus and Humphrey, 1973) we

analysed the data in terms of the amount of the body visible in the portrait and found that if the whole body was portrayed then the left cheek was portrayed significantly more often. This result we had found difficult to explain and had suspected that it might well be artefactual. A few years later I re-analysed this data (and included a little more) in terms of the degree of turn of the head, distinguishing between 'full-face' (in which the whole of both eyes was distinguishable) and 'profiles' (in which both eyes were not completely visible). The dependance upon the amount of body visible is indeed artefactual and is secondary to the turn of the head. Figure 13:2 shows that only those portraits in which both eyes are visible show a left-cheek tendency. This confounds any mechanical effect (which we would expect to be greater in the profile group), and suggests that a more psychological explanation is required, the salience of full eye-contact clearly being of importance.

Other more recent analyses of this data show several features of note. Figure 13:3, as well as Figures 13:4 and 13:5, show that the left-cheek tendency in portraits is stable with time (in contradistinction to the data to be presented later). Several other studies have confirmed the reality of the left-cheek predominance. Of the 390 portraits of the Medici in the sculpture gallery of the Uffizi, Florence, 216 (55.4%) show the left cheek ($X^2_1 = 4.3$, $p < 0.05$). In a book of American primitive paintings (Lipman, 1969) 22 out of 29 (75.9%) showed the left cheek

($X^2_1 = 6.72$, $p < 0.01$). Uhrbrock (1973) found that of 199 American commemorative medals, 136 (68.3%) showed the left cheek. Gordon (1974) showed that Goya's portraits tend to show the left cheek, and LaBar (1973) found that modern photographic portraits showed the same tendency. Coles (1974) found in a study of 188 portraits by Sir Joshua Reynolds that 58.6% showed the left cheek, and in a miscellaneous group of Western paintings that 53.8% showed the left cheek. Of 93 portraits by Titian (Wethey, 1971), 59 (63.4%) showed the left cheek ($X^2_1 = 6.1$, $p < 0.02$) (the two self-portraits having been excluded).

13:3 Self-portraits, Rembrandt, Rosetti and van Gogh

By early 1973 we had reached the point where in attempting to answer the deceptively simple question, Why is there a predominance of left cheeks in portraits?, we had found all mechanical explanations neither convincing nor satisfactory (McManus and Humphrey, 1973), and had come round to the remaining alternative, originally suggested by Nick Humphrey, that the cheeks had a symbolic significance. A review of possible mechanical artefacts in the left-cheek excess is given in Appendix A13:1.

A few weeks after our paper in Nature, Professor Landauer of University College, London, was kind enough to send the data shown in Figure 13:1 concerning self-portraits. He had found that of the 302 self-portraits in Goldscheider

(1950), only 119 (39.4%) showed the left cheek, a significant trend towards the right. This was consistent with our developing hypothesis that a symbolic explanation was necessary, but could also be interpreted mechanically. Inspired by Professor Landauer's result I then looked for a further series of self-portraits, with the intention of studying individual artists in more detail. The obvious artist to choose was Rembrandt for he probably painted more self-portraits than any other artist. It is worth noting in passing that we know that Rembrandt had at least two large mirrors in his studio, which he used frequently, and thus we may assume that he was aware of and had explored the nature of mirror-images (Konstom, 1977).

Figure 13:6 shows that indeed Rembrandt's self-portraits do show a strong tendency to show the right cheek. The data was collected from Bredius' catalogue of Rembrandt. This catalogue classifies the portraits both by sex and by kinship. It was thus simple to look at the results in terms of these two parameters (Figure 13:6). It is clear that not only do the proportions showing the left cheek depend upon the sex of the subject, but also upon the kinship relation, non-kin subjects showing the left cheek significantly more often ($X^2_2 = 8.91$, $p < 0.02$) (Humphrey & McManus, 1973). This result seems to dispose entirely of any mechanical hypothesis for the left cheek predominance in portraits, since the critical variable is seen to be the artist's relationship with his subject (or

rather the artist's perception of the relationship). When we look at Figure 13:6 in these terms we can equate the dimension of left cheek-right cheek with a parallel dimension of 'unlike myself - like myself'. Whether this is an accurate description of the dimension is difficult to tell at this stage and alternative dimensions of 'self as I would like to be perceived - self as I really am', or 'public - private' might be equally appropriate. This point will be returned to later after more evidence has been presented. With this hypothesis we were able to reconsider some other sets of data and provide explanations for them. Van den Hoeff (1973) has discussed Rembrandt's engravings.

In 1973 Dr. Edwin Clarke had pointed out to me that illustrations from mediaeval descriptions of neuroanatomy showed a strong tendency to show the left cheek. Thus of the 49 figures in Chapter Three of Clarke & Dewhurst (1972) 41 (83.6%) showed the left cheek. That this is not a mechanical artefact is shown by the fact that both drawings and woodcuts (which were probably drawn in reverse) both show the same left cheek tendency (18/21 and 23/28 respectively), implying that the artists intended to produce a finished product showing the left cheek. It is difficult to think of any form of portrayal of a human being which is less 'like oneself' than a dissected head; hence we may reasonably expect a strong left cheek predominance.

LaBar (1973) found that 63.4% of 628 photographs in a school year-book showed the left cheek. These photographs

were chosen by the students themselves, from four possible poses, as the most suitable for the year-book. The students were thus being asked to choose a 'public face', one which was possibly not too revealing. The preference for the left cheek thus becomes comprehensible. If we look at LaBar's data in a little more detail then a further trend becomes apparent. Figure 13:7 shows the percentage of left cheeks as a function of seniority: as one becomes more senior so the right cheek portrayal, the more personal, becomes more prominent. Perhaps status allows one to expose the otherwise vulnerable right cheek. LaBar had noted that his data showed no difference in left cheeks between the sexes. This may be explained since in each case it was the student himself/herself who chose the appropriate pose: this contrasts with the usual situation with painted portraits in which a male artist paints a male or female subject. It is perhaps also worth pointing out that LaBar's data disposes of any simple mechanical explanation dependent upon painting techniques themselves.

LaBar's work raises the possibility that individual artists might differ in their use of the left and right cheek. In general we might predict that women artists would reverse the portrayal of males and females but would still persist in producing self-portraits showing right cheeks: thus the dimension would be Left Cheek - Males - Females - Self - Right Cheek. Regrettably this hypothesis is not a simple one to test due to a lack of

readily available data on women artists.

Individual artists might also be idiosyncratic in their usage of the left-right dimension in a manner related to their own world perceptions. Let us consider van Gogh and Rosetti.

Figure 13:8 shows data on Rosetti's portraits. Whilst the position of the (very limited) number of self-portraits is normal, the males show significantly more left cheeks than do the females. The implication is that Rosetti felt women to be closer to him than men, a suggestion which is not incompatible with biographical data.

The Rosetti data show that the male and female groups may be reversed in their proportions of right and left cheeks. Data from van Gogh shows that the most extreme right cheek group need not be the self-portraits. Here only the male portraits are considered (Figure 13:9) and are classified by social class. We know, both from direct and indirect evidence, that van Gogh, though of middle-class origins, felt a strong identification with peasants and workers. When we consider the heads and self-length portraits (Figure 13:9) we find that self-portraits are placed between the lower and middle classes: this we may interpret as the middle classes being 'unlike self' whilst the lower classes may be interpreted as representing almost an idealised self, more like self than self itself.

This picture is further complicated when we consider the male full-length portraits, all of which are of the lower-classes, usually of peasants working in the fields. In this group there is a strong left cheek predominance: we may speculate that it was only the concept of the noble peasant which van Gogh found attractive, rather than the (working) reality itself. It is worth pointing out that we know that van Gogh was certainly concerned with the effect of left-right reversal upon his work (Humphrey and McManus, 1973).

The discussions of the last few paragraphs, whilst interesting, raise severe methodological problems. The theories inevitably have an ad hoc quality about them which is due to the inevitable lack of data on any one artist. If the entire oeuvre has been used to create a hypothesis what may be used to test it? This dilemma possibly represents a special case for Popper's falsifiability theory of science, for whilst the hypotheses described above are in principle testable (by collecting more data) this is in practice impossible (where may one find another 300 Rembrandt paintings?).

For these reasons my research drifted away from the study of individual artists towards large groups of artists where more data was available and thus categorisation still left samples of sufficient size to be statistically analysable. By choosing an historical period in which we

would expect a greater degree of unity of thought amongst artists we may also reduce the problem of inter-artist variation. For these reasons (amongst others) I looked next at the art of the Italian Renaissance, a very prolific period in which large numbers of works were produced on a limited range of thematic material, thereby allowing detailed study.

Most of the data so far reported had been partly influential in constructing the 'like self - unlike self' hypothesis. The data from the Italian Renaissance, and Mediaeval paintings, are however temporally a posteriori to the hypothesis and thus may be regarded as a test of its usefulness.

13:4 The Crucifixion and the Annunciation

It is not necessary for the hypothesis to consider just typical portraits, but in principle any human representation should show the phenomenon to a greater or lesser extent.

Whilst on holiday in Tuscany in September 1973 it became readily apparent to me that Renaissance portrayals of the Crucifixion and the Annunciation both showed strong, regular asymmetries. This observation was put on a surer footing on my return home by studying the pictures illustrated in Bernard Berenson's eight-volume survey of the Italian Renaissance (1957, 1963, 1967, 1968).

The crucifixion portrays the horrible and unusual death of a man who was quite unlike any other man. We may expect that Christ will therefore be perceived as different from the artist, and thus ought to show the left cheek. Of the 147 crucifixions in Berenson, 146 (99.3%) portray Christ showing the left cheek. The one exception was painted by Titian when a very old man. That an iconological interpretation is valid is suggested when we consider those pictures which also show the crucifixion of the two thieves. Of the 25 thieves portrayed in Berenson, 20 (80%) showed the right cheek. By contrast alone we might expect this result, for the thieves are the archetype of the ordinary, fallen, sinning man, and are thus close to the artist. The traditionally 'good' thief (placed on Christ's right hand) shows the right cheek in all thirteen cases, whilst the 'bad thief shows the right cheek in only 50% of 10 cases. This is within the compass of the theory: the good thief, representing an idealised form, whom the artist hopes to imitate, is more to the right than self (vide van Gogh, supra), whilst the unrepentant thief is exactly mid-way between the two. The reasons for the thief on the right being the 'good' thief are also considered in Appendix A13:4.

The Annunciation represents a slightly more complex situation, for which it is necessary to introduce a slight modification of the hypothesis. The rider to the theory simply states that the hypothesis is applied firstly

to the most important figure in the picture, and then to those of lesser importance in turn. Of the 209 Annunciations in Berenson, 202 (96.7%) show the angel entering from the left side, and, since the Angel Gabriel and the Virgin Mary are usually shown in part or complete profile, this means that Gabriel is usually showing the right cheek, and Mary the left cheek. A simple interpretation of this data would say that the angel enters from the left simply because the eye reads movement from the left to the right and thus this conveys the greatest sense of movement (e.g. Witmer, 1902; Keller, 1942). Using the same principle it has been claimed that figures entering on to a theatrical stage are far more prominent if they enter from the audience's left than from the right (Dean, 1946). This explanation is however untenable. First it is only this particular Annunciation which shows this gross asymmetry: of 8 other paintings in Berenson in which an angel enters to make an announcement, in 5 he enters from the <u>right</u> side (Fisher's exact test, $p = 2.13 \times 10^{-5}$; two-tailed test) (see also section 6, para 6 of this Chapter). Secondly, in an experiment in which art students were simultaneously shown pictures and their mirror-images there was no tendency for the students to choose those Annunciations with the angel coming from the left as the original or correct version, suggesting that the implied direction or movement is of little significance. (see Appendix A13:5).

From the point of view of 'like-self, unlike-self'

the Annunciation presents a minor problem. Both figures are very unlike self, and thus ought to be portrayed showing the left cheek; but this is pictorially impossible. The solution is to ask, Which is the more important of the two figures? In the Renaissance there is no doubt that the answer would have been the Virgin Mary: hence she shows the left cheek, and the angel inevitably, but unsatisfactorily, has to show the right cheek. When the angel becomes the most important figure in the composition (as in Plate 13:1 for instance) then indeed he does show the left cheek. Of the other figures in this particular picture, all but one of the shepherds are showing their right cheeks as may be expected. Only the least important figures, the fourth shepherd and the women, are anomalous in the cheek shown.

13:5 The Madonna and Child

Whilst the application of the 'like-unlike' hypothesis to the Madonna and Child portrait came after that of the Crucifixion and the Annunciation my interest in its asymmetries had been aroused far earlier: it is therefore necessary to have a slight digression.

Salk (1966, 1973) claimed that about 80% of real mothers carried their child on the left side of their body, and that this proportion was unrelated to the handedness of the mother. As such this basic result has been confirmed

(Rheingold & Keene, 1965; de Chateau & Anderson, 1976; de Chateau et al., 1978; Lockard et al. (1979). Salk suggested that children underwent intra-uterine auditory imprinting to the mother's heart-beat, and that his result was a consequence of the mother being aware that the proximity of the child to her heart would result in the soothing of the child. Whether this explanation is correct is not relevant to the purposes of this study (and indeed other factors such as differential breast sensitivity to touch and pressure, may well be relevant (Weinstein, 1962)). Salk suggested that the tendency to hold the child on the left side was a fundamental biological feature and supported this statement by producing data to show that in Italian Renaissance paintings of the Madonna and Child, the child was held on the mother's left side in 80% of cases. Uhr-brock (1973) also found a similar but weaker tendency and suggested that it demonstrated the artists' sensitivity to the natural biological relationship between mother and child. It is noteworthy that Burt (1937) had also described the tendency of real mothers and Madonnas to hold their child on the left side.

Whilst in Italy I noticed that Salk's observation seemed to be true at the beginning of an art gallery, but that as one proceeded through the gallery its verity seemed less and less likely. When I looked through Berenson's works I found that only 492 (53.9%) of the 913 Madonna and Child portraits showed the child on the left. After several

false starts the reason for this discrepancy became apparent. Figure 13:10 shows the percentage of children held on the left side by the date of production of the painting. At the beginning of the Renaissance just about 100% of the pictures of the Madonna and Child showed the child on the left: by the first quarter of the sixteenth century a significant proportion were holding the child on the right. The growing disbelief in Salk's theory as one proceeded through the galleries was a direct result of their chronological arrangement. Salk's error was in using as a data source a book entitled 'The Christ Child in devotional images during the XIV century'/(Shorr, 1954). i.e. the years 1300-1399 when indeed four-fifths of pictures do have the child held on the left side.

Such a highly significant shift in the mode of portrayal of the Madonna and Child is unlikely to be due to simple artistic conventions for one may demonstrate that there are no important differences either between schools (Figure 13:11), or, more importantly, according to whether the artist was great, good or simply indifferent (Figure 13:12). Why is there an asymmetry in the first place? and more importantly, Why is there a very significant temporal shift? Let us consider the application of the 'unlike-self, like-self' hypothesis. For convenience Madonna and Child portraits will be described by a three letter code (e.g. LRL) where the first letter represents the side of the child, the second the cheek shown by the

Madonna and the third the cheek shown by the Child.

At the beginning of the Renaissance the majority of Madonna and Child pictures were of the LRL type: the reasons for this will be discussed in the next section. From a Renaissance point of view however the LRL picture is unsatisfactory; unlike the case of the annunciation one cannot simply say that one or other figure is unimportant: both Madonna and Child were probably of equal importance during the Italian Renaissance. I would suggest that the transfer of the child from the Madonna's right to left side is a part of the solution to this problem. What is required is that both Christ and Mary should show their left cheeks. If Mary shows her left cheek as well as Christ then the result is an LLL portrait, which is unacceptable, for the mother is looking away from her child. If though the child is switched to the other side then a solution becomes possible. We now have an RLL picture. The Madonna is now looking at her child, but unfortunately this is countered by the child looking away from the mother, also pictorially unacceptable. This cannot be corrected by the child then looking to the right for this would render the child inferior in status to the mother. The final solution involves the artistic device of introducing another person or object into the RLL picture. If the child is holding an object such as a goldfinch, or book, in his outstretched right hand, then it is pictorially acceptable for him to look away from his mother. Alternatively a well placed saint

or donor in the left-hand foreground will produce the same result. If we look at the data then we may see this process occurring. In Figure 13:13 is shown the percentage of cases in which the child is showing the left cheek: as is to be expected this shows little shift through the period concerned. However the Madonna's cheek shows a very different pattern: there is a highly significant shift towards portrayal of the left cheek. The net result may be assessed by the 'total left cheeks' shown. This is an index of the artists' success at portraying both figures showing the left cheek. Figure 13:13 shows that there is a significant increase in the total left cheeks. That these shifts are occurring throughout Renaissance Italy, and for all classes of artists simultaneously, is shown in Figures 13:14 and 13:15. If we look in detail at the eight possible types of picture (Figure 13:16) then it is clear that there is a great shift away from the LRL and LRR portraits of the early Renaissance, toward the RLR, and more importantly, the RLL portraits of the Late Renaissance. It is also noticeable that in the final period considered, 1500-1549, there is a general tendency towards randomness in the mode of portrayal, the eight types becoming more equal in distribution. This may possibly represent part of the early decline into Mannerism, with its emphasis upon painterly qualities at the expense of the more profound meanings of the picture. (Blunt, 1973).

13:6 Mediaeval Pictures

The analysis of the previous section leaves a major problem for the hypothesis of 'like-self, unlike-self', Why does the Renaissance Madonna and Child start out, in 1250, with a predominance of LRL pictures? This question may be answered by considering mediaeval painting and theology. The crucial point is that during the period 600 to 1350 AD attitudes within the Catholic Church towards the Virgin Mary underwent a radical shift, the development of the Cult of the Virgin Mary (O'Connor, 1967; Lagarde, 1915).

A fundamental tenet of Catholicism involves the doctrine of original sin, which all persons may be regarded as having from the moment of conception onwards; furthermore, all may be considered to have shown actual sin during the course of their life. Initially the only exception to this rule was Christ himself, since he was conceived of the Holy Ghost. In particular, as St. Augustine (354-430) emphasised, the Virgin Mary was not an exception to the rule. During the 6th and 7th centuries the churches of Rome and Constantinople began to split further and further apart. About the year 700 AD the Eastern church began to celebrate a festival of the conception of the Virgin Mary: this festival did not in any way suggest that the conception of Mary was different from an ordinary conception as far as the doctrine of original sin was

concerned. During the early 11th century the Normans were in Sicily, where there were large numbers of Greeks celebrating the rites of the Eastern Church. A consequence of this was that the festival of the conception of Mary was brought to England, from whence it spread to France, and eventually to Germany and Italy. The presence of this festival caused some embarrassment in Rome, since by now it had become modified such that it was celebrating the Immaculate Conception of Mary, i.e. that Mary, from conception onwards, was exempt from sin, both original and actual. The church vigorously opposed this change and St. Bernard (c. 1140), in an attempt to prevent the development of the new doctrine, found justification for the elevation of Mary to the status of Saint. However, by now the doctrine was gaining a populist momentum and despite all the efforts of the thirteenth century doctors of the church, including St. Thomas Aquinas, it would not be stopped. In an attempt to neutralise the view, it was therefore argued that whilst subject to original sin, Mary was purified from the stain during her intra-uterine life. This was insufficient however, and by now mass opinion was being supported by some of the scholars, the most influential of these being Duns Scotus (1265-1308). The belief was then officially taken up by the Franciscans, and from then onwards it was only a matter of time before the Immaculate Conception became an official church dogma; this eventually occurred in 1854.

The effects of the Cult of the Virgin upon the production of works of art may easily be seen. Initially the Crucifixion was the corner-stone of religious art, being by far the single most common image during the Middle Ages. In Figure 13:17 is shown the ratio of the numbers of representations of the Crucifixion and of the Madonna and Child. It can be seen that during the period 500-1250 there were two to three times as many versions of the Crucifixion as of the Madonna and Child. Yet at the end of the thirteenth century, in the life-time of Duns Scotus, this changes dramatically and very many more Madonnas were painted than Crucifixions. These results can be seen as representing 'consumer demand' of the time, and the demand was clearly for the Virgin Mary.

The analysis of the development of the Madonna and Child during the Renaissance has depended upon the equal status of the Madonna and of the Christ-child: but up until the year 1250 this was not generally considered to be the case. We might therefore expect significant differences in the portrayal of the left and right cheeks during this earlier period. The data to be described here have all been obtained from the collections of the British Museum, London, and the Victoria and Albert Museum, London, and from three fairly comprehensive books on mediaeval art (Beckwith, 1970; Lasko, 1972; Rickert, 1954). It must be remembered that data from this period is quite rare due to the success of the iconoclastic movement during the 6th

to 8th centuries.

Let us consider first the crucifixion. Here, as during the Renaissance, the situation is simple. Christ is clearly the dominant, and often the only, figure, and is also very 'unlike self': he should therefore be portrayed showing the left cheek, and in 138 crucifixions of the period 500-1349 AD this is indeed so in all but four cases three of which show Christ full-face. Furthermore in those cases where the thieves are also portrayed (of which 10 examples were found) of the 19 thieves portrayed, 18 show the right cheek; this is similar to the Renaissance situation, although there is no evidence of differentiation between good and bad thieves.

In the Annunciation the dominant figure is Mary, and as in the Renaissance, since only one figure may show the left cheek, it has to be Mary. Of 46 cases of the Annunciation, the angel enters from the left side in 36 (84%) of cases. When we look at this data chronologically (Figure 13:18), it appears that the situation has taken a while to develop into its final form, suggesting that initially the resolution of the problem of two figures represented a difficulty, which by the Renaissance, had been well resolved. As in the Renaissance, for Annunciations other than to the Virgin Mary, there is no significant tendency for the angel to come in from the left (see Plate 13:2): of 8 such pictures, only 2 show the angel

entering from the left side (Fisher's exact test, p = 0.00399 one-tailed test).

The Madonna and Child again represents a more complex case. As in the Renaissance we have the problem of requiring, if possible, the child to look in the direction of the mother, and vice-versa. It is also necessary for the Christ child, who is theologically the more dominant figure, to show the left cheek. However unlike the Renaissance situation, the role of Mary is far less critical: whilst it would be desirable to have her showing the left cheek, this is not essential. An initial solution to the problem was to avoid all asymmetry completely, thereby producing the classic Byzantine type of Madonna and Child, as shown in Plate 13:3, in which the child is held centrally and both Madonna and Child are full-face (see Figure 13:15). However as the Middle Ages progressed this portrayal became less and less popular and instead the classic LRL pose developed. This pose solved the problem of showing the child's left cheek, and in consequence since the child ought to be looking at his mother, he was held on the left side and thus Mary was forced to show her right cheek. That Mary was showing her right cheek was of minor consequence since at this stage she was much less important than Christ: whilst it would be preferable if the situation could be avoided, it did not really matter. It is noticeable that in many cases Mary was painted full-face whilst the other asymmetries were retained, presumably to avoid

as far as possible showing Mary's right cheek.

It is ironic that at the very time the LRL solution to the portrayal of the Madonna was being reached, the Festival of the Immaculate Conception was just reaching England.

This data from the Middle Ages is therefore of exceptional interest. Not only can it explain the occurrence of the LRL type of Madonna and Child, at the beginning of the Renaissance, but it also shows how the portrayal of a left or right cheek may be sensitive to a change in the perceived status of an individual.

If my present interpretation of the crucial role of the elevation of the Virgin Mary is correct, then one ought to be able to make several predictions. Firstly in those branches of the Christian church which did not elevate the Virgin Mary should continue to show a predominance of LRL type Madonnas into the middle and late 2nd millenium AD. The Greek Orthodox Church never elevated Mary; scrutiny of the collection of paintings of the Byzantine Museum in Athens shows that almost all Madonna and Child paintings of this period are LRL, even though painted in the 16th to 18th centuries (the four notable exceptions to this rule were all of the Cretan-Venetian school - implying a strong Italian influence). The Coptic Church, and the Russian Orthodox Church, like

the Greek Church, never elevated the Virgin Mary: the collections of Icons in the Coptic Museum, Cairo, and in a series of books on Russian icons (no exact numerical data) all seem to suggest that the vast majority of such pictures are LRL in type.

A second prediction would be that in branches of the Catholic Church which denied the elevation of Mary, the mode of portrayal should revert to the more primitive form. Carey Wolfe (1978), in a project carried out under my supervision, investigated this possibility very carefully, in the paintings of Northern Europe produced before, during and after the Protestant Reformation. Before the Reformation there is no doubt that the trends in the mode of portrayal are very similar to those in Italy. However at the very moment of crucial interest, the number of pictures of the appropriate type, declines rapidly, due to the rise of humanism, and of a move away from the decoration of churches, so that the hypothesis becomes almost impossible to test properly.

Despite the lack of confirmation of an effect during the Reformation, the combined impression of these somewhat brief studies of the Greek, Coptic, Russian and Protestant Churches is that they give further support to the hypothesis of an important role played by the theological status of the Virgin Mary.

13:7 The Nature of the Left-Right Dimension

Whilst there are many ad hoc mechanical factors which might account for some of the left cheek phenomenon (see Appendix A13:1 for a resumé), I would suggest that no mechanical explanation can be entirely satisfactory because it is unable to account for differences in proportions of left cheeks dependent upon social or theological variables. Appendix A13:3 discusses a further case for which it is difficult to conceive of any mechanical explanation, but for which the 'like-self', unlike-self' hypothesis can deal moderately well. It is necessary therefore to try and decide quite what it is that is conveyed by the left and right cheek, and how.

Renaissance symbolism is very complex and became greatly hypertrophied with the passage of time. There are however no well-documented examples of left and right being of primary symbolic significance (although as shown in Appendix A13:4, there are interactions with other symbolisms). I would argue that the left cheek phenomenon is not a symbolism per se. On iconological grounds this would be due to the absence of a clear-cut, one-to-one relationship between signifier and signified (Barthes, 1967). We are not dealing therefore with a symbolism of the form exemplified by the well-known Lion of St. Mark, which represents either St. Mark, or, by derivation, the State of Venice: whenever the Lion (the signifier) is

present, one or other of these 'signifieds' must also be implied. No such relationship can be discerned with the left cheek phenomenon.

The possibility of a conventional symbolism may perhaps also be rejected on psychological grounds. The relation between signifier and signified is usually available to the conscious awareness of the subject, and even if it is not immediately available may usually be obtained relatively easily by simple experimental means. Thus, if we consider the case described by Barthes (1972) of the 'Roman fringe' or the 'Roman curl', a single, almost circular lock of hair conventionally placed on the forehead of Romans in modern films, a symbol which Barthes points out was not actually used by the Romans themselves. Whilst perhaps not directly aware of this sign, it soon became readily apparent to us when it is pointed out. If we were to be shown a series of faces, some with and some without Roman curls, and were asked, as naive observers, and with feedback, to divide them into Greeks and Romans, we would rapidly realise the cue we were using.

No evidence of such a process can be found in the case of right and left cheeks. In an experiment reported in Chapter 14 it was found that when subjects applied the semantic differential to portraits showing the left or right cheek, there was no evidence at all of differentiation in response according to the cheek shown. Similarly with neither

ordinary students (Blount et al, 1975), nor with art students (see Appendix A13:5) is there any evidence that subjects are able to correctly discriminate the original of a picture from its mirror-image. Neither is there evidence that subjects use either the cheek shown in portraits, or the direction of light in portraits, (see Appendices A13:2 and A13:5) as cues to the correct left-right orientation.

When we look in more detail at the results of the semantic differential experiment reported above we find that whilst there are no differences between the subjects' interpretations of left and right cheeks, we find that if we now look at the pictures in terms of the artists' use of left or right cheek in the original, as a function of the subjects semantic differential judgements, there is a clear differentiation of left and right cheeks, implying that the artist is attaching a different meaning to the two cheeks, a meaning which is not apparent to the subject of the experiment. Such a result immediately raises the question as to whether the artists, if acting as subjects in a similar experiment, would have recorded different responses to right and left cheeks; to this we have no answer.

The logical status of the left-cheek, right-cheek dimension is therefore rather difficult. It may be compared in some ways with grammatical rules, which very often are

not apparent to the users of a language but are used continually by them, and yet are readily available for inspection once a simple rule has been formulated: e.g. 'In English in sentences of the form Noun Phrase - Active verb phrase - Noun phrase, the first noun phrase is almost always the subject and the second noun phrase is almost always the object of the verb phrase'. And yet the analogy is not complete for there is evidence that ordinary subjects do not perceive the left cheek rule at all, only artists. It is perhaps more akin to a stylistic rule such as that which condemns the use of the split infinitive: split infinitives may be commonly observed in the speech and writing of ordinary people, and these people are often very bad at perceiving them,even when they are pointed out. Professional writers on the other hand rarely produce split infinitives, and thus our hypothesis of a rule governing the split infinitive would only apply to their literary output. Is the left cheek phenomenon simply then a stylistic feature (akin perhaps to a particular way of painting cupids floating in a Baroque heaven?). Probably not, for the simple reason that none of the artists appear to have perceived the rule themselves. The condemnation of the split infinitive is most vociferous from the writers themselves, and it is they who have recognised it: no evidence for such an insight on the part of the painters is apparent. My interpretation of the left-cheek, right-cheek hypothesis is that it is describing a rule which is usually sub-conscious, but frequently applied,

is in no way a simple stylistic convention, and may perhaps be understood in terms of a 'deep structure', akin to those which Chomsky proposes in language, and Levi-Strauss proposes in anthropology, not being directly accessible psychologically, but having to be inferred from the works produced. Whilst such an interpretation has many problems it can at least account for the stochastic nature of the 'symbolism' of the left cheek, it helps to explain the non-appearance of the phenomenon in ordinary subjects in an experimental situation, and also accounts for the occurrence of the phenomenon in artists of all grades of competence. Whether the presence of the 'deep structure' differentiates artists from non-artists, or whether perhaps the sense is merely more highly tuned in the artists is a question capable of empirical analysis. Thus one might for instance give feedback to experimental subjects according to their semantic differential responses to paintings and determine whether, without being explicitly told, they could detect, either consciously or sub-consciously, the existence of a left-cheek, right-cheek dimension.

Whilst I would argue that the left-cheek, right-cheek dimension possibly represents some form of 'deep structure', it is worth adding that this must inevitably be subject, in its expression, to the ordinary laws of psychology. Thus I would expect that artists would, as Gombrich (1960) suggests be actively experimenting to produce the desired effects,

the particular effects at a particular moment distinguishing the style of the period. We may find an example of this in the sketches of Michelangelo, sketch books being the artists' equivalent of the scientists' laboratory bench, a place where experiments may take place. We have seen earlier that right cheeks are very rare indeed in Italian Renaissance crucifixions, the incidence being about 0.68%. If we take an estimate of this two standard errors higher we obtain a figure of 2.03%. In Michelangelo's sketchbooks there are 10 drawings of Crucifixions, of which 3 show the right cheek. The probability of such a high occurrence of right cheeks, 3 out of 10, is very unlikely (exact $p = 0.0007$). The implication is that the artists are testing and sometimes rejecting the use of one cheek or the other. Regrettably Michelangelo produced no finished versions of the Crucifixion, for comparison. The failure of ordinary subjects on the semantic differential judgements applied to right and left cheeks might be primarily a result of a lack of experience of utilising the two cheeks to convey meaning. A further prediction of this 'experimentation' model of the use of cheeks, is that when artists decide to copy works by other artists they should preferentially choose those works which are more appropriate for the time: thus an Italian artists copying a Madonna and Child in 1300 should copy pictures of the type LRL significantly more often than would be expected.

Having discussed the formal nature of the left-cheek,

right-cheek dimension it is necessary to consider in a little more detail what is is that is being conveyed. Earlier on the definition was kept purposely vague, and the question deferred. The best insight into the dimension is perhaps given by the semantic differential experiment of Chapter 14. Here we find that portraits painted originally showing the left cheek tend to be more evaluatively positive, more dynamic and more spiritual (these three factors being extracted by factor analysis of the 20 dimensions of the original semantic differential). This is not however a satisfactory description. Firstly it is unlikely that three orthogonally separate dimensions should be reduced to a single dimension, and secondly these dimensions do not correspond in any useful way with the dimensions proposed earlier, 'like-myself, unlike-myself', and 'public-private'. Any further description of the dimensions must await further experimental investigation. Certainly from the difficulties encountered in finding the dimension and then probing it experimentally we may expect that the labels to be attached to it are not simple dichotomous terms such as good-bad, but are semantically more complex.

13:8 The Origin of the Left-Right dimension

What is the origin of the left cheek - right cheek dimension? Two major alternatives confront us: either it is inherent in the make-up of the human brain (as Chomsky would argue are the deep structures of human language), or

else it is acquired, presumably as the result of cultural influences. The origin of the dimension in no way alters its logical interpretation: thus it may have all the formal properties of a deep structure and yet still be dependent upon strong cultural influences for its expression (the existence of portrait painting being one such necessary cultural pre-condition).

If the dimension is in some real sense innate then we ought to be able to find wide-spread evidence of it. In this paper I have so far shown evidence for the differential usage of right and left cheeks over the period 600 AD to the present day. If the dimension were truly innate we might expect to find evidence for it in earlier historical periods, and also in different cultures. In the limited number of Roman portraits I have managed to examine, 10 showed the left cheek, 14 the right cheek, and 3 were completely symmetrical. Possibly with a larger sample size we might find evidence of a difference in cheek usage: alternatively, in view of Quintillian's comment that "in a portrait the full-face is the most attractive" (Inst. Orat., II, xiii, 12) we may not find anything. Too small an amount of Greek painting has survived to make any useful conclusions. In one area of left-right asymmetry which I have studied in Greek sculpture, the scrotum, there is evidence of left-right symbolism, but only in the ordinary sense of symbolism, being clearly related to the Pythagorean mystic traditions (see Chapter 12). Earlier still there is

evidence that the Egyptians differentiated between left and right in their wall-paintings, although whether this is symbolic is not clear (Dennis, 1958).

Cross-cultural evidence on the portrayal of left and right cheeks is almost totally lacking. Of 48 portraits of single Moghul emperors in the Victoria Memorial, Calcutta, 24 (50%) showed the left cheek, the proportions of left cheeks in paintings (n = 32) and engravings (n = 16) being identical; this result is however not large enough to be conclusive.

One piece of experimental evidence is however interesting. Children, if asked to draw a profile, draw it facing to the left in a very large proportion of cases. This effect is probably independent of handedness and also is shown as strongly by Japanese as well as American children (Jensen 1952 a,b).

If an innate interpretation of the phenomenon were required then one obvious candidate would be the right-left asymmetry of the brain itself, an account of which is briefly given in Appendix A13:1.3. At present the evidence is not strong enough to either accept or reject any innate origin of the left cheek phenomenon.

Even if there is an innate structure upon which the dimension depends we might also expect strong cultural

influences to be important. In Appendix A13:4 I have gathered together evidence on the possibility that the details of the Shroud of Turin, a cloth which purports to be that in which Christ was wrapped after his death, are the primary origin of all asymmetries in Western art, particularly those in the religious painting of the Italian Renaissance. In Appendix A13:5 I have collected evidence that shows that there is no reason to believe that the direction of light in paintings is a fundamental asymmetry to which all others are secondary, contrary to the suggestion of Coles (1974).

13:9 Conclusions

In this Chapter we have come a long way from the initial, deceptively simple, observation that portraits are more likely to show the left cheek than the right. In studying the phenomenon I have used methods which are unusual in studying art history, and these can probably find their origins in my medical training. The traditional approach to art history, the detailed study of the individual painting (or of the individual artist), can be likened to the doctor's study of the symptoms and signs of the individual patient. Medicine however found that one could not always make useful generalisations by studying the individual patient, and thus epidemiological methods developed; the manner in which I have studied painting in

this paper I would wish to call 'the epidemiology of art', attempting to sketch out the natural history of a style, and to follow its evolution. Later in medical history, and also in this study, we find the application of experimental methods, the manipulation of stimuli and subjects in order to clarify issues, 'experimental aesthetics' in this study. Whether such methods are justified in the study of art is a function of the results produced and the insights the methods provide into the subject-matter. Whether or not the left-cheek right-cheek hypothesis is itself a correct or useful approach to this data there is no doubt that an explanation of some sort is required for effects which are of enormous statistical significance, and cannot be interpreted just as the results of chance.

APPENDIX A13:1 MECHANICAL ARTEFACTS AND THE PREDOMINANCE OF THE LEFT CHEEK

In section 13:2 I briefly raised the possibility that the predominance of the left cheek might be a result of a mechanical artefact, perhaps related to the right-handedness of the artist. In section 13:3 I concluded that such an interpretation was probably untenable due to the impossibility of accounting for the dependence of the phenomenon upon social and theological variables. In this Appendix I will briefly consider some of the possible artefacts which must be borne in mind when analysing any left-right asymmetries in paintings, but which in my opinion cannot account for the main differences between left and right cheeks. The vexed question of the direction of light in pictures is considered separately in Appendix A13:2.

A13:1.1 The Right-handedness of Artists

Whilst a few famous artists such as Leonardo, Michelangelo and Holbein are often quoted as being left-handed, there is no reason to doubt that the majority of painters were probably right-handed and indeed more persons in pictures are shown as right-handed (Coren and Porac, 1977). As a result we might expect certain asymmetries to arise from their unimanual use of palette and brush. It has often been proposed that a right-hander will be able to draw

a left-cheek profile more easily than a right-cheek profile (e.g. J.S., 1870; Schapiro, 1969), presumably as a result of the sweep of the curve of the face coinciding with the locus of movement of the hand. Martin (1906) with adults and Jensen (1952 a,b) with children, have both found that when asked to draw a profile, the majority of persons will draw a left profile, Jensen's results showing this to be also true in both Egyptian and Japanese children, both of whom have very different styles of writing from American children. Jensen's results on left-handers were somewhat equivocal due to a small sample size; only 42% of 33 left-handed children drew a left-profile, as compared with 65% of 355 right-handed children. This difference is highly significant ($X^2 = 7.41$, $p < 0.01$, 1 df), although 42% is not significantly different from chance expectations of 50%. Whether therefore the tendency of children to draw left-profiles is determined by handedness per se is not clear.

The profile-painting tendency cannot explain the left-cheek predominance in paintings since the phenomenon is found only in full-face paintings and not in half-profiles or full-profiles (see Figure 13:2).

A13:1.2 A visual preference for the left-side of the face

If a preference existed, for whatever reason, for the left side of the face, we might expect a predominance of

left cheek paintings. The human face is not completely symmetric, the direction of asymmetry being dependent upon the handedness of the individual as far as the nose is concerned (Sutton, 1963), but being independent of handedness for the direction of hair-whorl (and hence the side of parting of the hair) (Lauterbach and Knight, 1927). The nasal asymmetry can probably be explained by the differential pull of the facial muscles on the two sides of the head during early development (Washburn, 1946). That faces are psychologically asymmetric was shown by Wolff (1933), and McCurdy (1949), who asked subjects to say whether the right or the left side of the face was more representative of the whole face; the right side (i.e. the right cheek) was regarded as more representative overall. Whilst thought by many individuals to be a reflection of the actual asymmetry of the face of the subject, Gilbert and Bakan (1973) have demonstrated that the asymmetry is in fact primarily in the eye of the beholder, the half of the face in the experimental subject's left visual field (i.e. the portrait's right cheek) being regarded as more representative overall. This tendency is independent of reading habits, and Gilbert and Bakan propose that the asymmetry is fundamentally of the cerebral hemispheres. Hilliard (1973) has clearly demonstrated that facial recognition is superior in the left visual half-field, and thus in the right cerebral hemisphere in the majority of individuals; similar results were found in children from 5 years upwards (Young and Ellis, 1976).

Whilst all these reasons might be excellent for assuming that an asymmetry might exist in the perception of paintings there does in fact appear to be no such asymmetry. Blount et al (1975) showed there to be no tendency to choose left cheeks in actual paintings as the preferred version, and indeed there was a slight tendency to prefer right cheeks, a feature also shown in a study using art-students (Appendix 13:5). The difference between these experiments and the ones described earlier is that our experiments used actual portraits which are invariably quite asymmetric, whilst those of Wolff et al used completely full-face pictures, a type very rare in painting.

In conclusion there is no evidence of a tendency to prefer left-cheeks in painted portraits, although there might be excellent a priori reasons for supposing such an asymmetry.

A13:1.3 Asymmetry of Visual Space

Perceptual space is not completely left-right symmetric. The left-half of the visual world projects predominantly to the right cerebral hemisphere, and the right-half to the left cerebral hemisphere. In the right-handed majority of the population these hemispheres subserve clearly different functions. The right hemisphere is primarily concerned with visuo-spatial analysis, whilst the left-hemisphere is specialised for verbal and language functions.

More specifically the right hemisphere has been shown (almost always in tests using tachistoscopic presentation of stimuli separately to the two half-fields) to be superior in the enumeration of dots, the localisation of dots, the detection of line slant and depth, and in the perception of some geometric forms (Kimura and Durnford, 1974), the fusion of Julesz-type stereoscopic figures (Carmon and Bechtoldt, 1969), and the discrimination of both hue and saturation of colours (Davidoff, 1976). Perhaps also of relevance to aesthetics is that the right hemisphere would appear also to show different emotional responses to the left hemisphere, tending to rate films as more unpleasant or horrific (Dimond et al, 1976). Some authors have also suggested that the two hemispheres differ in their affective states, the right hemisphere tending to be depressive, and the left to be hypomanic or euphoric (Gainotti, 1972).

Whilst most of these effects have been obtained by using tachistoscopic presentation of stimuli we might also expect some of the phenomena to be demonstrated during free, unrestricted vision, particularly in the edges of the visual fields. Of particular relevance to the perception of paintings are the findings of Adair and Bartley (1958) that objects in the left foreground (i.e. viewer's left) of pictures are phenomenally closer than those in the right fore-ground. That a psychological rather than a physiological explanation of this effect is required is shown by the finding of Bartley and Dottardt (1960) that objects

in the left and right backgrounds appear phenomenally equi-distant. That objects in the left fore-ground are also more salient is shown by Nelson and MacDonald's (1971) finding that when asked to choose a title for a picture, subjects tended to choose that one referring to the objects placed in the left half rather than the right half of the picture.

The relationship of all these perceptual asymmetries to the left-cheek, right-cheek phenomenon is not clear. They are possibly the fundamental asymmetry underlying the whole process, which determines its whole direction, although no positive evidence for this statement can be produced. Certainly none of these results can be used to explain away the left-cheek, right-cheek phenomenon; at best they can only explain its direction. Preliminary results suggest that there are no laterality differences in the aesthetic responses of right and left-handed subjects, but the result requires further confirmation.

The possibility also exists that when looking at faces individuals may use different scanning strategies. Yarbus (1967) in his Figure 115 shows beautifully that one particular individual scanned only the left side of a face. Walker-Smith et al (1977) found that of three subjects, one showed a strong tendency to concentrate on the right eye of pictures, one to look at the left eye, and the third to concentrate on the nose and mouth. Whether a directional asymmetry of such

gaze strategies exists is not clear, but may probably be discounted (Argyle and Cook, 1976; p 51). Lord and Haith (1974) found no systematic differences in the perception of gaze with either right or left eye.

A13:1.4 Asymmetry of the subject

Most of the discussion so far has centred around asymmetries of the artist and his perception (or perhaps conceivably of the asymmetries of the eventual viewer of the painting). However the subject of the painting also has his own asymmetries. The possibility of a facial asymmetry being of importance in determining the cheek shown has already been discounted (see A13:1.2 above) (see also Footnote 1).

Footnote 1.

An interesting and apparent exception to this statement is shown in the famous portraits of Federigo, the Duke of Montefeltro. He lost his right eye and badly disfigured the right side of his face in a jousting accident. In order to increase his nasal field of vision from the remaining eye he had the bridge of his nose partially cut away. The result is a very characteristic profile which, in the portraits by Berruguete and Justus of Ghent (in Urbino) and Piero della Francesca (in Florence and Milan) all show the left profile, with the characteristic hooked nose clearly visible. However the large portrait of Federigo by Piero, in the Uffizi, has, on its reverse, a painting of The Triumph of Federigo da Montefeltro, showing the instantly recognisable profile with the hooked nose, but this time showing the right cheek, which is apparently intact, although the picture was presumably painted at the same time as the painting on the converse. The implication is clear: Piero wanted, for compositional reasons, to show Federigo's right cheek in this picture, and so he simply produced a mirror-image.

An asymmetry of motor function is conceivable as a factor in portrait asymmetry. Gesell and Ames (1950) found that the tonic neck reflexes are very well formed in neonates, the tendency being for most of the infants to move their head so that they were looking over their right shoulder (i.e. to show their left cheek). This tendency has been further analysed recently and appears to be due to both motor and sensory asymmetry of the neonate (Turkewitz, 1977). How far this spontaneous turning tendency extends into adult life is not clear. Gesell and Ames (1947) found that the direction of turning correlated with later handedness. Motor asymmetries in adults are relatively common. Lynn and Lynn (1943) claimed that about 40% of individuals show a distinct asymmetry whilst smiling, one corner of the mouth rising earlier than the other. Kimura (1973) described how right-handed individuals use their right-hand far more for making free expressive gestures whilst talking, although this asymmetry does not apply for making self-touching movements. Gur and Gur (1977) have studied the phenomenon reported by Kinsbourne (1972) in which subjects tend to turn their eyes to the right if performing verbal tasks and to the left if performing visuo-spatial tasks. They found this to be only a useful test of hemisphere dominance if subjects were facing away from the experimenter, and thus in a non-anxiety provoking situation. If eye-movements were recorded whilst subjects faced the experimenter then the direction of gaze indicated not the mode of cognitive task, but rather a personality difference

between subjects, left-movers being for instance less susceptible to hypnosis and more prone to psychosomatic symptoms.

Whilst it is conceivable that some of the variation in left and right cheeks shown in pictures might be attributed to subject motor asymmetries, this really does seem somewhat unlikely. A confusing factor which must be remembered in these studies is that if one postulates that, say, in right-handers, the muscles of the right side of the body are all just a little stronger than those on the left then the pattern for head-movements is difficult. The main muscle for making sideways movements of the head is the sterno-cleido-mastoid. However stimulation of the right sterno-cleido-mastoid results not in movement to look over the right shoulder but to look over the left shoulder (i.e. to show the right cheek to the world).

In summary it is difficult to see how these motoric asymmetries could reasonably account for the left-cheek, right-cheek data.

A13:1.5 Asymmetries of conventions in painting style.

The main asymmetry to be discussed here is that proposed by Professor A. Green, and discussed in Corballis and Beale (1976). Professor Green has pointed out that there was a definite tendency for pairs of portraits to be painted,

so that, typically, the husband would be hung on the left, the wife on the right, and the two would look inwards, towards each other. Since they thus show opposite cheeks, it is reasoned that we might expect a difference between male and female portraits in their proportions of right and left cheeks.

I have re-examined the Rembrandt data to look at the paired portraits. Of those which are known to have been paired, the vast majority are indeed in the manner described by Green (Table A13:1.1). When we now consider the data previously described in Figure 13:6 we find that the main trends are not substantially altered by removal of the portraits known to have been paired (Table A13:1.2). The difference between kin and non-kin is not quite significant at the 5% level, but this is primarily due to a reduced sample size. The main trends are still apparent. Corballis and Beale suggest thatthe trends shown in Table A13:1.1 are 'carried over even to portraits hung singly, and almost certainly applied to the portraits painted by Rembrandt . This hypothesis is however not sufficient to explain all of the left cheek data. It would predict that there would be a trend for female portraits to show the left cheek (as is the case) but would also have to predict that there would be a <u>right</u> cheek predominance for male portraits: this is not the case for Rembrandt's male non-kin portraits, 45.7% showing the left cheek, which is not significantly different from a chance expectation, $X^2 = 0.78$, 1 df).

It is certainly not the case for most male portraits by other artists (see section 13:2). Further evidence against the hypothesis (which comes close to being impossible to disprove), is that the production of paired portraits probably developed in the mid-Renaissance (Francesca's portraits of the Duke and Duchess of Urbino (see Footnote 1), possibly being one of the earliest pairs); the differential usage of right and left cheeks probably occurred at a far earlier stage than this, going back at least to the middle ages. The only portrait precedents for the mediaeval artists were classical sculptures, and possibly some of the Graeco-Roman and Coptic wax portraits used for the lids or coffins and sarcophagi. Whilst it was possible these were painted in pairs (one example being in the Naples museum, inv.9058, and which incidentally shows the man showing his left cheek and the woman her right), it is highly unlikely , on stylistic grounds, that the mediaeval artists were aware of these portraits.

A13:1.6 Summary of Appendix A13:1

Most of the available evidence on possible left-right asymmetries which could act as artefacts to confuse the left cheek phenomenon have been considered. None of them are capable of explaining away the data presented in the main part of this paper, except perhaps with an unreasonable degree of ad hoc elaboration and multiplication of hypotheses. It is however possible that the asymmetries of

the cerebral hemispheres in some way relate to the underlying asymmetry which originally gave rise to the left-cheek, right-cheek dimension.

APPENDIX A13:2 THE DIRECTION OF LIGHT IN PICTURES

Coles (1974) documented the tendency for light in Western pictures to come from the left-hand side (that is, as if the source of illumination were placed to the left of the viewer), although the tendency had been recognised earlier (e.g. Gombrich, 1960). Coles suggested that the direction of the light was the primary asymmetry in portraits and that the cheek shown was only secondary to this, the left-sided light acting as a reference point against which the turn of the subject's head could, as it were, be titrated to give different degrees of 'openness'.

Of the finding that light tends to come from the left there seems to be little doubt. Thus in the 340 English Icon paintings from Strong (1969) I found that 208 (61.2%) showed the light from the left, 9 (2.6%) the light from the right, and in 123 (36.2%) the direction of the light was either indeterminate, or in a few cases, actually contradictory. This last group of portraits, with indeterminate or contradictory light, represent a test of Coles' theory. If the direction of light were indeed truly primary then in this group we would expect 50% left cheeks, and 50% right cheeks. Table A13:2.1 shows that this is not the case, a definite left cheek tendency still being apparent.

The group of Italian Renaissance portraits (Berenson and Pope-Hennessey, 1966) also show a strong predominance of

left-sided light, but have a far lower proportion of indeterminate pictures: of 272 portraits, 219 (80.4%) showed light from the left, 45 (16.5%) light from the right, and only 8 (2.9%) were straight on, indeterminate or contradictory. When we analyse these data further we find, in Table A13:2.2 for both male and female subjects, a significant interaction between the cheek shown and the direction of the light; this direction is in the same direction as that suggested by the limited number of pictures for the English Icon. The interaction is however in the opposite direction to that shown by Coles: far from being less common than might be expected by chance, the right-cheek, right-light group are more common. In these portraits therefore the light is arranged so that it tends to shine directly into the face of the subject rather than passing across the face at a glancing angle, and when we analyse the data in these terms we find no interaction with the direction of the light A13:2.3. The pictorial utility of such a convention is obvious.

The difference between this data and that of Coles is very important. If we take the combined data of myself and Coles (Table A13:2.4) then we find that whilst there is still a significant interaction between the direction of the light and the cheek shown (albeit in the direction described by Coles), this interaction is only just significant with probability less than 5%. Considering the sample size of 1245 this suggests a fairly

mirror effect and I would suspect that the addition of more data to it might well make it non-significant. Coles' hypothesis, that the direction of light is the primary assymetry, would thus appear to be untenable. That however the direction of light is important in some way is indisputable for the differences between my results and those of Coles are themselves highly significant. For this I can at present offer no explanations.

The problem remains of why the light in pictures should come from the left side. Gombrich (1960) claims that "Psychologists have found that in the absence of other clues, Western observers have settled for the probability that the light falls from high up and from the left-hand side". Whilst accepting that there is *prima facie* evidence for his statement (e.g. from the typical colouring of maps, the mis-interpretation of hills and valleys in inverted moon photographs, etc.) I can find no reference in the psychological literature to support the claim, certainly not in Gombrich's quoted reference (Gibson, 1950). I intend to carry out experiments to test the hypothesis.

Gombrich's hypothesis suggests that the reason for light coming from the left is an innate perceptual tendency. It is however possible that there are also cultural influences, or perhaps just simple stylistic differences, associated with different schools of art. Thus Rembrandt painted a far higher proportion of paintings with light from the left

(93.9%) than did Reynolds (64.3%), the difference being statistically highly significant (X^2 = 70.9, 1 df, $p < 0.001$; data taken from Coles, 1974). When we consider data from the Italian Renaissance we find a similar effect. Figure A13:2.1 shows for the four Italian Schools, the percentage of pictures with light coming from the left. There is no difference between the Venetian and Northern Schools, and the Central and Florentine schools are marginally different, but the difference between the combined Central and Florentine schools and the combined Venetian and Northern schools is highly significant. For the case of the Madonna and Child pictures, Figure A13:2.2 shows the historical changes for each of the four schools separately; the differences between the schools are not sampling artefacts due to the inclusion of more pictures of a later date for the Venetian school, although no simple relationship is discernable.

Figure A13:2.3 shows the data on the direction of light for the mediaeval crucifixions, the only group for which sufficient mediaeval data could be obtained. The majority give no intimation of a source of light, and it is clear that it is a Renaissance innovation, associated presumably with the drive to greater realism. Within the Renaissance itself there is a distinct trend to produce less pictures in which the light is indeterminate, for both crucifixions (Figure A13:2.3) and also for the Madonna and Child (Figure A13:2.4). The use of left sided light at the

beginning of the Renaissance is however immediate, there being no transitional phase in which a racemic mixture of left and right sided light was produced (e.g. in Figure A13:2.3). Figure A13:2.4 shows that with the Madonna and Child figures there is a significant trend towards using light from the right more as the Renaissance progresses. This is not however the case with the Crucifixions (Figure A13:2.3). Since with the Crucifixions we find no long-term trend in cheek shown, left being shown for the entire time, and yet with the Madonna and Child we find significant variation of portrayal, we might expect that the two phenomena might be linked, the direction of light being secondary to the cheek shown. The correlation is not however simple, for with the increasing proportion of left cheeks in the Madonna and Child portrait during the Renaissance we find a decreasing proportion of left-sided light. Figure A13:2.5 explores the relationship between light and the various facets of the Madonna and Child, in more detail. For Madonna and Child pictures with light coming from the left we find the highly significant chronological changes already described (section 13:5). For those Madonna and Child portraits with light coming from the right we find statistically significant chronological trends only in the case of the Madonna's cheek: nevertheless there is a distinct trend in the case of both Madonna's cheek, and the side of the child, for the chronological change to be in the opposite direction to that of the pictures with the left light. Such data are not easy

to interpret. If indeed the trends shown in 'Side of Child' and 'Madonna's Cheek' for right light are the reverse of those shown for left light then this would be good evidence that the light is responding secondarily to the cheeks shown in the painting. In the absence of convincing statistical proof we are left in a limbo. Certainly these data do not seem to strongly support, in any way, the contention that the direction of light is the primary asymmetry in such pictures.

In view of the remarkably rapid left-light predominance at the beginning of the Renaissance it is necessary to consider one other possible reason for the origin of the light direction. In Appendix A13:4 I have considered some of the symbolism of the Crucifixion and suggested that much of this might be secondarily related to the actual wound received by Christ at his Crucifixion and recorded in the form of the Shroud of Turin. From this asymmetry, of the face and chest wounds, we might also expect a tendency for light to come from the left side. We know that Christ died late in the afternoon and thus we might expect (particularly given the views of Molanus, quoted in Appendix A13:4)that Christ would look towards the setting sun in the west, the west traditionally being placed to the left-hand side. Alternatively it could be argued that since Christ had to show his left cheek (either for iconological reasons or due to a bruise on the right cheek) then the light had inevitably to come from the left

side, for the light represented the Sun, and hence good, the Church, etc. Given the existence of such an asymmetry in Crucifixions we might expect it to rapidly generalise to all picture types.

In summary therefore I would propose that light tends to come from the left in Western paintings for one (or possibly all three) of the following reasons:

i. Because of a basic perceptual asymmetry which assumes that light will come from the left.

ii. Secondarily to other asymmetries such as the portrayal of cheeks, and of the side of holding of the child in Madonna and Child figures.

iii. As a consequence of the symbolism attached to the Crucifixion, which might find its origins in the actual events of the Crucifixion, as transmitted through the Shroud of Turin.

APPENDIX A13:3 ASYMMETRY IN ITALIAN RENAISSANCE POLYPTYCHS

An extremely popular type of picture in the early Renaissance was the large polyptych altar peice; in the later Renaissance this transmuted into a large single picture in which there was a central item (Madonna and Child, local saint, etc.) with pairs of figures, usually saints, symmetrically placed to either side of the main figures: the archaetypal picture is the 'Madonna and Child with Saints'. Of the approximately 6000 pictures in Berenson, 605 consist of this type of picture, in most cases with the Madonna as the central figure. To any theory of left/right symbolism the polyptychs pose an immediate challenge in that they have a very strong inherent symmetry. Thus for instance in Plate A13:3.1, whenever a figure to one side of the mid-line shows one cheek, the corresponding mirror-image figure shows the opposite cheek.

Within this system asymmetry does however occur. Plate A13:3.2 shows an example which is not totally symmetric as far as the cheeks are concerned. Figure A13:3.1 shows the total number of figures within such polyptychs. 27.4% of polyptychs show a symmetry 'error' of some sort in the cheeks, the vast majority showing one, or occasionally two, errors. (It is not of course possible, on logical grounds, to say which of the two figures is in error). 14.28% of saint-pairs show an error (Figure A13:3.2).

The theory of 'like self-unlike self' has difficulties with polyptychs for its small effects will tend to be masked by the stronger effects induced by simple symmetry considerations. Nevertheless we may find evidence for its existence. We may regard the saints as different from self in so far as they represent an idealised self, and we may expect a tendency for saints to show the left cheek, although in so far as the saints are still human we would not expect 100% left cheeks. The symmetry of the polyptychs, if applied strictly, would prevent this predominance of the left cheek. Symmetry is not however strict, for we have found frequent errors. I would postulate that these errors are attempts to portray more left cheeks and thus to correctly place the saints on the spectrum of 'like-unlike self'. If this is so we would expect more errors resulting in two left cheeks being shown than those resulting in two right cheeks. Figure A13:3.3 shows that this is indeed the case, although it is only so for the Florentine and Central Italian Schools (a finding which resembles the difference in schools described in Appendix A13:2). The difference between schools may possibly be artefactual, being simply a function of the chronological distribution of the works. Whilst this result is not strong evidence for the theory of 'like self-unlike self', it is at least compatible with it: an explanation in any other terms would be very difficult to produce. The errors themselves, of either type, are equally distributed between polyptychs of all sizes.

The polyptychs also provide a useful role in testing the theory further and for demonstrating that the hypotheses it creates are capable of empirical disproof. In view of the symbolism of all sorts which is rife in Mediaeval art, we may expect that strict rules would exist for the painting of the saints to the left or right of the centre of a polyptych; in terms of my own hypothesis it woudd seem likely that the most important saints (perhaps defined operationally as those portrayed most often) would be perceived, and hence depicted, as being closer to Christ, and thus showing the left cheek more frequently. Table A13:3.1 shows, perhaps surprisingly, that the saints are placed randomly to left or right of centre, and show no tendency for the more important ones to show the left cheek. Table A13:3.2 shows the fifteen most commonly portrayed saints and the number of occasions they are placed to right or left, and the cheek shown. None of the differences are greater than chance expectations.

APPENDIX A13:4 THE ICONOGRAPHY OF THE CRUCIFIXION

This subject is complex: nevertheless, as Réau emphasises, iconographical hypotheses must be open to testing in the same way as any others, for theories of symbolism are easy to beget but difficult to destroy.

The Crucifixion is central to the present study for it is the clearest example of a left/right asymmetry. Its central figure, Christ, represents one end of a spectrum, the other end of which is the artist himself: any individual may then be placed along this spectrum. The main question therefore is, Why does Christ show the left cheek in almost every example of the Crucifixion? There are, inevitably, several subsidiary questions regarding the portrayal of asymmetries in the Crucifixion. Réau (1957) describes how the left side of the picture (i.e. on Christ's right hand) represents the Church, whilst the right is the Synagogue. As a result Mary stands to the right of Christ and John to the left. The spear which made the wound in Christ's side is held in the left half of the picture, for the spear signifies the solider, St. Longinus, who inflicted the wound and later became converted to Christianity, whilst the vinegar-soaked sponge represents the mocking synagogue and is thus held in the right half of the picture. As a corollary churches are built on an east-west axis with the altar at the east

end (footnote 1); hence on entering a church and looking along the nave, the north (equated with darkness, cold, the devil and the synagogue) is to the left, whilst the south (and light, warmth and God) is to the right. The Old Testament frescoes are placed on the north side of the aisle and the New Testament frescoes on the south. This north-south symbolism extended so that in some French churches the men sat on the right side of the nave and the women on the left (or north). In mediaeval crucifixions we also find the sun shown to Christ's right and the moon to his left. In Dante's Divine Comedy the synagogue is placed in the Northern Hemisphere, whilst the church is placed in the Southern Hemisphere (Purgatory, IV, 76-84). In Paradise Lost there are several references to the Devil coming from the North (V, 689; V: 726; VI: 79); Fowler (1971) has suggested that all of these associations derive from a patristic interpretation of the text of Isaiah, xiv, 13-14.

The two thieves, who are often portrayed alongside Christ, have traditionally been divided into good and bad. In about one third of such pictures examined (7 out of 18) there is definite pictorial evidence that the thief on Christ's right hand is the good thief whilst in the others there is no evidence, or only dubious evidence, for such a differentiation. In the gospel accounts there is no mention of the good thief being on the right hand (Matt., 27, 38; Mark, 15, 27; Luke, 23, 39; John, 19, 18). From evidence

of cheeks shown by the two thieves (sections 13:4 and 13:6) it would appear that the differentiation into good and bad is a Renaissance phenomenon.

The spear wound in Christ's side, if present, is invariably present in Christ's right side (Footnote 2). The evidence for placing the wound in the right side is not clear. The biblical account (John, 19, 34; 30, 24-7) makes no mention of the side of the wound, we are merely informed that "forthwith there came out blood and water", an event for which various theories have been proposed; these include pericardial effusions and a haemohydrothorax, but none is totally convincing, and certainly do not unequivocally locate the wound on the right side. It may be that the spear-wound is placed on the right side because 'spear' in Roman military usage was a synonym for right (and 'shield' for 'left', cf. Paradise Lost, iv, 785; "Half wheeling to the shield, half to the spear", Fowler, 1971).

The 'Doctrine of the Concordance of the Testaments', by which it is claimed that for each event in the New Testament there is an equivalent one in the Old Testament, is of some relevance to the positioning of the spear wound. The wound may be related, by analogy, to Moses striking the river with his stick and turning it to blood (Exodus 7, 20), to the removal of the rib from Adam's side to fashion Eve (Genesis, 2, 21), or even to the killing of

Asabel, Abner, Ish-bosheth, and Amasa, in each case under the fifth rib (II Sam., 2, 23; 3, 27; 4, 6; and 20, 10). However none of these events unequivocally describe the right or the left. Indeed the use of Adam's right or left rib seems to be confused. Thus in Lucas Cranach the Elder's Das Paradies of 1530, in the Kunsthistorisch-esmuseum, in Vienna, Eve is clearly being created from Adam's right side. In 1608, Andrew Willett, in his Hexapla wrote "It is a superficial question out of what side of Adam, Eva was taken ..... It is resolved by most, out of the left because Adam's heart lay there; but these are frivolous and needelesse matters". Nevertheless, Milton thought the matter sufficiently important to refer to it twice in Paradise Lost (IV, 484; VIII, 465). To confuse the symbolism even further, Milton also states that during the battle between Michael and Satan, the former's sword enters the devil's right side (PL, VI, 327).

The biblical evidence has so far given us no reason for the particular portrayal of left and right in the crucifixion. The most difficult, but by far the most challenging and interesting explanation of the asymmetries of the Crucifixion is that they find their origins in the actual events of Christ's Crucifixion. Their universal occurrence, through all ages, suggests, even if tradition is a secondary factor, that some primary orienting event of great moment must have occurred to account for these asymmetries. Two separate lines of evidence may be

followed, one more useful than the other.

The positioning of the Cross on Golgotha, and the direction faced by Christ, are not told us in the Gospels. However, Molanus in 1547, in a volume produced by decree of the Council of Trent, in which were set down rules for the painting of all religious pictures, tells us:-

> "He was crucified (and therefore should be portrayed) with his back to Jerusalem and the East, looking towards the West, with his right to the north and his left to the south ..... In this position also he ascended, turning his eyes towards the West, and over the Roman Church set in the West, to which he was about to send his chief apostles Peter and Paul, and where he was to keep his pact with Paul".
>
> (Molanus, 1547).

The evidence for these statements is not given, but in conjunction with the recent discovery and excavation of Golgotha, it may well provide useful information.

The most important evidence of all is the Shroud of Turin (Plate A13:4.1). This remarkable piece of cloth is kept in the Cathedral at Turin, and is claimed to be the actual Shroud in which Joseph of Arimathea wrapped the body of Christ. As a result of an ill-understood chemical reaction between the embalming fluids and blood and sweat upon the body (Lancet, 1902) we are left with a sort of 'natural photograph' in which many of the details of the body may be seen. The shroud itself has had a chequered

history, being partially destroyed by fire on one occasion. Its first definite historical identification is at Chambery in the mid-15th century, although Green (1969) has provided good evidence, on iconographical and historical grounds, for its existence at least back to the sixth century, and by implication back to the time of Christ himself. There is no reason to doubt at present that the Shroud is anything but entirely authentic, although further credence will be given to this point of view by the carbon-14 tests being undertaken at present.

For the purposes of this study the Shroud provides several important items of evidence. Firstly there is a large wound between the fifth and sixth ribs on the right side, which is compatible with a spear-wound, and, according to Bucklin (1970), "There is a sign of another fluid which has been mingled with blood". Secondly, on the face, corresponding to the right cheek, there is a swelling of the malar region which has resulted in partial closure of the right eye (Plate A13:4.2). This may perhaps be more convinving in the reconstructed three dimensional image of Plate A13:4.3.

In view of the evidence described above, I would propose that the most reasonable theory of the iconography of the crucifixion is as follows. Christ is portrayed with a spear wound in his right side because the wound actually was in his right side. His left cheek was portrayed because

the right cheek actually was badly bruised (a process for which a classical precedent has been set in Appelles' portrait of the one-eyed King Antigonus; Pliny, Nat. Hist., XXXV, xxxvi, 90; Quintillian, Inst. Orat., II, xiii, 12). From these two primary asymmetries all others follow as secondary processes. The spear which produced the wound is placed in the left half of the picture, the good thief, to whom Christ would be preferred to be looking, is to his right, and the light of the afternoon sun, to which Christ would alsobe looking, comes from the left side of the picture. Evidence for the subsequent, and contingent, development of the secondary asymmetries lies in the facts that light only begins to come from the left side toward the beginning of the Renaissance (Figure A13:1.3); the thieves are portrayed in only 8% of mediaeval crucifixions and in many cases there is little evidence of any differentiation between the two; the spear, ultimately held on the left side only is initially, in a few early pictures, present on both sides and even in late mediaeval crucifixions is present in only 30% of Cases (Figure A13:.4.1). The secondary asymmetries probably represent a result of the Mediaeval and Renaissance obsessions with the symbolic meaning of objects. Such an approach also allows for the apparent inconsistencies in symbolism; the left half of the Crucifixion represents both West (the light and the setting sun) and also South (the Church, warmth, light, and the 'good' thief), and yet in Churches, Christ in an altar Crucifixion inevitably looks away from the New

Testament (the south) and towards the Old Testament (the north).

The transmission of such iconographical knowledge presents an epistemological problem that is most parsimoniously solved by taking the hypothesis of Wilson (1978) that the Shroud of Turin is identical with the Image of Edessa, for which there is good historical evidence from 544AD, and which left Constantinople in the thirteenth century. This holiest of relics, the 'True likeness', was probably shown to only a handful of artists in Constantinople in the sixth century. This image we may then speculate was transmitted down through generations of artists, the accuracy of this process being assisted by the strict canons of Byzantine art. By the Renaissance these details would have become tradition, a tradition which for most artists there was no rational explanation.

Appendix 13:4 Notes

1. It is worth pointing out, en passant, that the well-known deviation between the axis of the nave end of the apse in many churches, which was once considered to be portraying the inclination of Christ's head on the Cross (Lasteyne, 1905; Anthyme, 1906), is almost certainly not iconographical in origin. Reau (1957) considered the deviations to be probably random, and the data of Cave (1950) support this suggestion. Wordsworth, quoted by Benson (1975), felt that deviations from true east were due to churches being aligned "by the point in the horizon at which the sun rose upon the day of the saint to whom the church was dedicated". Benson attributed internal deviations within a church to the misalignment of the Julian calendar and the true year. An alternative, and possibly more convincing,hypothesis has recently been proposed by Searle (1974), who has shown that the deviations are probably a function of the shifting of the magnetic north pole and hence the use of different east-west axes whilst building different portions of the church.

2. An interesting exception to this is in Carpaccio's 'I diecimila crocifisi del Monte Ararat' in the Accademia, Venice, where there are a score or more crucified figures, in some of whom the spear wound

is on the left side: of course there figures are not portraying Christ himself. Other occasional exceptions do occur. The Rubens Descent from the Cross, in the Courtauld Institute Gallery clearly shows a left-sided spear wound. But this is within Western Europe, unique, as far as I am aware. Whilst in Cochin, in Kerala, Southern India, a while ago, I noticed a locally carved wooden crucifix with a left-sided wound. Further investigation in the local Cathedral of St. Thomas showed that of 8 crucifixions, two had left-sided wounds and seven had right-sided wounds. The two left-sided wounds were painted on to walls, and were clearly produced locally, whilst the right-sided wounds were all carved crucifixes and looked as if they had probably been imported from Europe. The Church of Southern India was founded circa 60 AD, possibly by St. Thomas (the doubter) himself, and thus the local tradition of a left-sided spear wound might perhaps represent a tradition founded before knowledge of the Shroud became extant. It may of course also be argued that Thomas was perhaps in a better position than most to know the side of the spear-wound, having placed his fingers into it.

APPENDIX A13:5 THE DISCRIMINATION OF ORIGINAL AND MIRROR-IMAGE REPRODUCTIONS OF WORKS OF ART BY ART STUDENTS

In a previous paper (Blount et al, 1975) we have described the results of an experiment in which subjects were unable to discriminate the original from a mirror-image reproduction of a painting unless they had seen the picture before. We have since repeated the experiment using art students and including pictures with known asymmetries.

Fifty subjects, all of whom were studying fine arts at University or were at Art School, were each shown sixty pictures by means of a pair of slide projectors. The original version and a mirror-image were displayed side-by-side, the side of the original being randomly ordered. The subjects were asked to indicate on a 6-point rating scale (Strong, Medium, Weak for each version) which picture they thought was the original, and on a four-point scale (Never, Possibly, Probably, Definitely) whether they had seen the picture before. In other respects the conditions were the same as in the previous paper.

One picture was excluded after the experiment was completed as it inadvertently contained writing. Some subjects omitted to check all responses.

Of the 2947 choices of original (out of a possible 2950),1512 (51.30%) were correct: this is not significantly better than chance (X^2 = 2.03, 1 df). Of the 1495 cases in which the picture had never been seen before, 752 (50.30%) were correct (X^2 = 0.054, 1 df, NS). Analysis of responses by individual pictures and individual subjects, as in the previous experiment, showed no evidence of individual differences beyond the expectations of chance. Of particular interest is the analysis of the different types of picture. Twenty-three of the pictures were a miscellaneous collection of portraits, male and female, right and left cheek. Figure A13:5.1 shows that there is no evidence for subjects being able to detect the original by any simple rule of thumb; in the previous experiment there was a slight, although not significant, tendency for the right cheek to be chosen rather than the left.

Eight of the pictures were Rembrandt portraits, chosen for the direction of light, four having the light from the left and four from the right. These were chosen in view of Coles' (1974) analysis of the direction of light in Rembrandt portraits. Figure A13:5.2 shows that subjects made no use of knowledge of the direction of light in choosing the original version, although there is a non-significant tendency to choose pictures in which light comes from the right.

Seven of the pictures were Italian Renaissance Annun-

ciations, all of the usual type with the angel entering from the left. Four of the pictures were Italian Renaissance Crucifixions, all showing the usual portrayal of Christ's left cheek. Figure A13:5.3 shows that there is no evidence for detection of original version of these pictures beyond chance expectations.

At the end of the experiment subjects were asked to record the features they were using to choose the original version. Fourteen of the fifty subjects mentioned some aspect of light or shadowing, eleven mentioned memory of the pictures, ten mentioned 'Instinct', 'Intuition', or a feeling that the picture was 'just right', and seven admitted that they were guessing. One subject stated, "Crucifixions - Christ just had to face right", and analysis of his results showed that "right" meant right cheek in the same sense as in this paper. Another subject commented "Direction of looking - portraits usually to left", whilst a third commented, "People very rarely pick up babies in L.H.", by which it is presumed is meant Left Hand.

In general we may conclude that whilst some students are willing to admit that simple rules might exist for carrying out this task, and some have formulated such rules (which are wrong in some cases), in the majority of cases there is no evidence for knowledge of even the very simple rules governing pictures like the Annunciation and the Crucifixion.

(The experimental work described in this Appendix A13:5 was carried out by Ms. P. Blount, then a final year student at the University of Reading, under the joint supervision of myself and Professor M. Colthart. The original design of the experiment was entirely my own, as was most of the statistical anslysis: hence the inclusion of the work here).

Table A13:1.1 Cheeks shown in Rembrandt's known paired portraits.

		Left Cheek	Right Cheek
Sex of Subject	Male	3	26
	Female	24	2

All linked portraits are of non-kin individuals. The difference between males and females is highly significant. Numbers of males and females are not the same due to some members of pairs being lost.

Table A13:1.2

Analysis of cheeks shown in Rembrandt portraits after exclusion of all cases known to be members of linked pairs. Compare results with those of Figure 13:6. Differences between kin and non-kin are not quite significant (X^2 = 5.49, 2 df, $0.10 > p > 0.05$).

	Left Cheek	Right Cheek	% left cheek
Self-Portraits	9	48	15.7%
Male Kin	3	14	17.6%
Male Non-Kin	58	69	45.7%
Female Kin	22	17	56.4%
Female Non-Kin	28	12	70.0%

Appendix 2: Tables

Table A13:2.1 The cheek shown by the direction of light: 'English Icon' portraits from Strong (1969).

Direction of Light	Cheek Shown: Left	Cheek Shown: Right	N	%L	X^2
From left side	141	67	208	68%	6.25 $p < 0.01$
Straight on or indeterminate	99	24	123	80.2%	
From right side	4	5	9	44.4%	

Table A13:2.2 Cheek shown by direction of light and sex of subject. Data from Berenson (1957, 1963, 1967, 1968).

Direction of Light	Cheek Shown: Males: Left	Males: Right	Females: Left	Females: Right
From left side	157	62	55	16
From right side	18	27	5	16

$X^2 = 16.7$, 1 df, $p < 0.001$ $X^2 = 20.56$, 1 df, $p < 0.001$

Table A13:2.3 Data of Table A13:2.2 re-arranged.

Direction of Light	Direction subject facing with respect to source of light: Males — Towards light	Males — Away from light	Females — Towards light	Females — Away from light
From left side	157	62	55	16
From right side	27	18	16	5
	X^2 = 2.41, 1 df, NS		X^2 = 0.014, 1 df, NS	

Table A13:2.4 Data of Coles (1974) combined with data from Tables A13:2.1 and A13:2.2.

Direction of Light	Cheek Shown: Left	Right
From left side	598 (48.03%)	463 (37.18%)
From right side	120 (9.63%)	64 (5.14%)

X^2 = 4.68, 1 df, $p < 0.05$

Table A13:3.1 Position of saints to left or right of centre and cheek shown, by number of portrayals of saint (data from Berenson, 1968). Note: totals are not all consistent since, for various reasons, it was not possible to classify all saints on all categories.

Number of portrayals	Number of different saints	Position with respect to mid-line				Cheek Shown		
		Left	Centre	Right	$\frac{L}{L+R}$ %	Left	Right	% L
1	56	21	1	26	44.6%	29	23	55.7%
2	14	12	0	12	50%	13	15	46.4%
3	8	10	0	11	47.6%	15	9	62.5%
4	5	4	0	12	25.0%	12	8	60.0%
5-9	8	14	1	32	30.4%	31	23	57.4%
10-19	12	76	3	61	55.7%	69	92	42.8%
20+	7	110	7	103	51.6%	119	105	53.1%
Difference between groups in proportion of right and left		$X^2 = 4.001$, 6 df, NS				$X^2 = 6.77$, 6 df, NS		

Table A13:3.2 Portrayal of the fifteen most commonly occurring saints in Italian Renaissance Polyptychs (Berenson, 1968).

Total number of polyptychs = 229. Note: tables are not all consistent in their totals due to some pictures not being classifiable on some dimensions.

Saint	Number of images	% of polyptychs	Position with respect to mid-line			Cheek Shown	
			Left	Centre	Right	Left	Right
John the Baptist	54	23.58%	30	0	19	19	30
Francis	43	18.77%	17	3	16	23	17
Catherine of Siena	33	14.41%	10	0	18	22	11
John Evangelist	28	12.22%	9	0	12	19	8
Anthony Abbott	26	11.35%	14	0	12	14	11
Jerome	26	11.35%	13	1	10	11	15
Peter	25	10.91%	17	3	16	11	13
Michael	17	7.42%	5	1	6	5	11
Augustine	16	6.98%	8	0	2	5	10
Mary Magdalene	16	6.98%	4	1	6	7	8
Paul	16	6.98%	5	0	10	11	4
Sebastian	15	6.55%	8	1	4	6	8
Nicholas	15	6.55%	5	0	9	9	5
Bartholomew	14	6.11%	9	0	4	3	10
Lucy	14	6.11%	8	0	3	5	9

Difference between groups in proportion of left and right $X^2 = 8.34$, 14 df, NS $X^2=13.12$,14df,

Figure 13:1. Shows the proportions of portraits in which the left or the right cheek is shown. Data from McManus and Humphrey (1973) and Humphrey and McManus (1973). All groups are significantly different from a chance distribution of 50% left and 50% right cheeks (Females $X^2 = 72.5$, 1 df, $p < 0.001$; Males $X^2 = 14.2$, 1 df, $p < 0.001$; Self-portraits $X^2 = 13.14$, 1 df, $p < 0.001$). The difference between males and females is also highly significant ($X^2 = 20.44$, 1 df, $p < 0.001$).

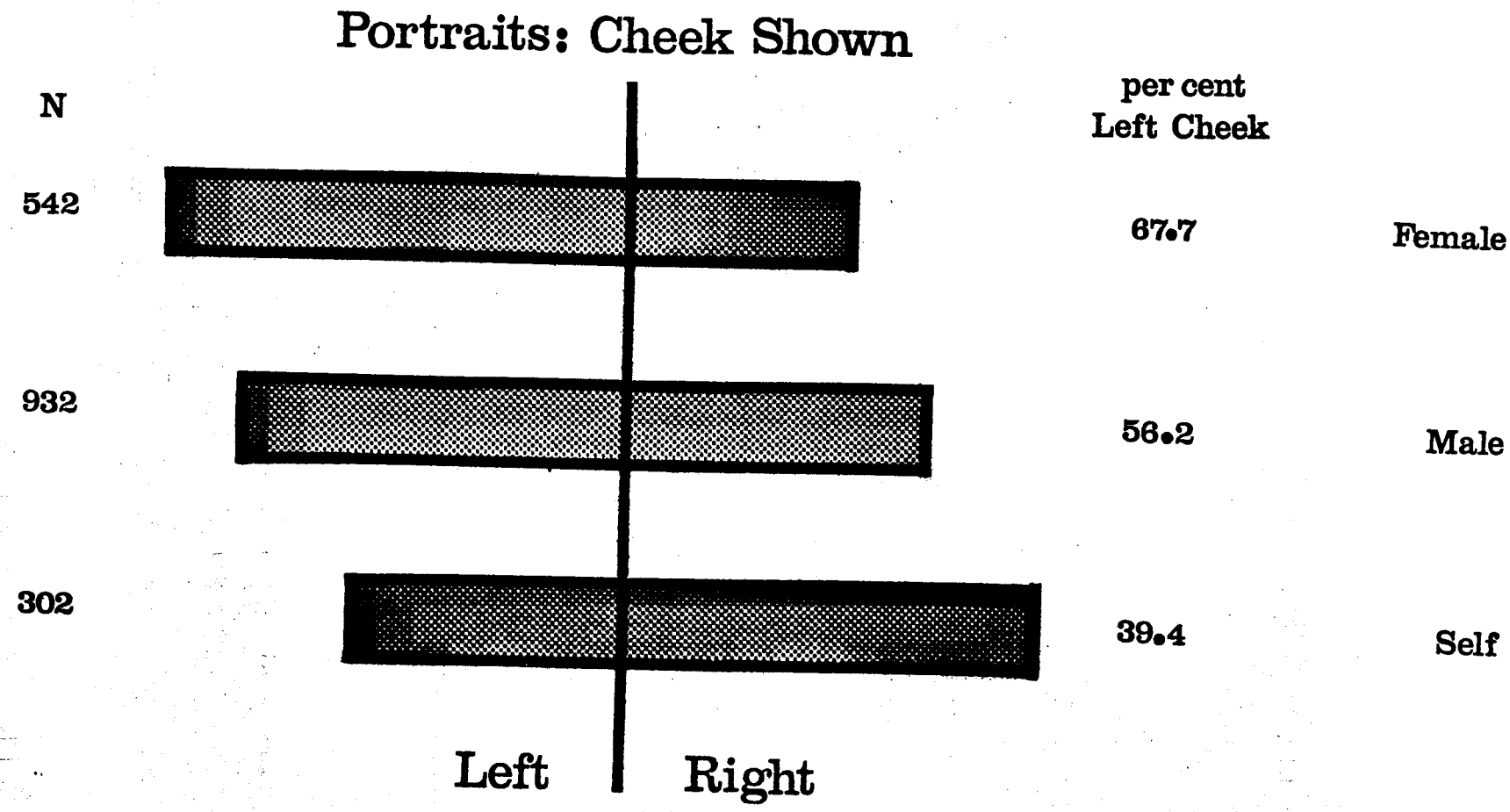

Portraits: Cheek Shown
N
per cent
Left Cheek
542
67.7
Female
932
56.2
Male
302
39.4
Self
Left
Right

Figure 13:2. Shows the percentage of left cheeks shown in Western portraits (excluding self-portraits) by the degree of turn of the head and the amount of the body of the subject shown. 'Full-face' portraits are those in which both eyes are completely visible, whilst 'profiles' are those in which one eye is partially or completely obscured. 'Head and shoulders' (HS) portraits usually cut off at about the level of the mid-sternum, whilst 'others' display more of the body than this. The ordinate shows the percentage showing the left cheek. Points which are shown as filled are significantly different from a value of 50% at at least a significance level of 0.05 by a X^2 test; unfilled points are not significantly different from chance. Head and shoulders portraits are represented by circles, and 'others' by squares. Female portraits are joined by a dashed line, male portraits by a solid line. The figures above the points (in order as shown) give the sample size for each point. Taken overall there is no significant difference in proportion of left cheeks between HS portraits and 'other' portraits ($X^2 = 0.98$, 4 df, NS). The difference between full-face and profile portraits overall is significant ($X^2 = 10.35$, 4 df, $p < 0.05$).

Portraits: Cheek Shown

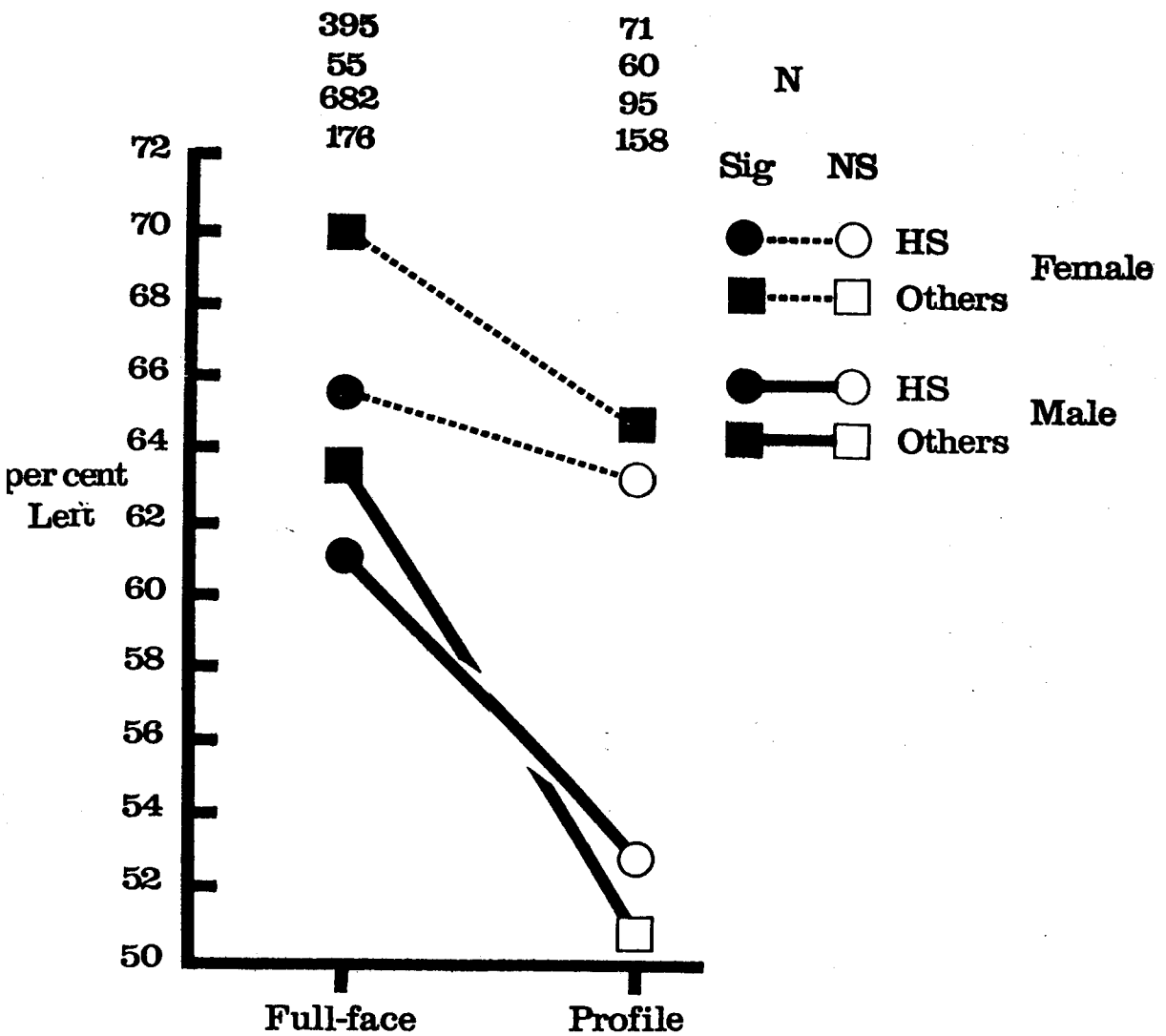


Figure 13:3. Shows the percentage of male portraits showing the left cheek in the National Portrait Gallery, London, by date of production. The sample size for each point is shown above it. The vertical bars from each point represent ± 2 standard errors. Standard errors have been omitted from all other figures to avoid undue complexity and confusion; if required they may be estimated from the sample size which is given for all data points.

Male Portraits: Cheek Shown

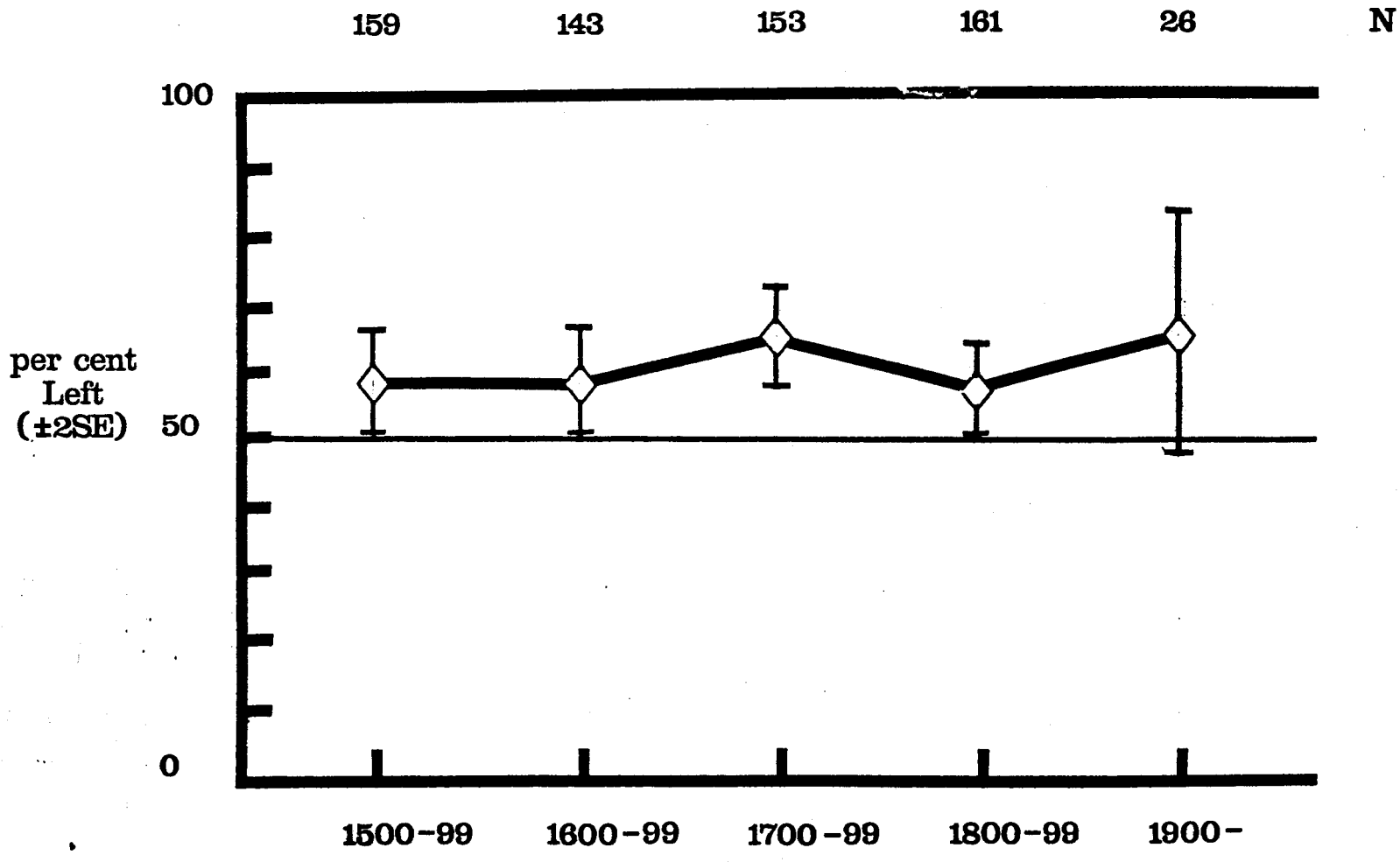


Figure 13:4. Shows the percentage of left cheeks shown in Italian Renaissance portraits (data from Berenson, 1957, 1963, 1967, 1968, and Pope-Hennessy, 1966). The proportions of both male and female portraits showing the left cheeks are significantly different from a chance hypothesis of 50% right and 50% left cheeks (Males, $X^2 = 26.5$, 1 df, $p < 0.001$; Females $X^2 = 10.6$, 1 df, $p < 0.005$). The difference between the male and female portraits is not significant. The self-portraits show a significantly lower proportion of left cheeks than do the male portraits (Fisher's exact test, $p = 0.025$, one-tailed test).

Italian Renaissance Portraits: Cheek Shown

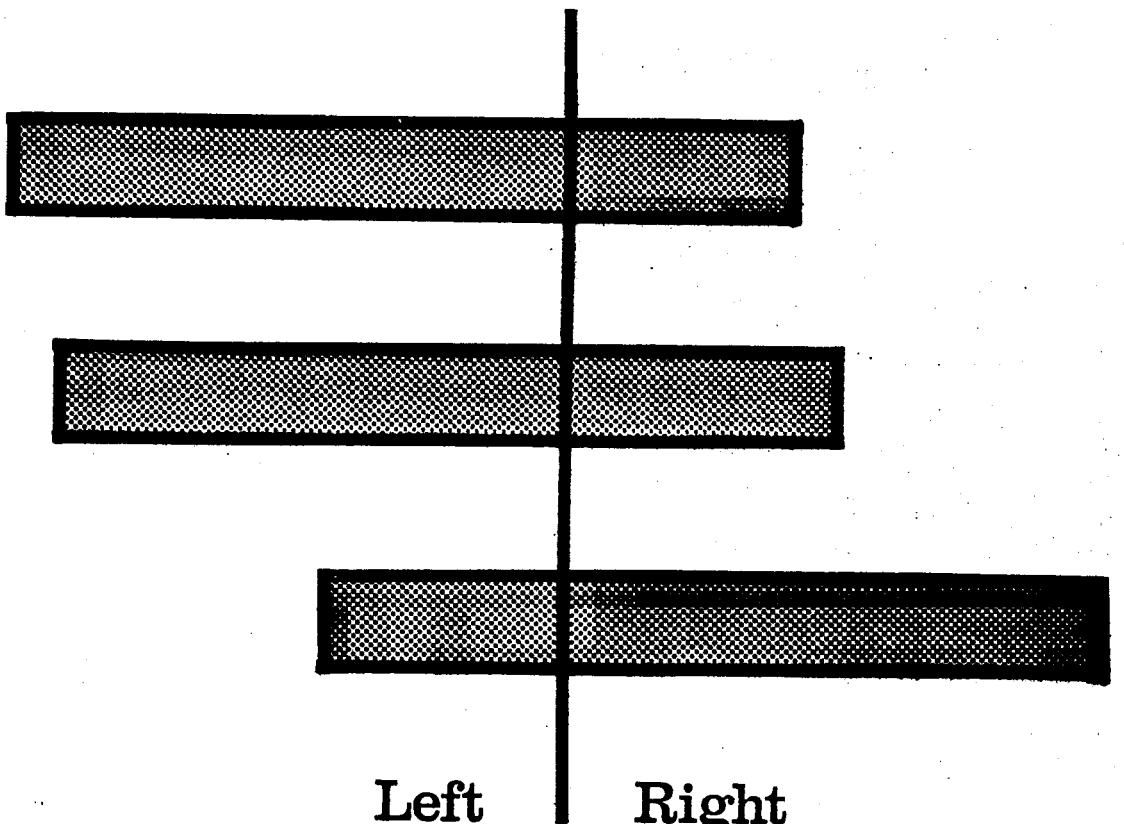


Figure 13:5. Shows the percentage of Italian Renaissance portraits showing the left cheek, by date of production. The chronological trends are not significant for either male or female portraits (X^2 = 5.26, 3 df, NS; X^2 = 4.33, 3 df, NS respectively).

Italian Renaissance Portraits: Cheek Shown

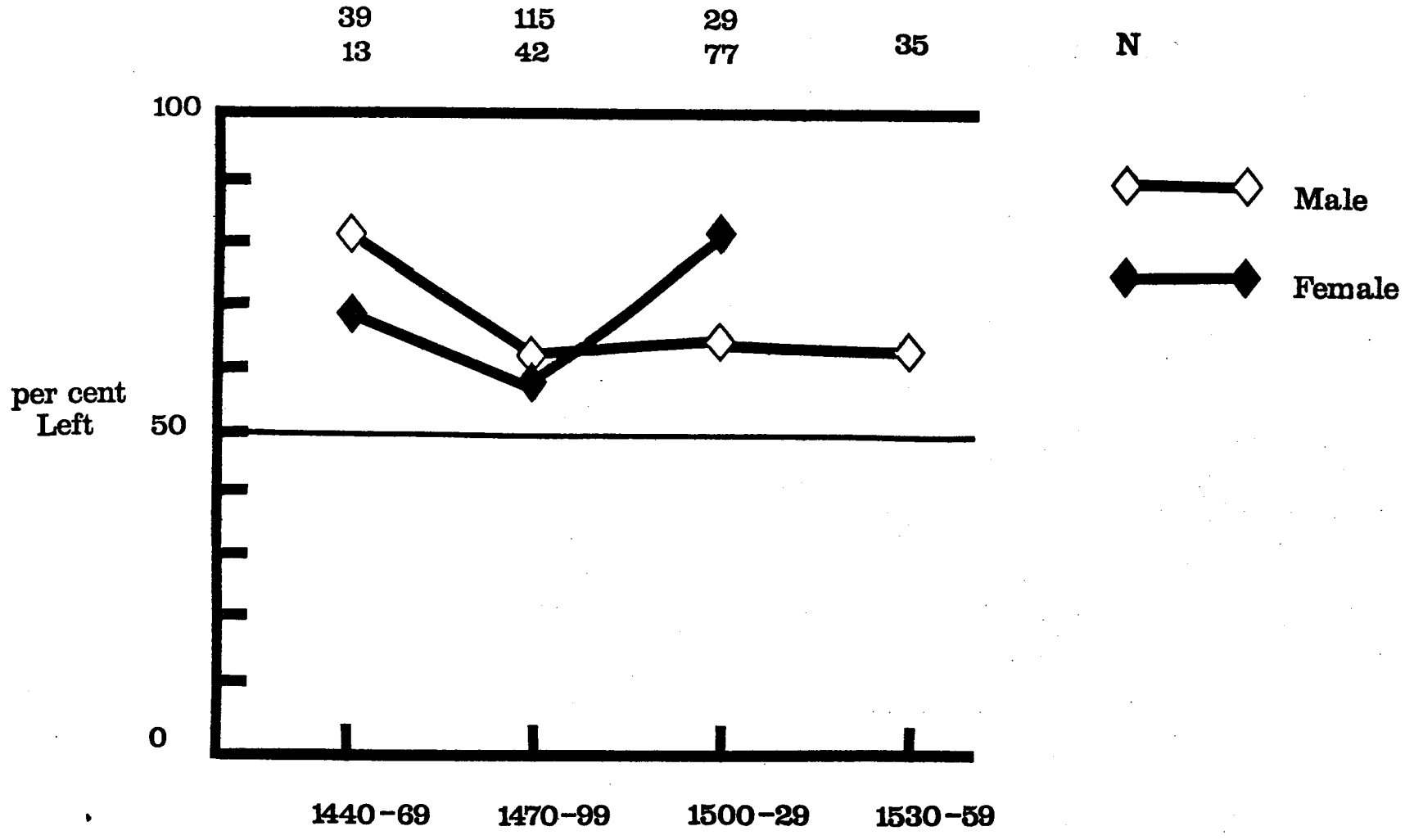


Figure 13:6. (from Humphrey and McManus, 1973). Shows the proportions of Rembrandt portraits showing the left or right cheek, by sex and kinship. The self-portraits Male Kin portraits, Male-Non-Kin portraits, and Female Non-Kin portraits are all significantly different from chance expectations (X^2 = 25.3, 1 df, $p < 0.001$; X^2 = 5.88, 1 df, $p < 0.05$; X^2 = 6.98, 1 df, $p < 0.001$; X^2 = 20.74, 1 df, $p < 0.001$ respectively). The Female Kin group is not significantly different from chance expectations (X^2 = 0.41, 1 df, NS). Taken overall there is a significant difference between kin and non-kin portraits (X^2 = 8.01, 2 df, $p < 0.02$).

Rembrandt: Oil Paintings: Cheek Shown

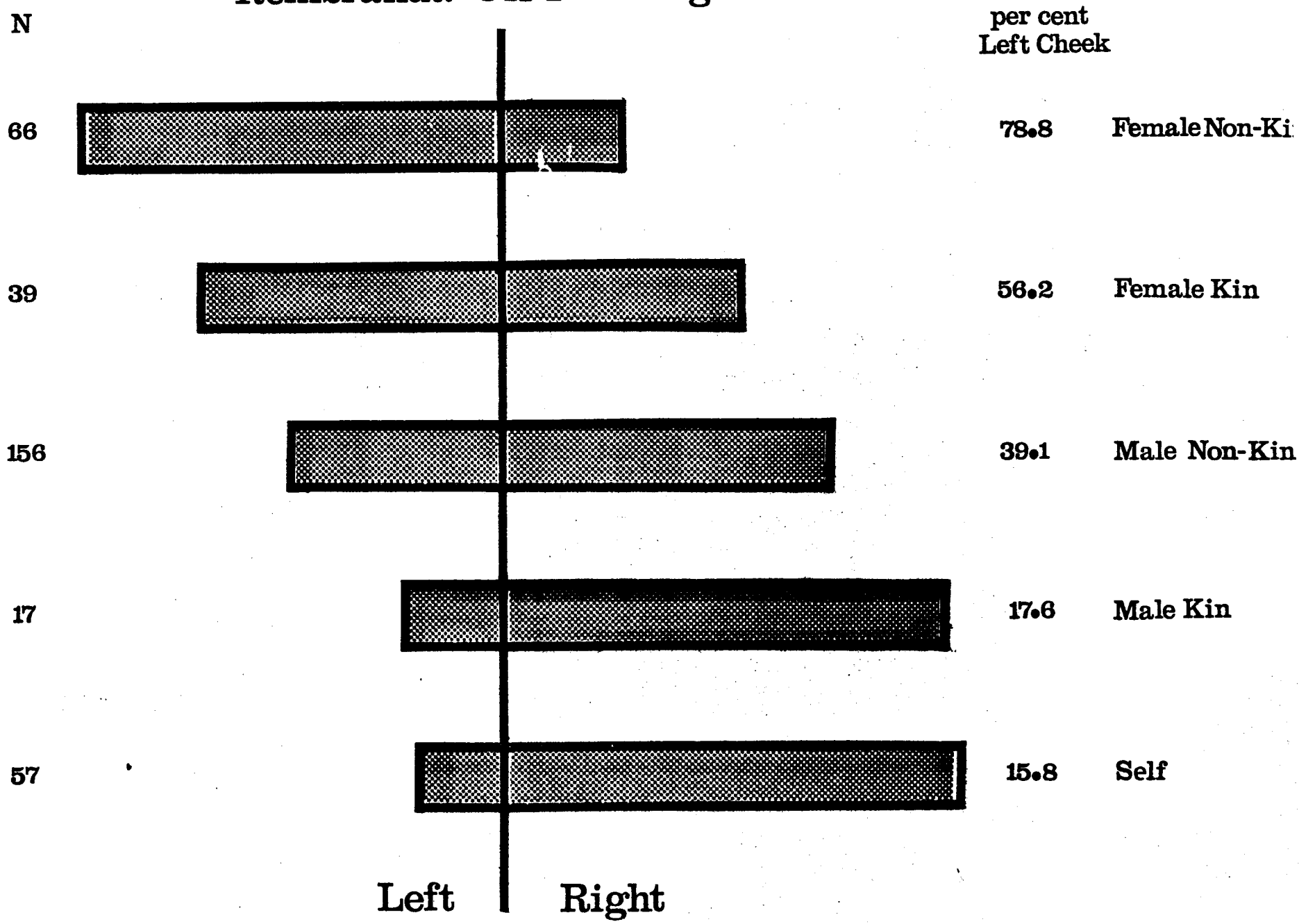
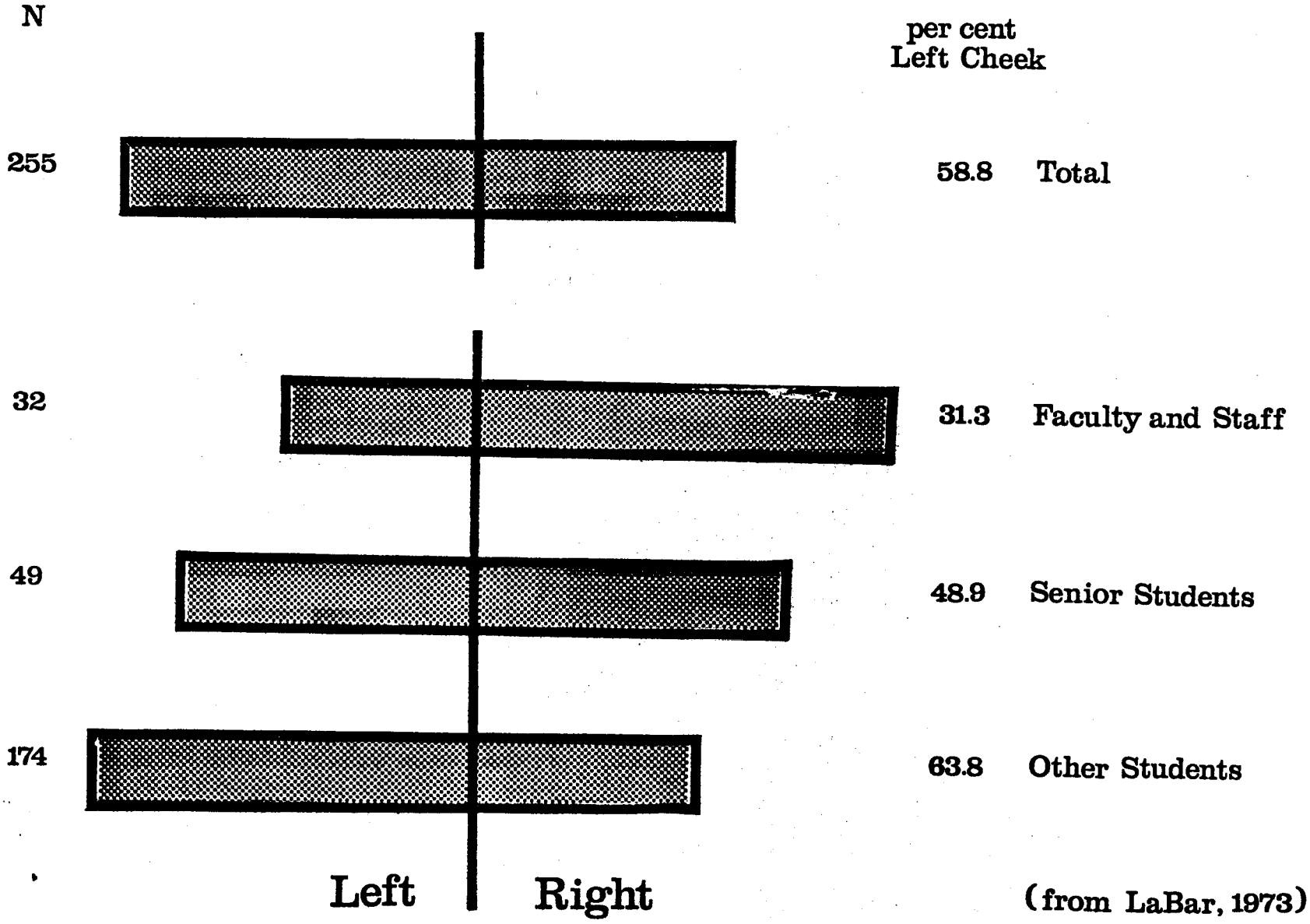


Figure 13:7. Shows data derived from LaBar (1973) concerning cheeks shown by students and staff in a school year book. The proportion of left cheeks overall is significantly greater than would be expected by chance ($X^2 = 4.53$, 1 df, $p < 0.05$). The bottom part of the figure shows LaBar's data for the Central Wesleyan College, the groupings being those of LaBar himself. Overall the differences between Faculty and Staff, Senior students and Other students are significant ($X^2 = 13.2$, 2 df, $p < 0.01$). The difference between Senior students and Other students is almost significant ($X^2 = 2.92$, $p < 0.10$), the difference between Seniors and Faculty and Staff is not significant ($X^2 = 1.82$ 1 df, NS), whilst that between Faculty and Staff and 'Other Students' is significant ($X^2 = 10.51$, 1 df, $p < 0.01$).

Modern Photographs: Cheek Shown



(from LaBar, 1973)

Figure 13:8. Shows data regarding Dante Gabriel Rosetti's portraits, the data being derived from Surtees (1971). The male portraits are significantly different from a chance distribution (X^2 = 7.22, 1 df, $p < 0.01$), whilst the female portraits are not different from chance (X^2 = 0.591, 1 df, NS). The difference between the male and female portraits is significant (X^2 = 4.2, 1 df, $p < 0.05$).

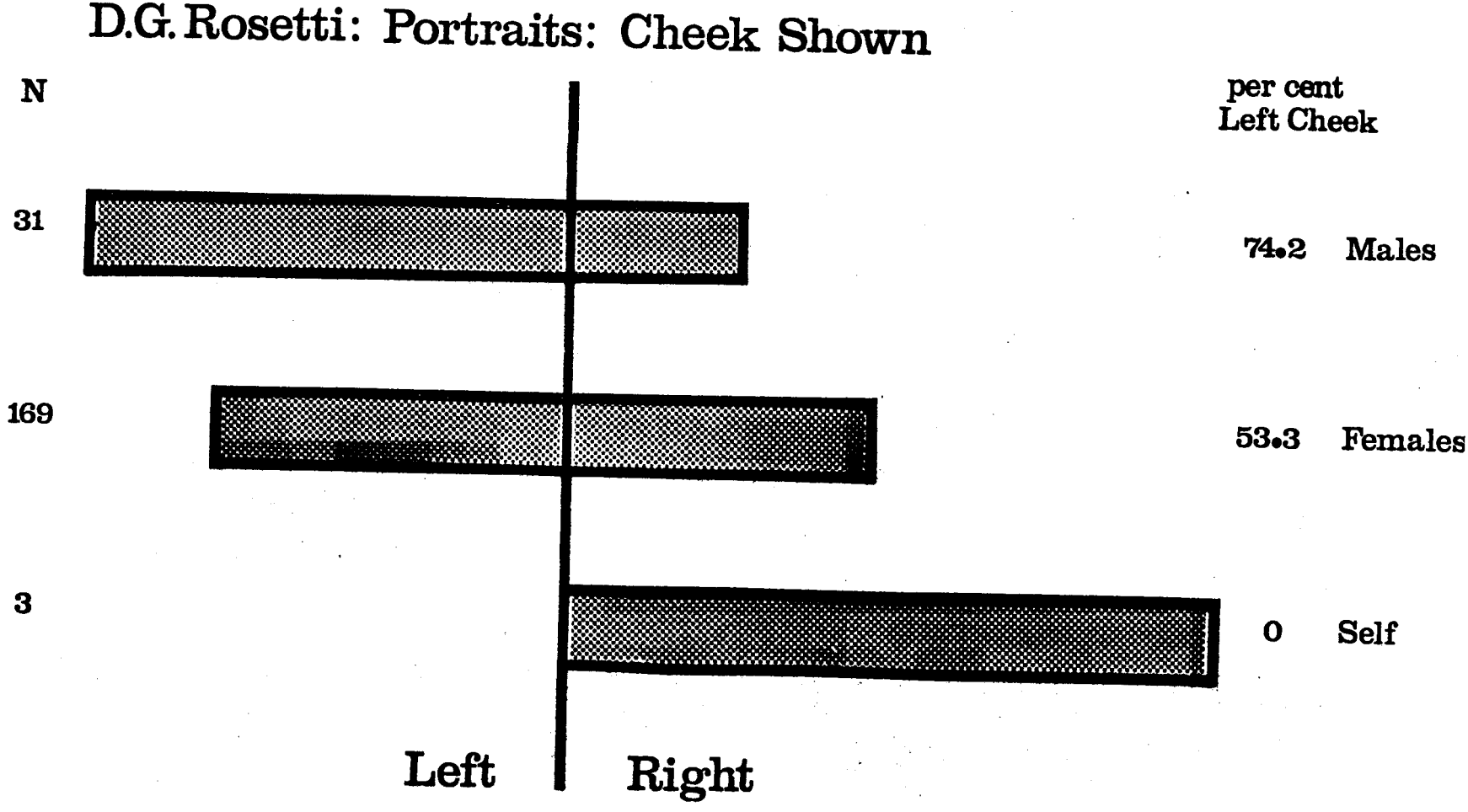

D.G. Rosetti: Portraits: Cheek Shown
N
per cent
Left Cheek
31
74.2
Males
169
53.3
Females
3
0
Self
Left
Right

Figure 13:9. Shows data on the paintings and sketches of van Gogh, from de la Faille (1970). Only male subjects are considered. For the Heads and Half-Lengths the differences between groups are significant ($X^2 = 8.79$, 2 df, $p < 0.02$). For the Whole-lengths the lower-class portraits show a distribution significantly different from chance ($X^2 = 4.69$, 1 df, $p < 0.05$). There were no middle-class full-lengths.

van Gogh: Male Portraits and Drawings

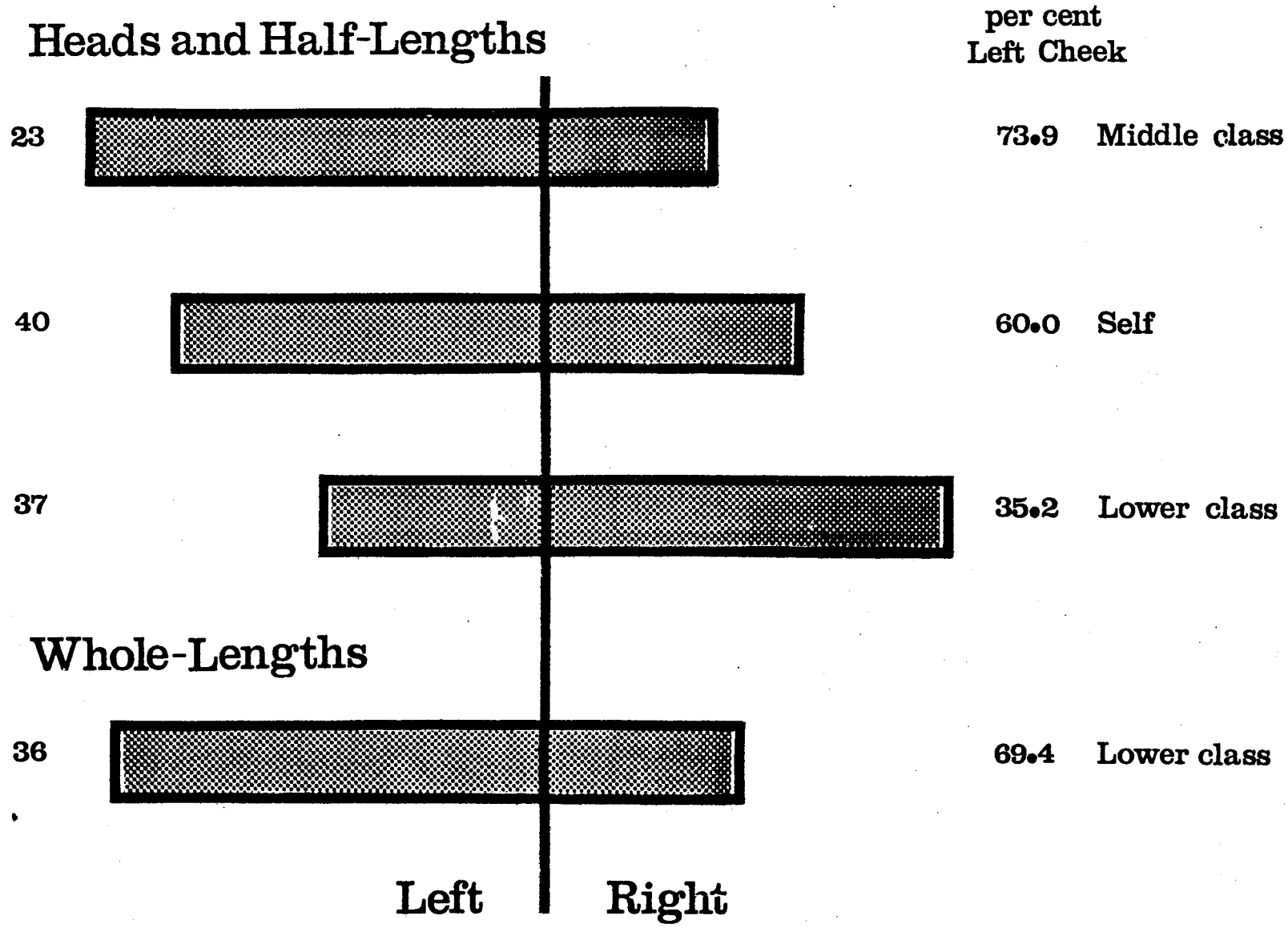


Figure 13:10. Shows the percentage of pictures of the Madonna and Child in which the child is held on the left side. Data from Berenson. The shift by date is highly significant (X^2 = 151.8, 5 df, $p < 0.001$). Individual data points are shown as open points if they are not significantly different from 50% on a X^2 test with 1 degree of freedom at the 0.05 level. The sample size for each datapoint is shown above the top of the figure.

Madonna and Child : Side of Child

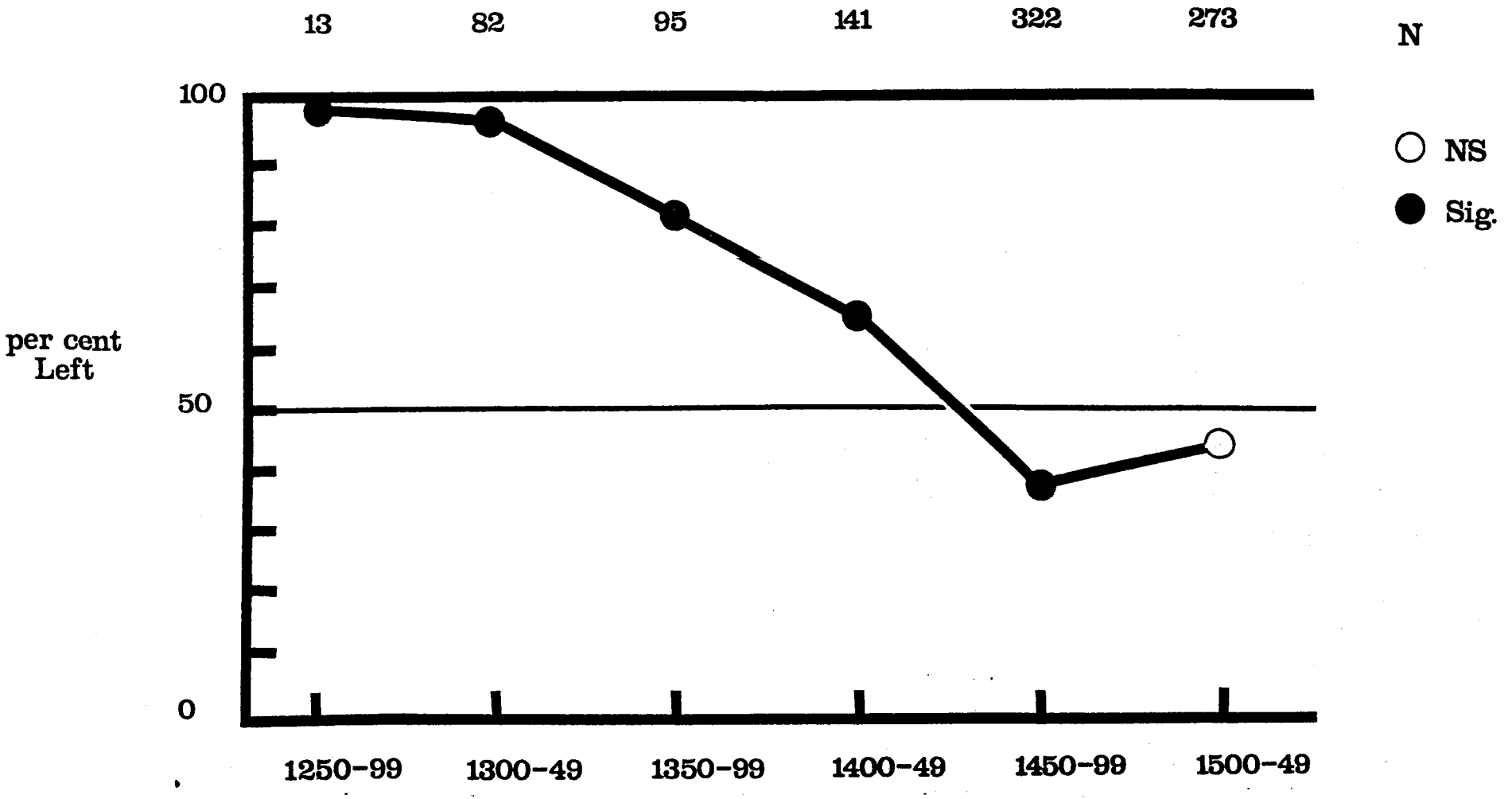


Figure 13:11. Shows the side of holding the child by date and by the school of painting. Insufficient Venetian and Northern pictures are available for the period 1300-1449. Differences between schools are not statistically significant (1350-99 X^2 = 0.27, 1 df, NS; 1400-49 X^2 = 3.65, 1 df, NS; 1450-99 X^2 = 5.75, 3 df, NS; 1500-49 X^2 = 5.51, 3 df, NS). The 1300-49 group is not testable with a X^2 statistic.

Madonna and Child: Side of Child

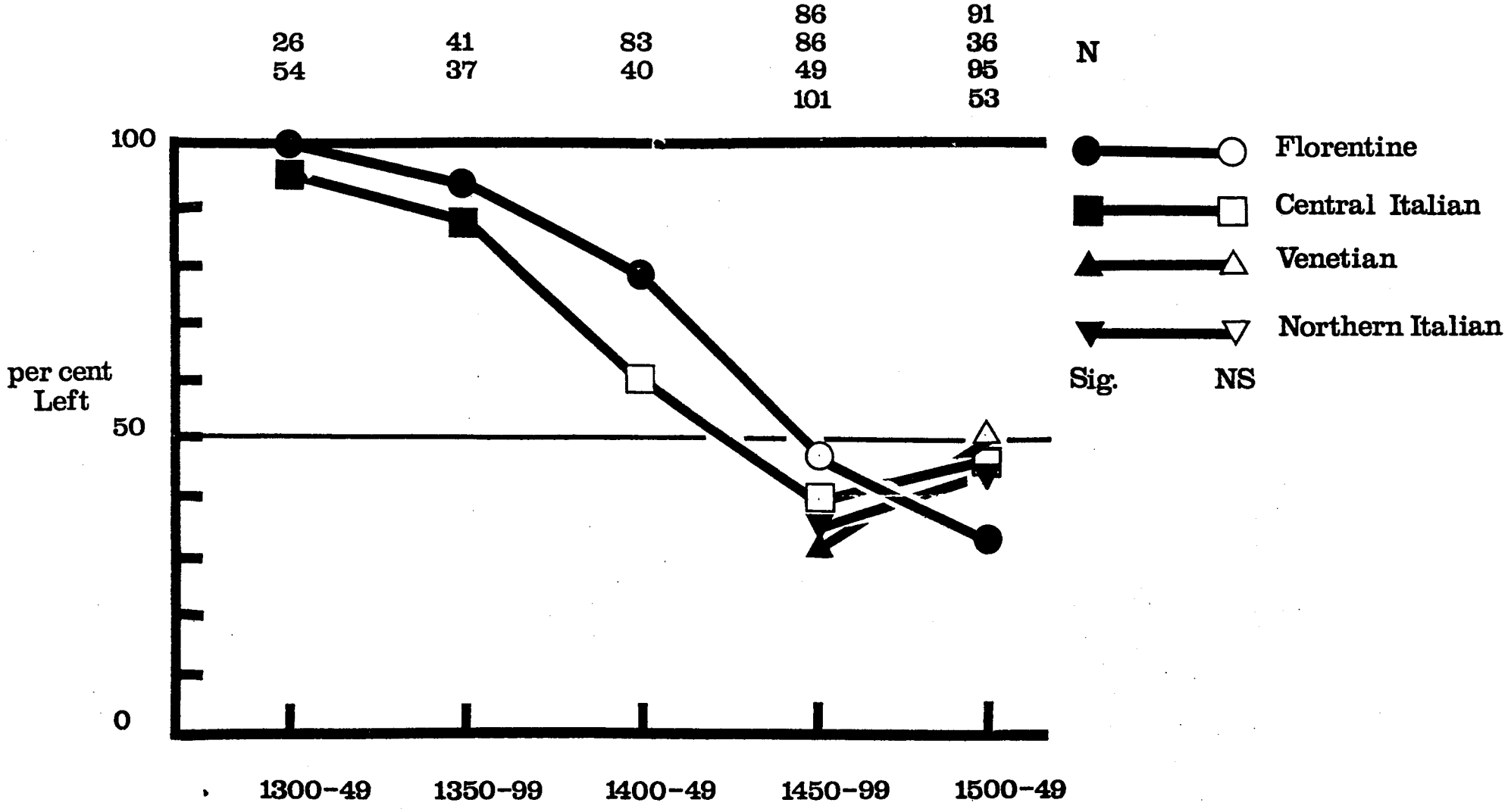


Figure 13:12. Shows the side of portrayal of the child by date and by the importance of the artist. Differences are not significant except for the 1350-99 group which gives a X^2 value of 5.10, p = 0.024; this value would not be significant after correction for repeated X^2 testing. For other groups:- 1400-49 X^2 = 4.28, 2 df, NS; 1450-99 X^2 = 5.89, 2 df, NS; 1500-49 X^2 = 3.29, 2 df, NS. The data for the 1300-49 group are not suitable for statistical testing.

Madonna and Child: Side of Child

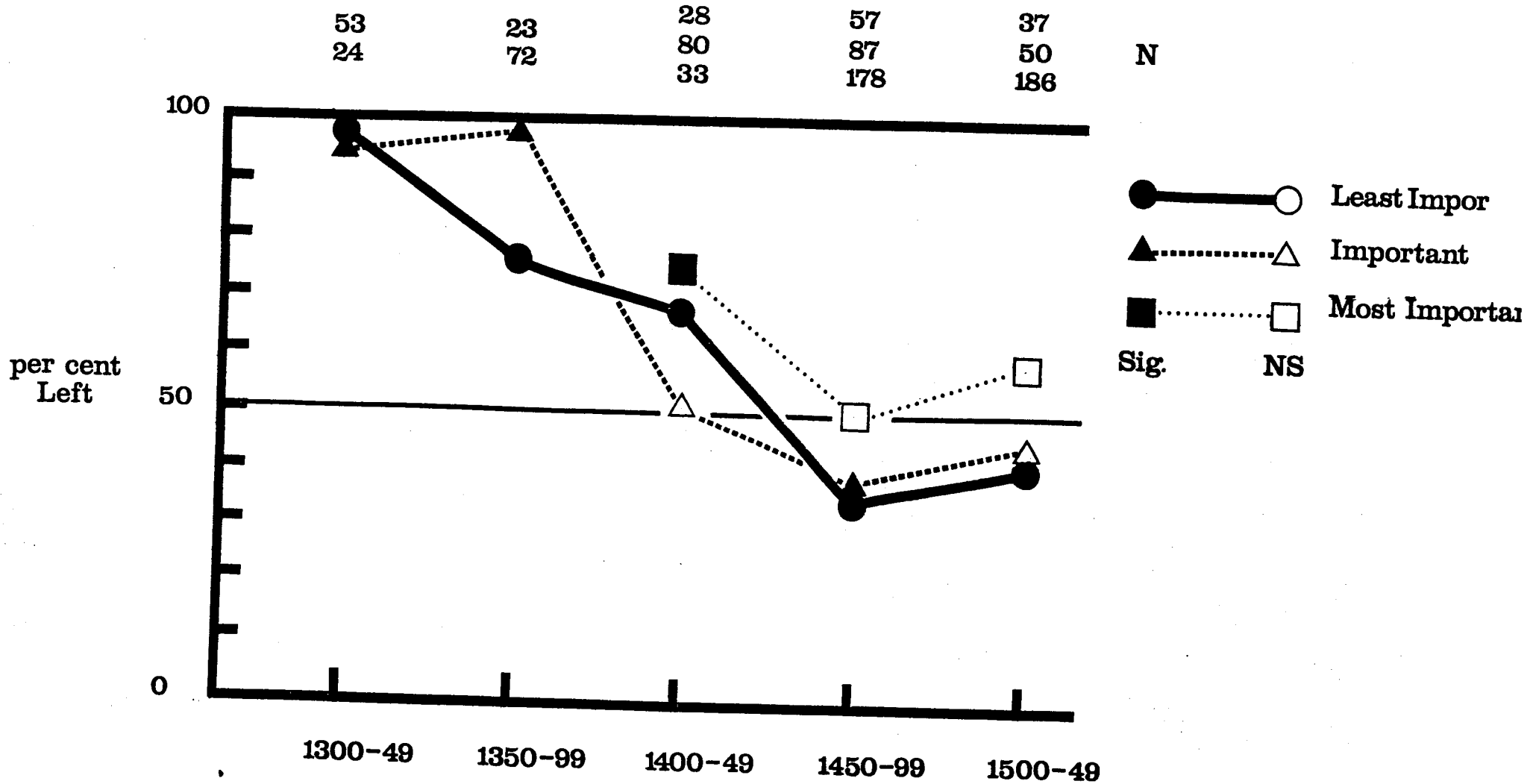


Figure 13:13. Shows the percentage of paintings in which the Madonna, the Child, and the Madonna and Child combined, show the left cheek, by date of production. Differences between the date groups are highly significant (Madonna $X^2 = 141.52$, 4 df, $p < 0.001$; Child $X^2 = 29.50$, 4 df, $p < 0.001$; Madonna and Child combined $X^2 = 38.94$, 4 df, $p < 0.001$).

Madonna and Child: Cheeks Shown

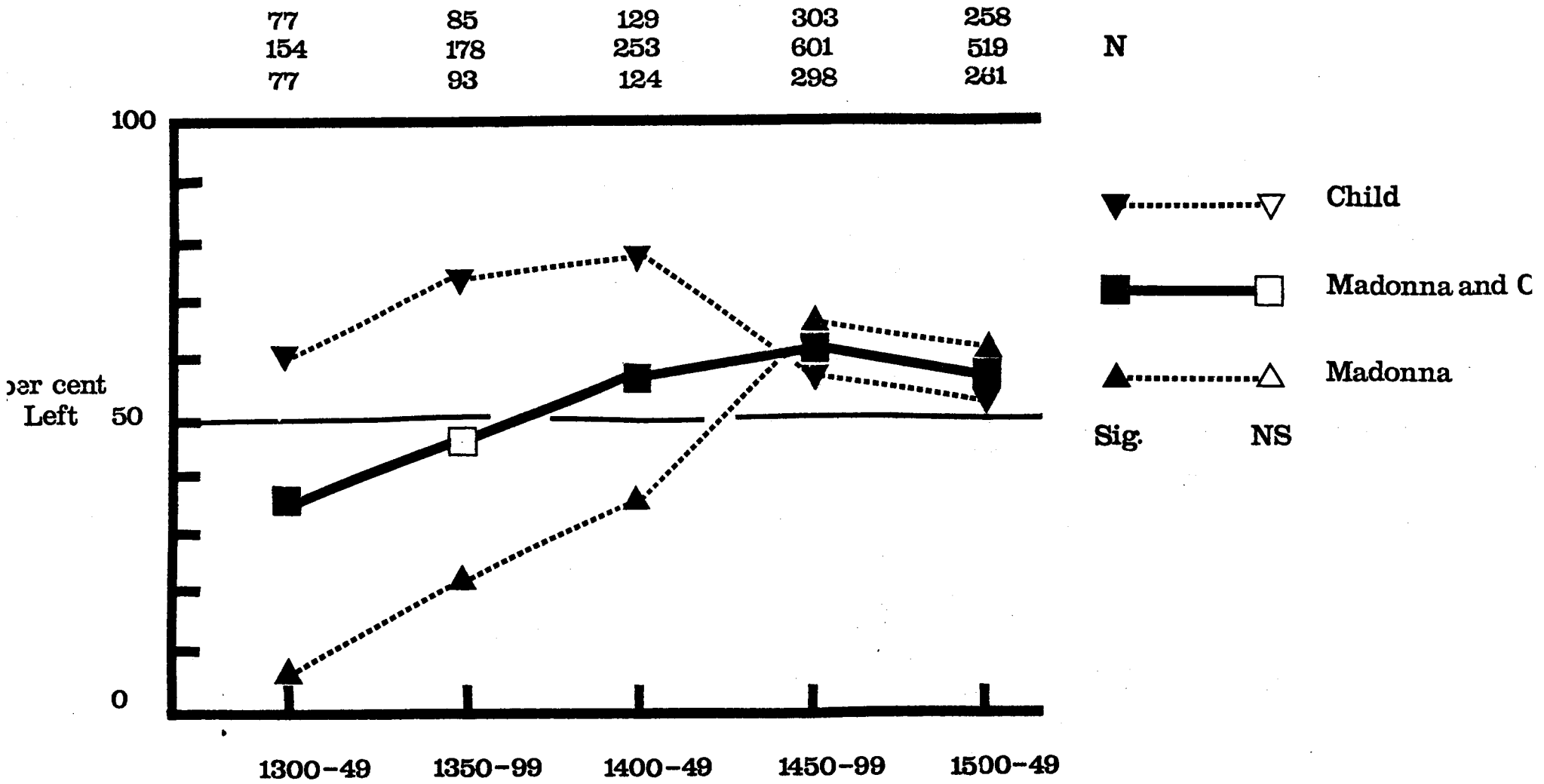


Figure 13:14. Shows the cheek shown by the Madonna and the Child by date and by school of artist. Differences between schools are not significant. Insufficient data was present for the Venetian and Northern schools in the period 1300-1449. (Madonna's Cheek 1350-99, X^2 = 0.005, 1 df, NS; 1400-49 X^2 = 1.59, 1 df, NS; 1450-99, X^2 = 1.00, 3 df, NS; 1500-49 X^2 = 4.37, 3 df, NS; Child's Cheek 1300-49 X^2 = 0.59, 1 df, NS; 1350-99 X^2 = 0.14, 1 df, NS; 1400-49 X^2 = 0.13, 1 df, NS; 1450-99 X^2 = 3.52, 3 df, NS; 1500-49 X^2 = 5.72, NS).

The data for the Madonna's cheek for the period 1300-49 are not suitable for statistical analysis.

Madonna and Child: Cheek Shown

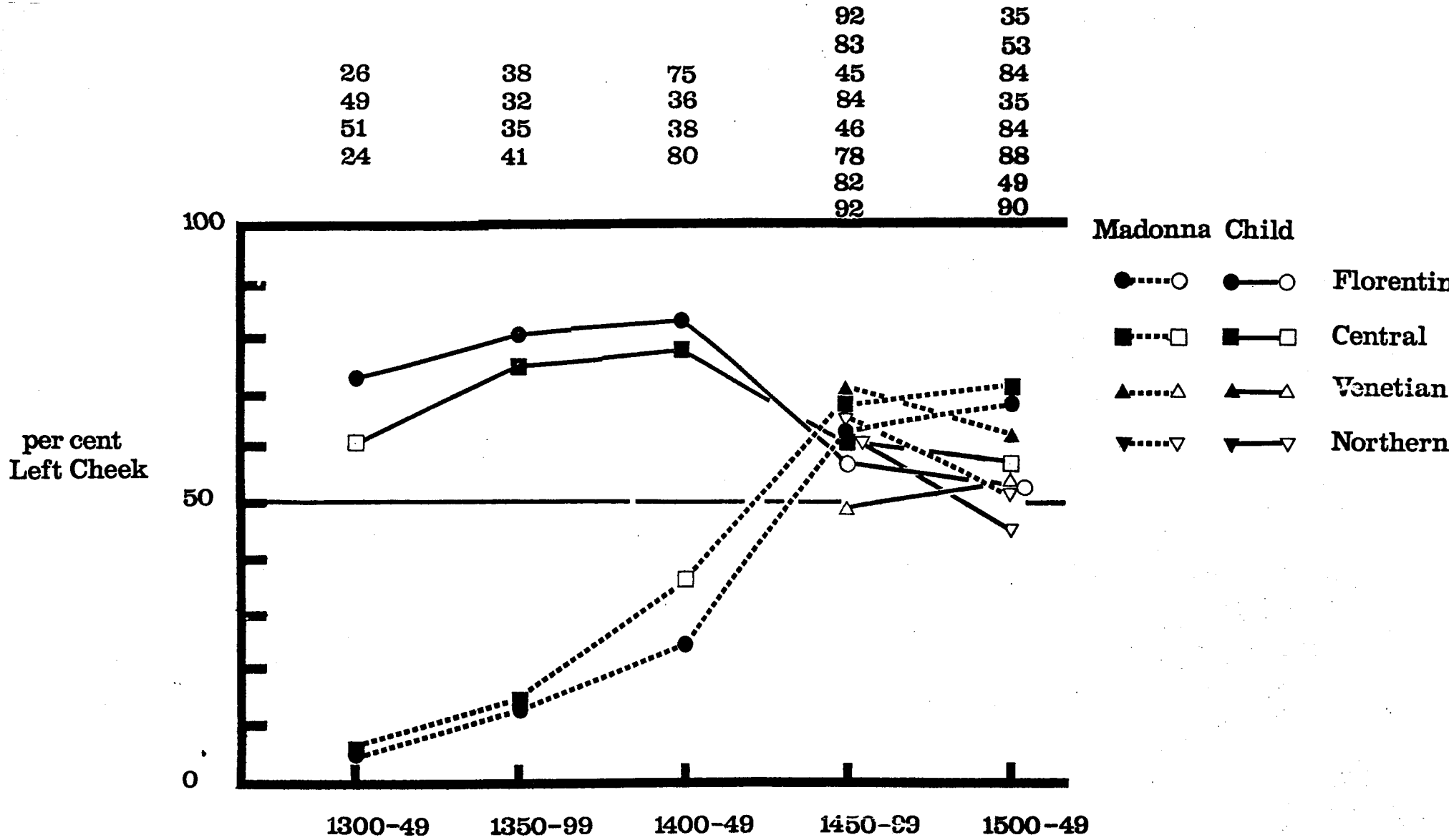


Figure 13:15. Shows the cheek shown by the Madonna and by the Child by date and by the importance of the artist. No statistically significant differences related to the importance of the artist are found. (Madonna's cheek 1350-99, X^2 = 2.04, 1 df, NS; 1400-49, X^2 2.26, 2 df, NS; 1450-99, X^2 = 1.25, 2 df, NS; 1500-49, X^2 = 1.09, 2 df, NS; Child's Cheek 1300-49, X^2 = 0.10, 1 df, NS; 1350-99, X^2 = 2.84, 1 df, NS; 1400-49, X^2 = 4.73, 2 df, NS; 1450-99, X^2 = 5.12, 2 df, NS; 1500-49, X^2 = 1.16, 2 df, NS.

Data for the Madonna's cheek for the period 1300-49 are not suitable for statistical testing.

Madonna and Child: Cheek Shown

		24	172	36
24	21	76	51	176
48	64	29	78	34
22	70	22	53	179
50	23	74	78	46
		28	169	48

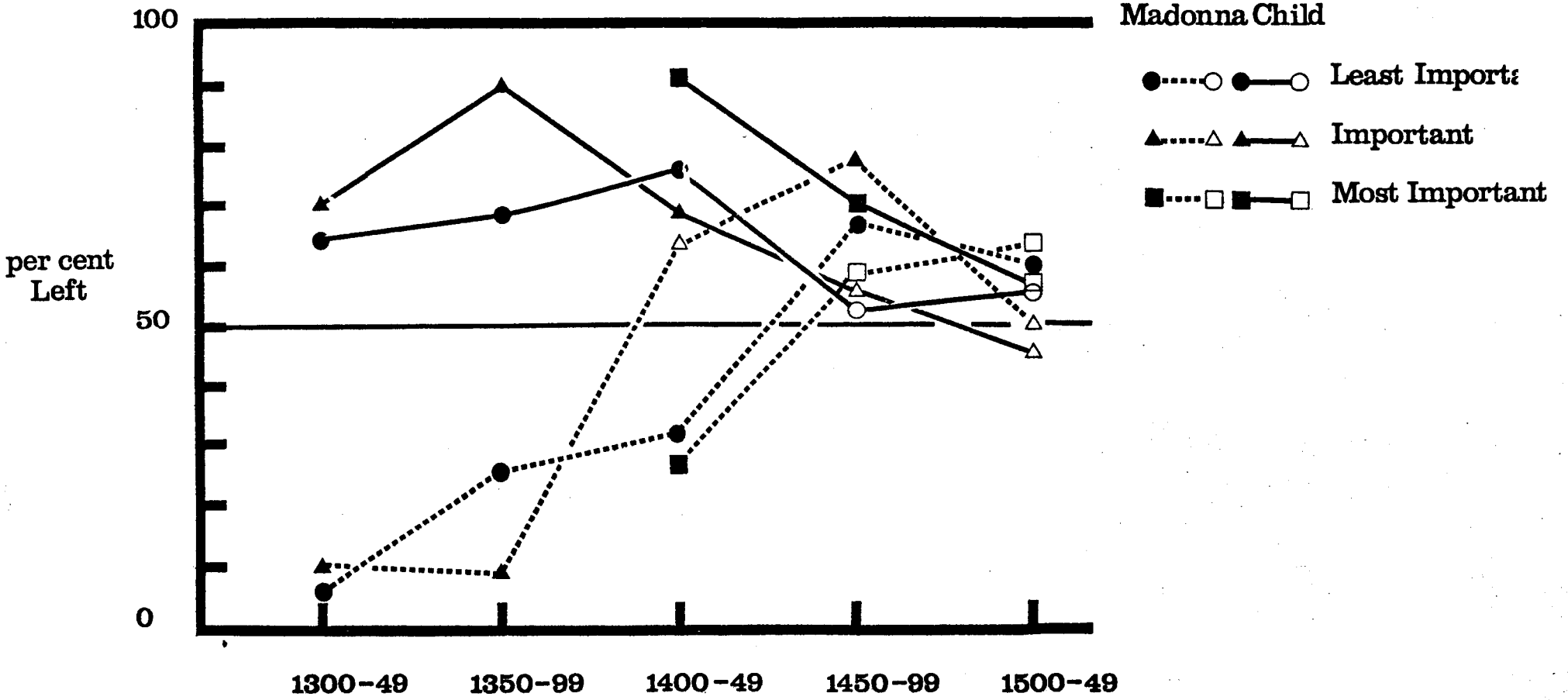


Figure 13:16. Shows the relative proportions of each of the eight possible types of Madonna and Child painting (LRL, LRR, etc.). Each particular type is described by the three letter code described in the text, and is also shown by a 'pin-man'. The large pin-figure represents the Madonna, the small pin-figure the Child, and the small bars in the faces the direction of facing.

Madonna and Child

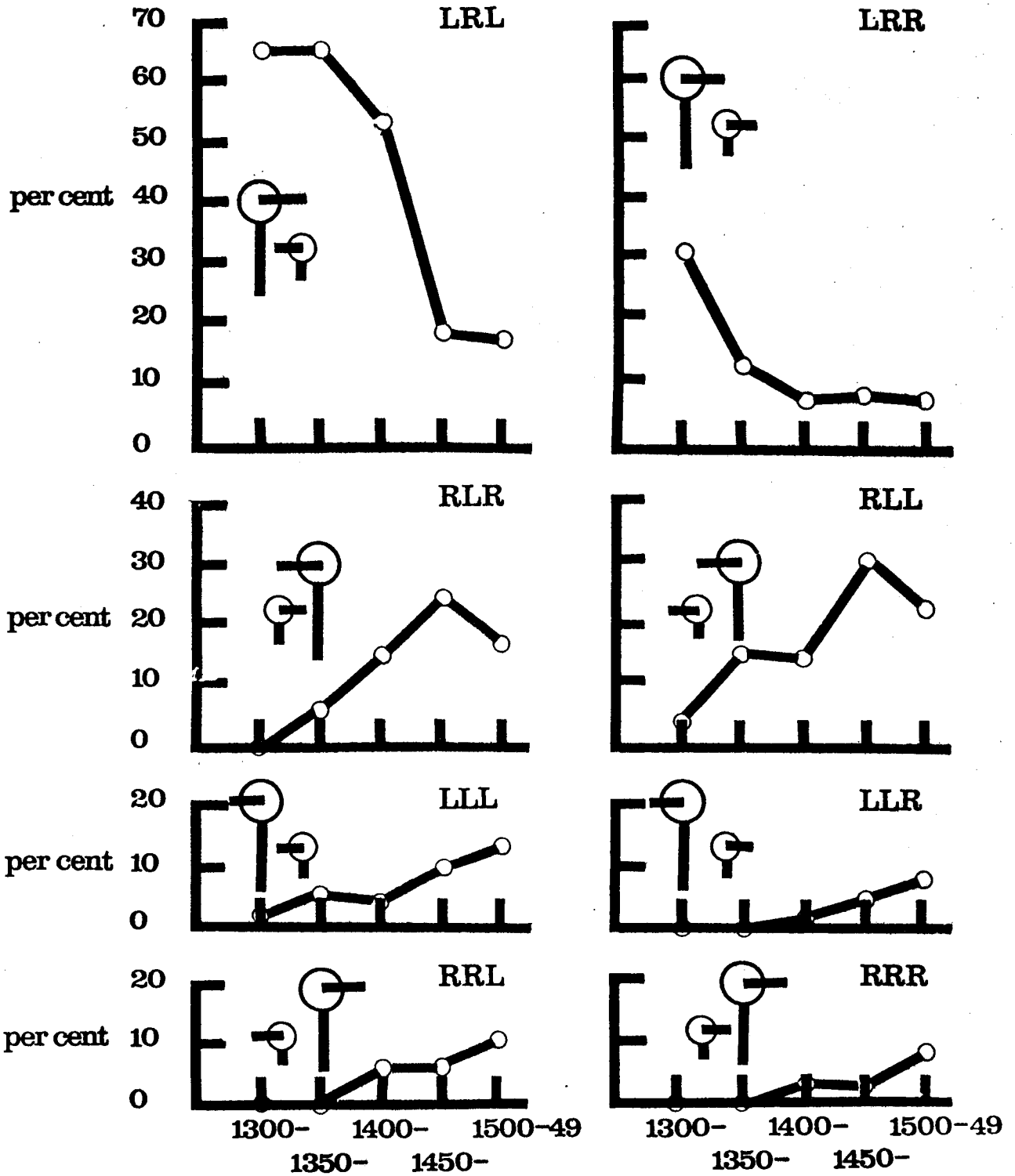


Figure 13:17. Shows for the period 500-1549, the relative proportions of works portraying the Crucifixion or the Madonna and Child. The ordinate is on a logarithmic scale and shows the number of Madonnas divided by the number of Crucifixions. The N values across the top are of the total number of pictures analysed. Data from Berenson, Beckwith (1970), Lasko (1972), Rickert (1954) and the collections of the British Museum and Victoria and Albert Museum, London.

The Cult of the Virgin Mary

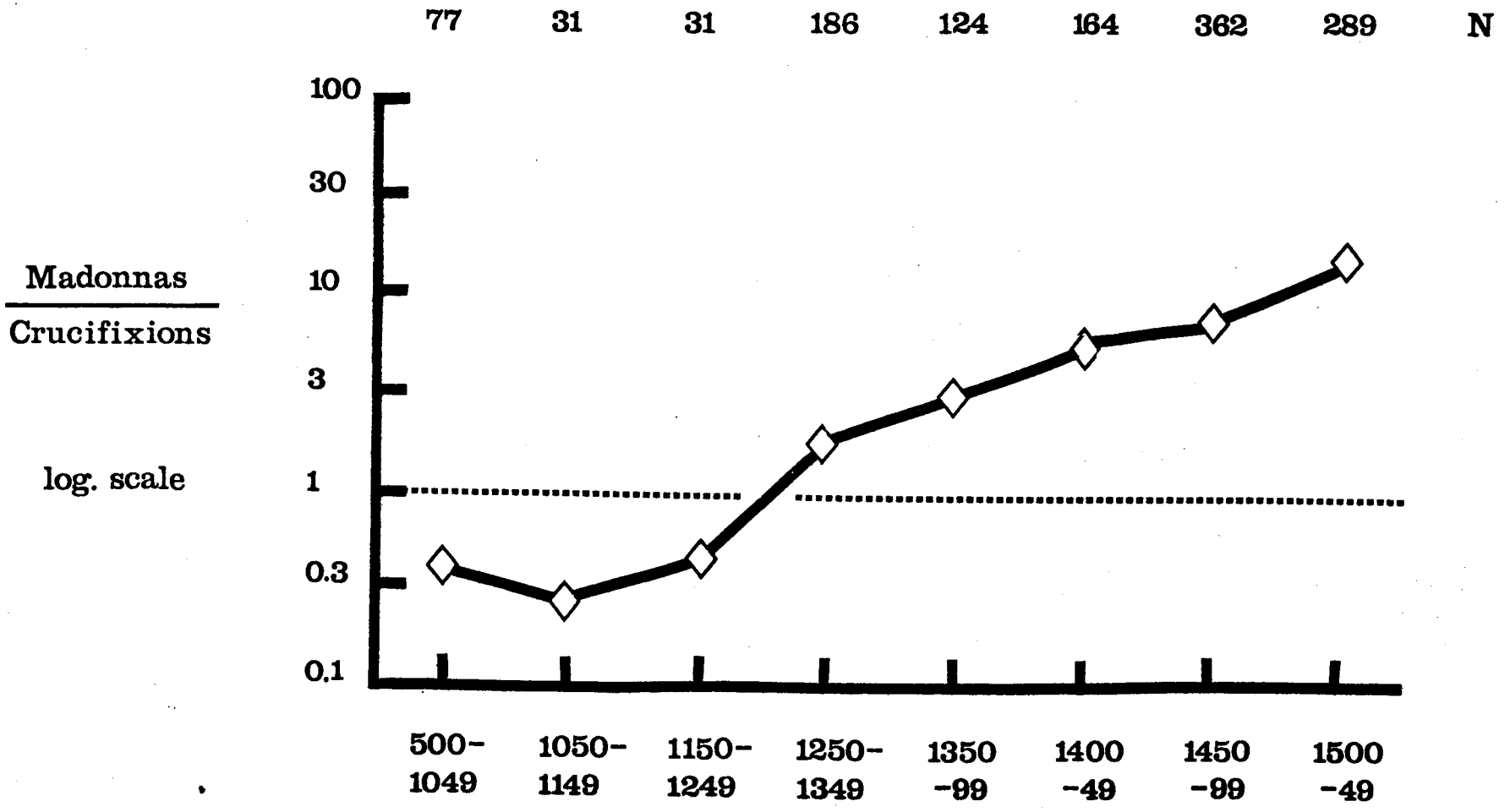


Figure 13:18. Shows the percentage of Annunciations in which the Angel is entering from the left side. As in previous figures, solid datapoints are significantly different from chance, open points are not. Differences between groups are not significant using Fisher's exact test.

Annunciation: Side of Entry of Angel

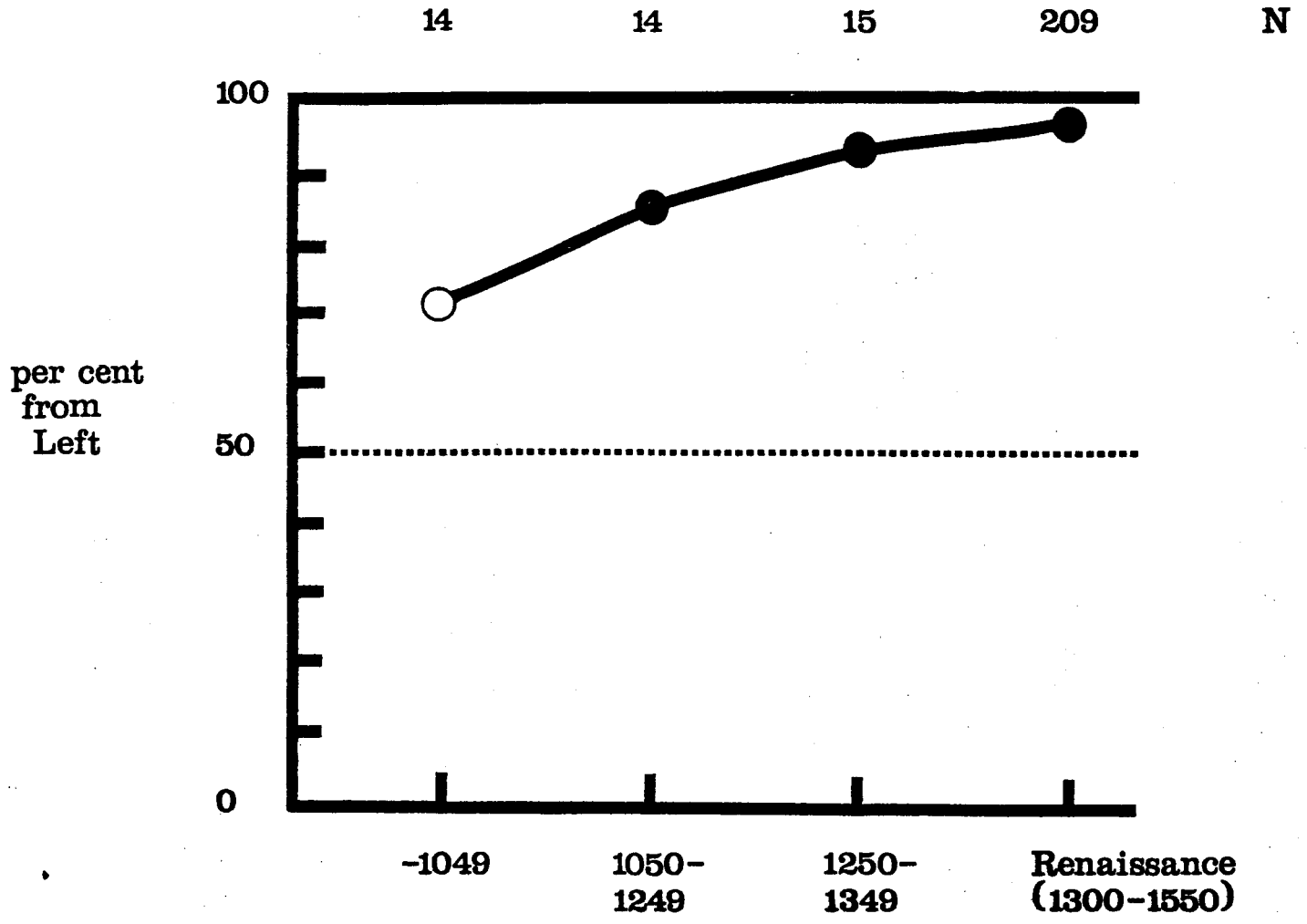


Figure 13:19 Shows for the mediaeval Madonna and Child, the proportions of portraits showing the left cheek, and holding the child on the left side. All graphs are for the same data set, for which sample sizes are given across the top. For the side of the Child there is a significant decrease in the proportion of portraits in which the child is held in the centre (pre-649 vs 1250-1349, Fisher's exact test, $p = 0.0012$). The proportion held on the left side versus the right side in those in which the child is not held centrally is not significant (Fisher's exact test). No other trends are significant.

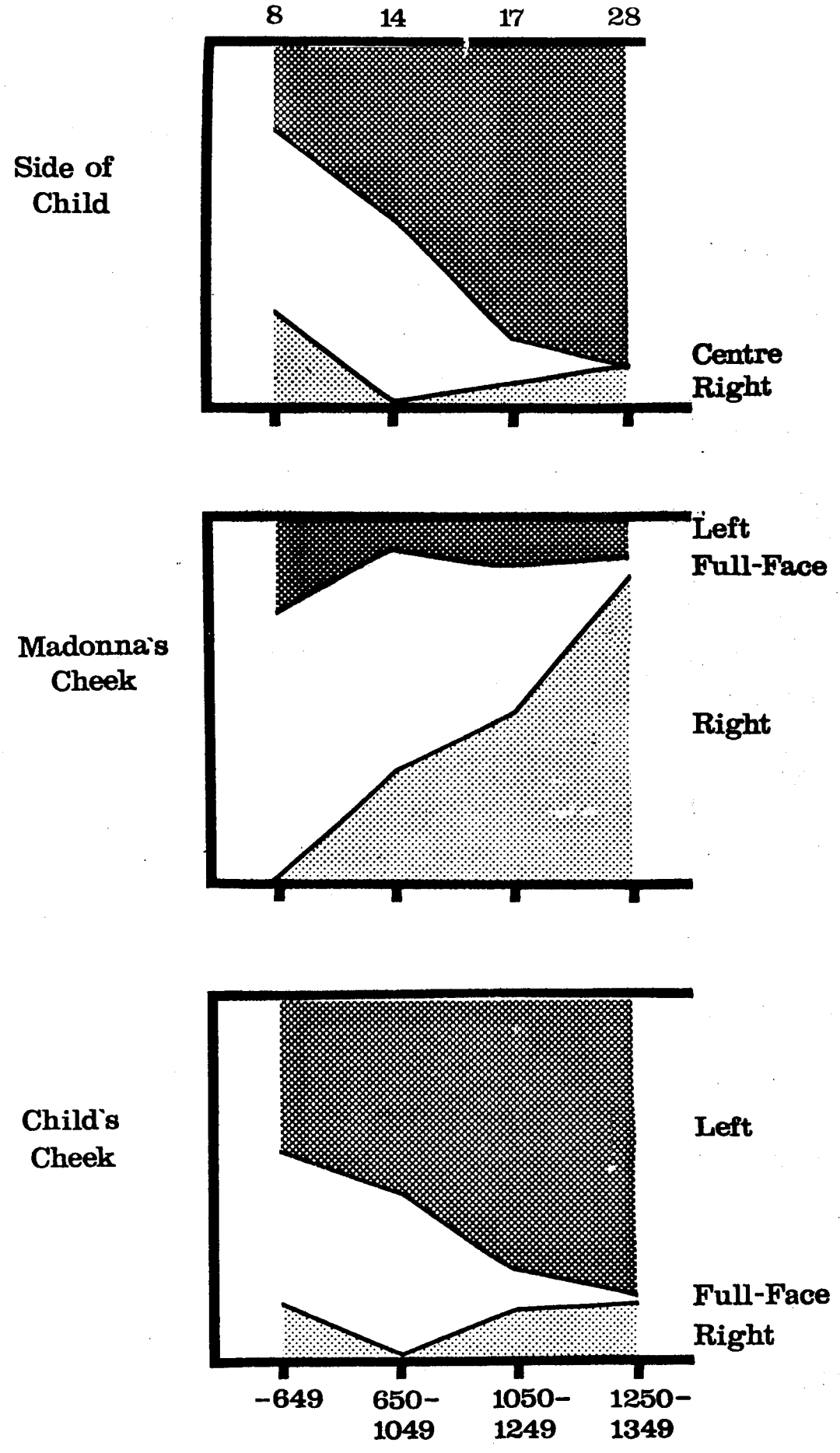

8
14
17
28
Side of Child
Centre
Right
Madonna's Cheek
Left
Full-Face
Right
Child's Cheek
Left
Full-Face
Right
-649
650-1049
1050-1249
1250-1349

Figure A13:2.1 Shows for four different painting types (Portrait, Crucifixions, Annunciations and Madonna and Child) the proportions showing light coming from the left side as a function of the number of pictures showing directional light (i.e. after exclusion of those with light straight on, indeterminate, diffuse, etc.), as a function of the school. The sample size for each data point is shown directly above the column of data points, in the same order as the data points. Considering just the 'Total' data points, there is no statistical difference between the Venetian and Northern schools (X^2 less than 0.01, 1 df), whilst the difference between the Florentine and Central Italian schools is just significant ($X^2 = 4.61$, 1 df, $p < 0.05$). The difference between the combined Northern and Venetian schools, and the combined Florentine and Central Italian schools is highly significant ($X^2 = 48.06$, 1 df, $p < 0.001$).

Renaissance Paintings: Side of Light

8	49	323	19	498
69	47	271	42	370
171	18	287	59	326
62	17	219	28	395

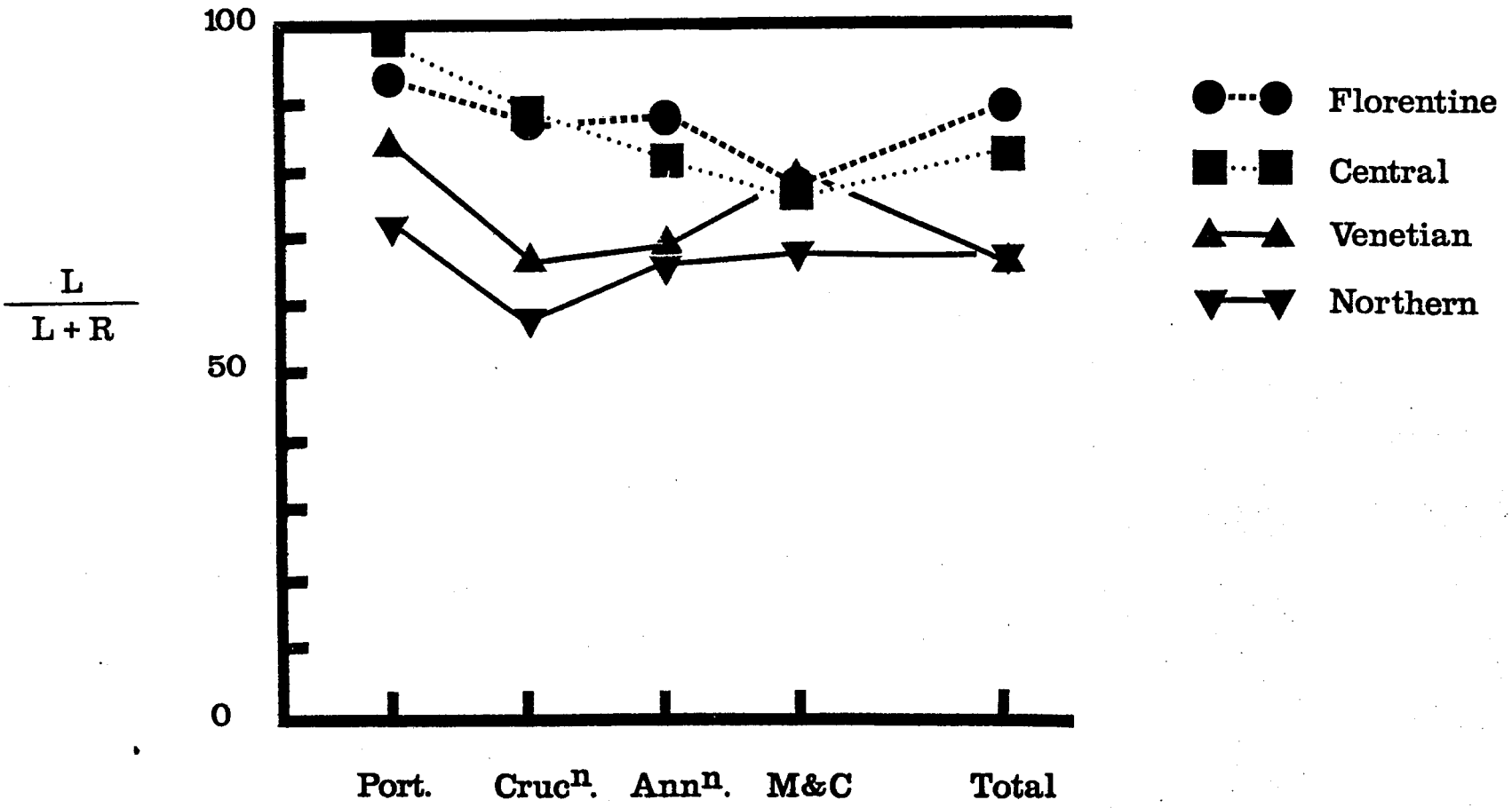


Figure A13:2.2 shows the proportion of Madonna and Child paintings with light from the left side as a proportion of Madonna and Child paintings with directional light. The differences between schools are significantly different from chance distributions for the years 1400-49, 1540)99 and 1500-49 (X^2 = 6.25, 2 df, $p<0.05$; X^2 = 13.08, 3 df, $p<0.005$; and X^2 = 24.66, 3 df, $p<0.005$ respectively).

Madonna and Child: Direction of Light

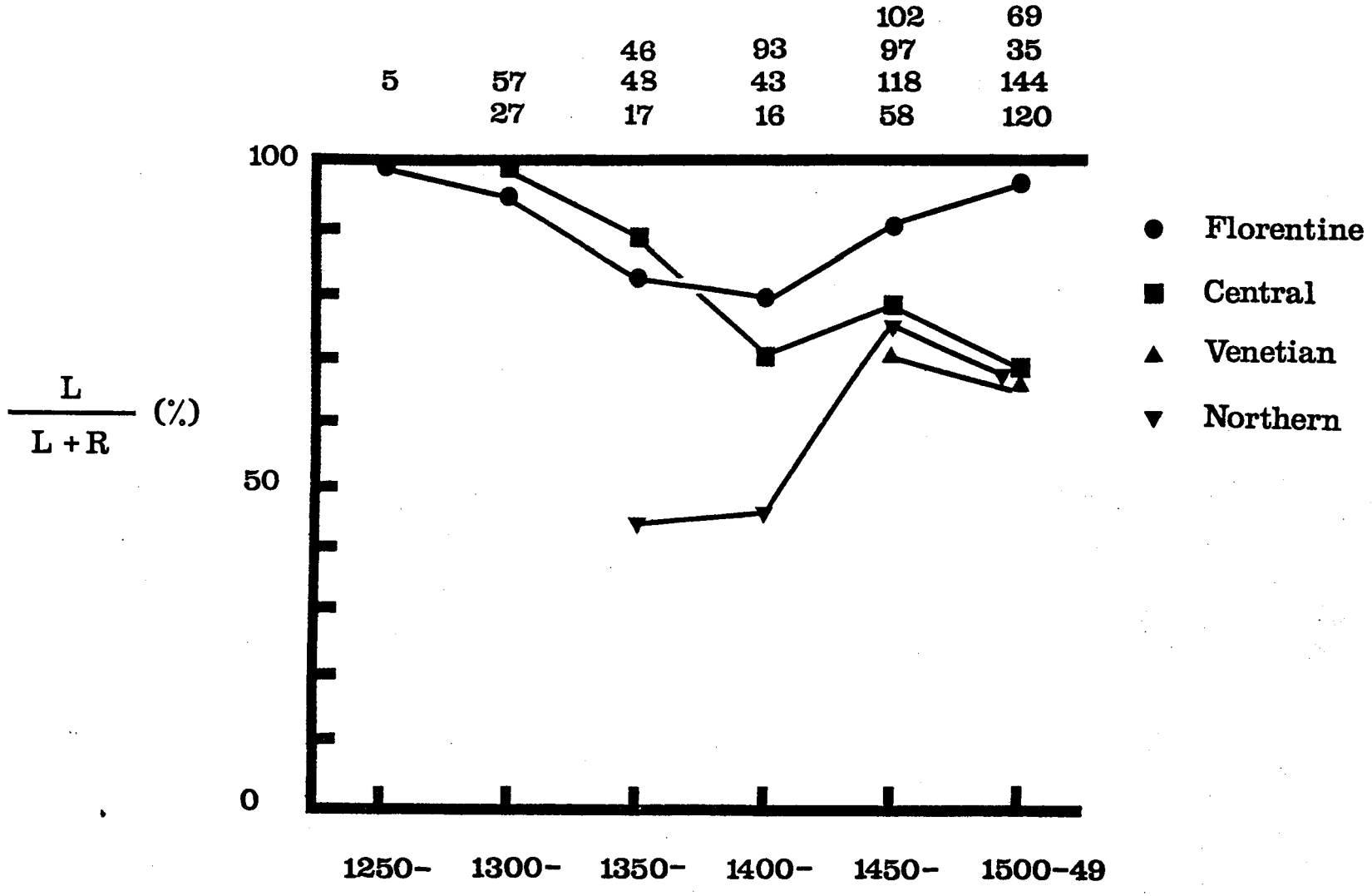


Figure A13:2.3 shows the proportion of Mediaeval and Renaissance Crucifixions having light from the left (dark shading), right (light shading) and indeterminate or straight on (white). During the Renaissance (1250-1550) there is a significant decline in the proportion of pictures with light straight on or indeterminate ($X^2 = 9.02$, 1 df, $p < 0.01$), whilst during the same period there is no significant variation in the proportions of left and right sided light (considering only those pictures with directional light) ($X^2 = 0.803$, 2 df, NS).

Crucifixions: Side of Light

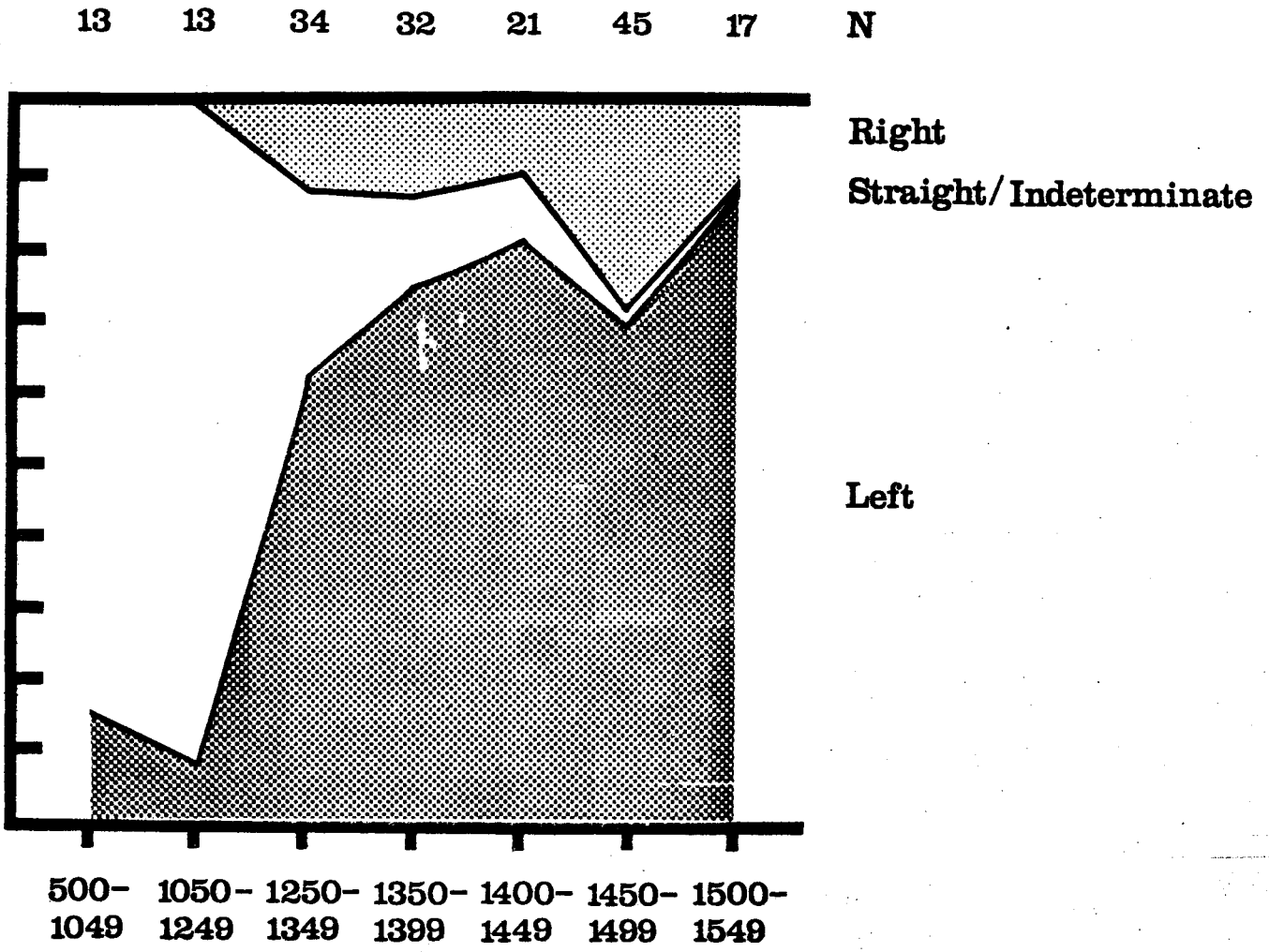


Figure A13:2.4 shows the direction of light in Renaissance Madonna and Child paintings. Light from the right is indicated by light stippling, light from the left by dark stippling, and indeterminate light by white. The proportion of pictures with light of indeterminate origin declines significantly during the period considered (X^2 = 41, 4 df, $p < 0.001$). In pictures with directional light there is a significant increase during the Renaissance of pictures with light from the right (X^2 = 29.28, 4 df, $p < 0.001$).

Madonna and Child: Direction of Light

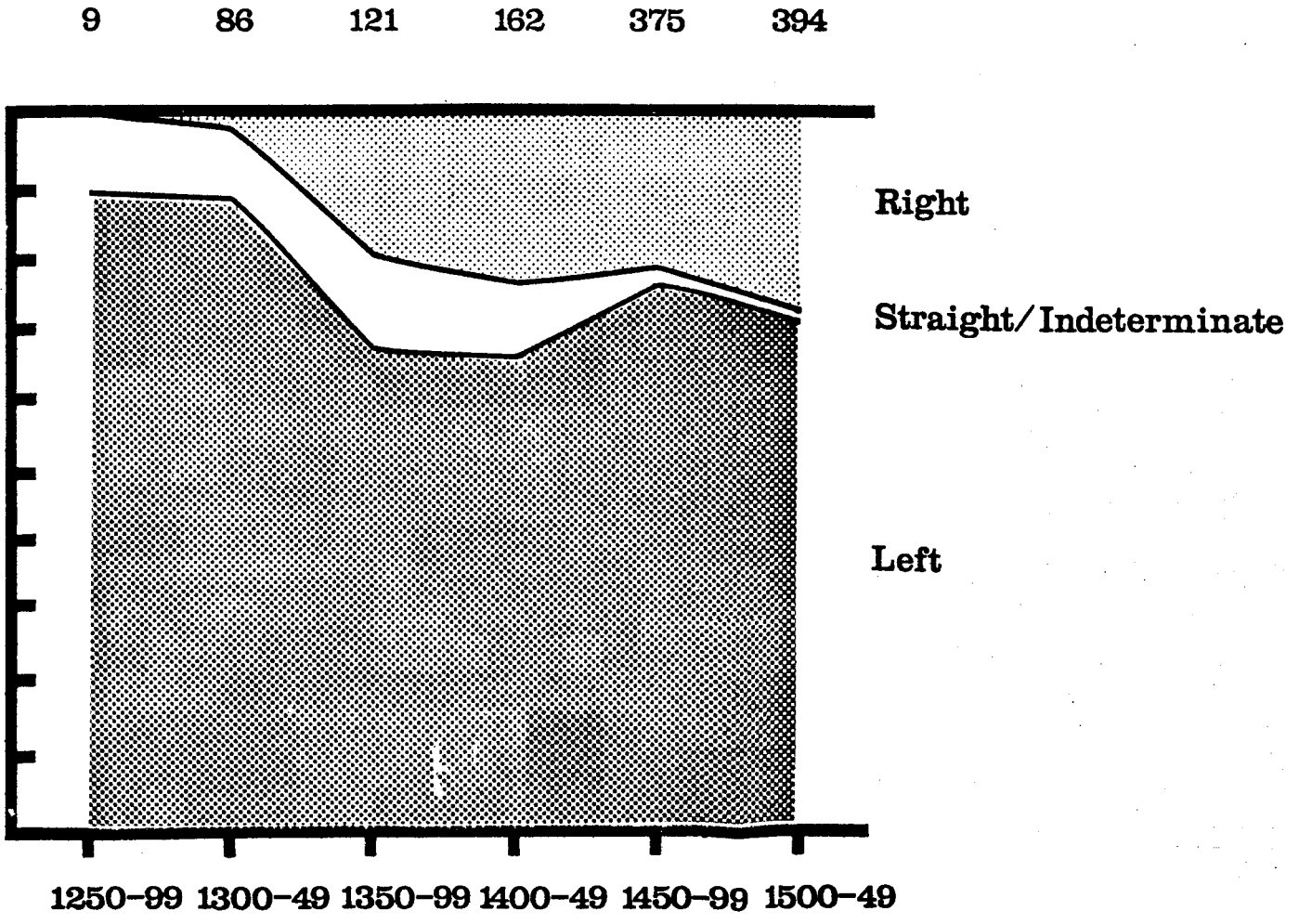


Figure A13:2.5 shows for Madonna and Child portraits with light from either the right or the left side, the proportions of pictures showing the left cheek of the Madonna, the left cheek of the Child, and holding the child on the left side. The changes with time for the group with light from the left side are statistically highly significant (X^2 = 97.6, 3 df, $p < 0.001$; X^2 = 124.6, 3 df, $p < 0.001$; X^2 = 24.9, 3 df, $p < 0.001$ for side of child, Madonna's cheek and child's cheek respectively.) For the group with light from the right side none of the chronological changes are significant by a Chi^2 test (X^2 = 1.17, 3 df, NS; X^2 = 5.83, 3 df, NS; and X^2 = 6.62, d3 df, NS; respectively; however comparing the first data point (i.e. 1350-99) with the last (1500-49) by a Fisher's exact test shows a significant difference in the proportion of left Madonnas cheeks ($p = 0.0208$, one-tailed test) but not in side of child or child's cheeks ($p = 0.232$; $p = 0.80$ respectively).

Statistics are calculated only for the time epochs used on the abscissa; the earlier years produced insufficient pictures with light from the right to merit statistical analysis. For pictures prior to 1350 changes in pictures with light coming from the left are denoted by short dashed lines. The sample sizes for each point on the Madonna's cheek datapoints are shown in the same order as the points themselves. The sample sizes are the same for all three graphs.

Madonna and Child

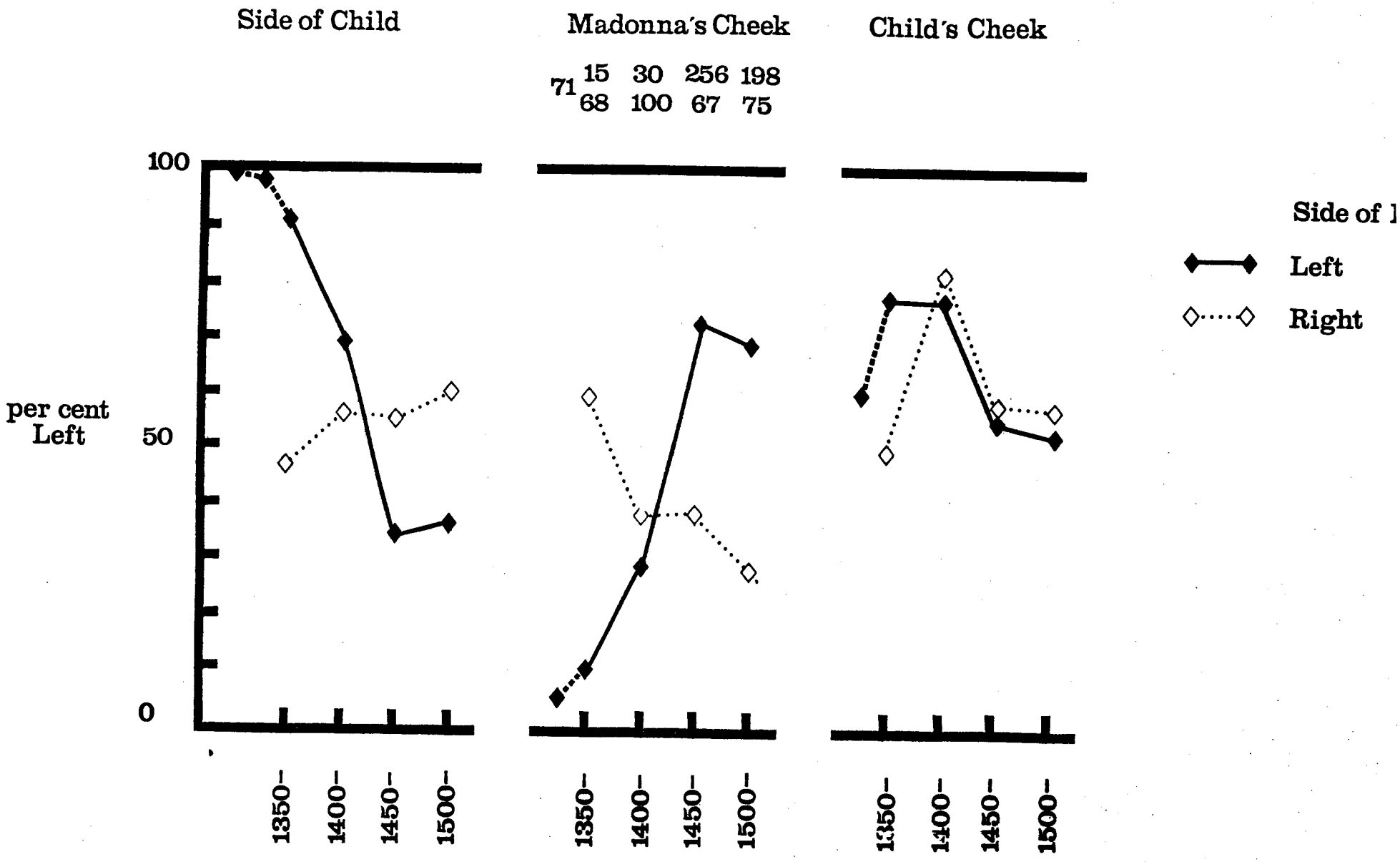


Figure A13:3.1 shows, in the top part, the number of polyptychs in which were shown one, two, three, etc. pairs of saints. n(polyptychs) = 605. Mean =2.09 pairs of saints (4.18 saints); standard deviation = 1.657 (pairs). The lower part shows the proportion of saints portrayed who are in polyptychs with one, two, three, etc. pairs of saints. N = 2532 saints.

Polyptychs

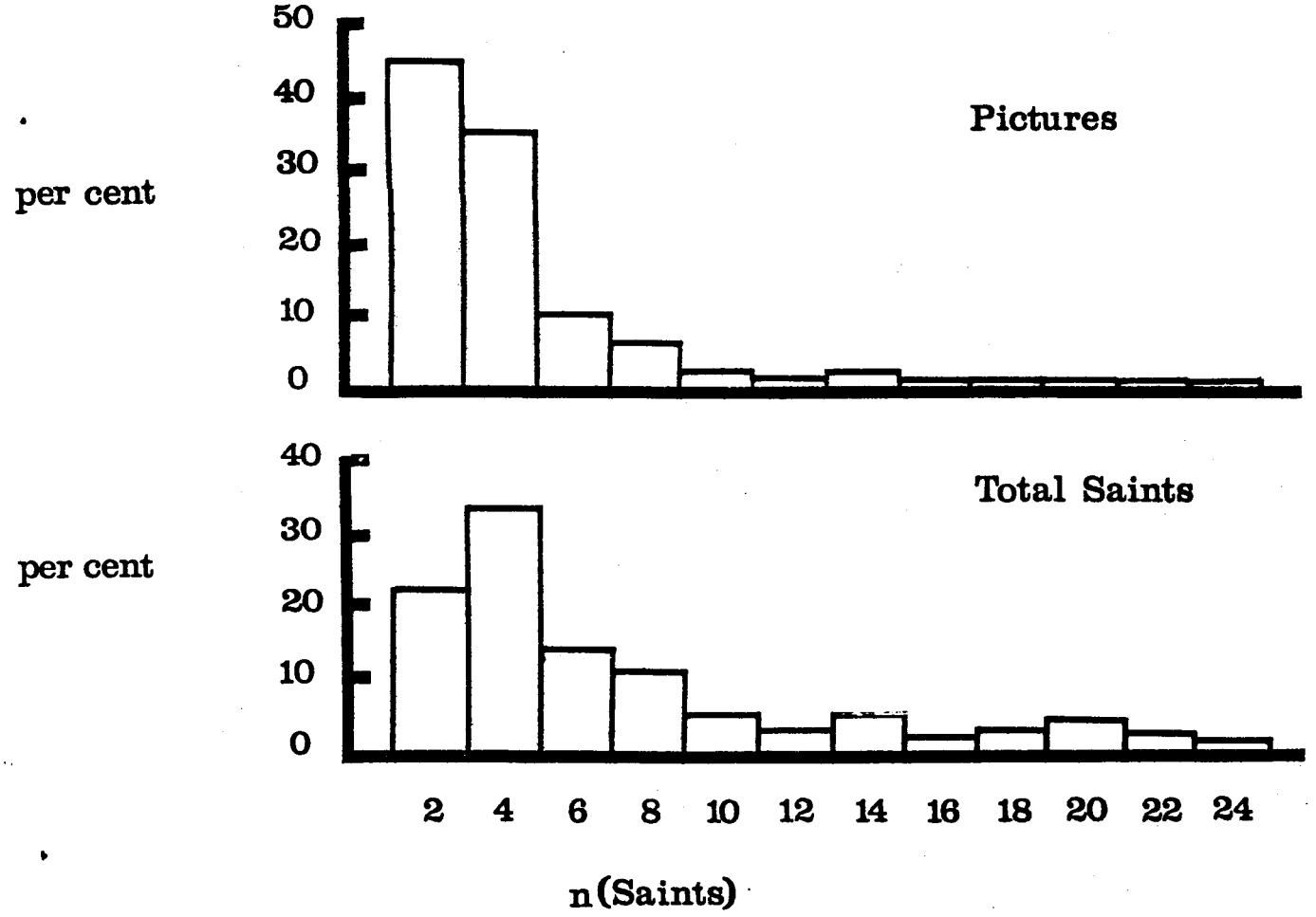

50
40
30
20
10
0
Pictures
per cent
40
30
20
10
0
Total Saints
per cent
2
4
6
8
10
12
14
16
18
20
22
24
n(Saints)

Figure A13:3.2 shows for Italian Renaissance polyptychs, the number of works containing various numbers of symmetry 'errors'. n = 605; mean = 0.27438, standard deviation = 0.52381. The distribution is significantly different from that of a Poisson distribution ($X^2 = 8.65$, 1 df, $p < 0.01$), due to a deficit of polyptychs with no errors and a surplus of those with one error.

Polyptychs: Symmetry Errors

439 153 12 0 1 0 N

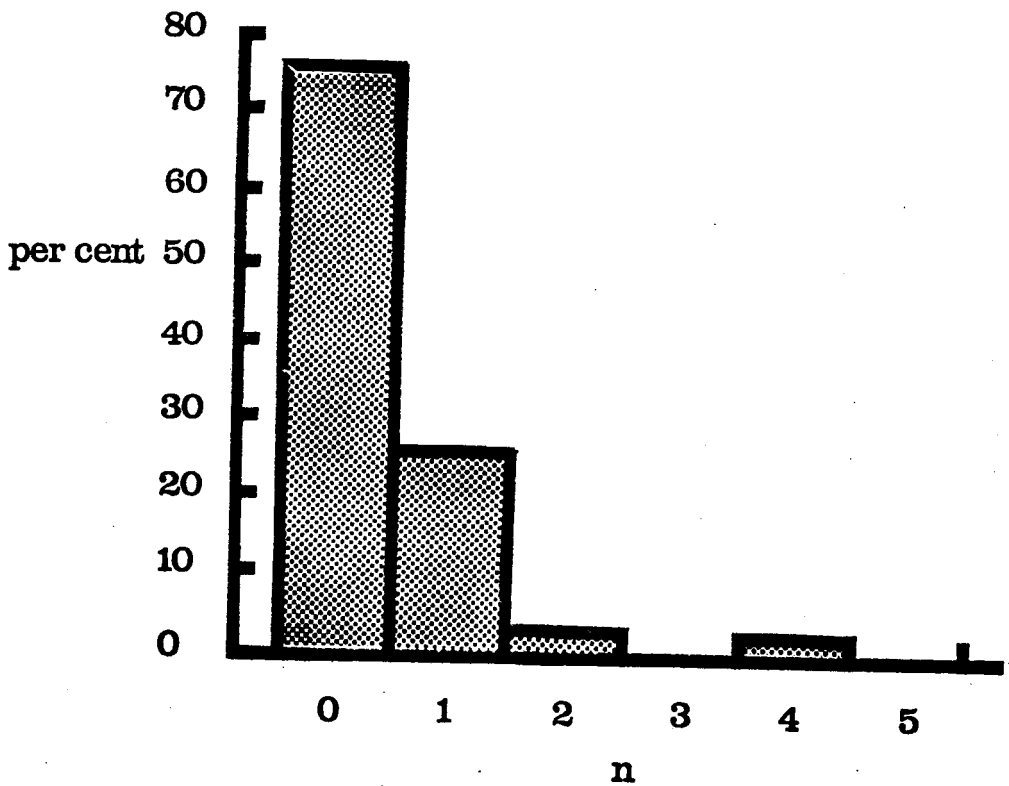
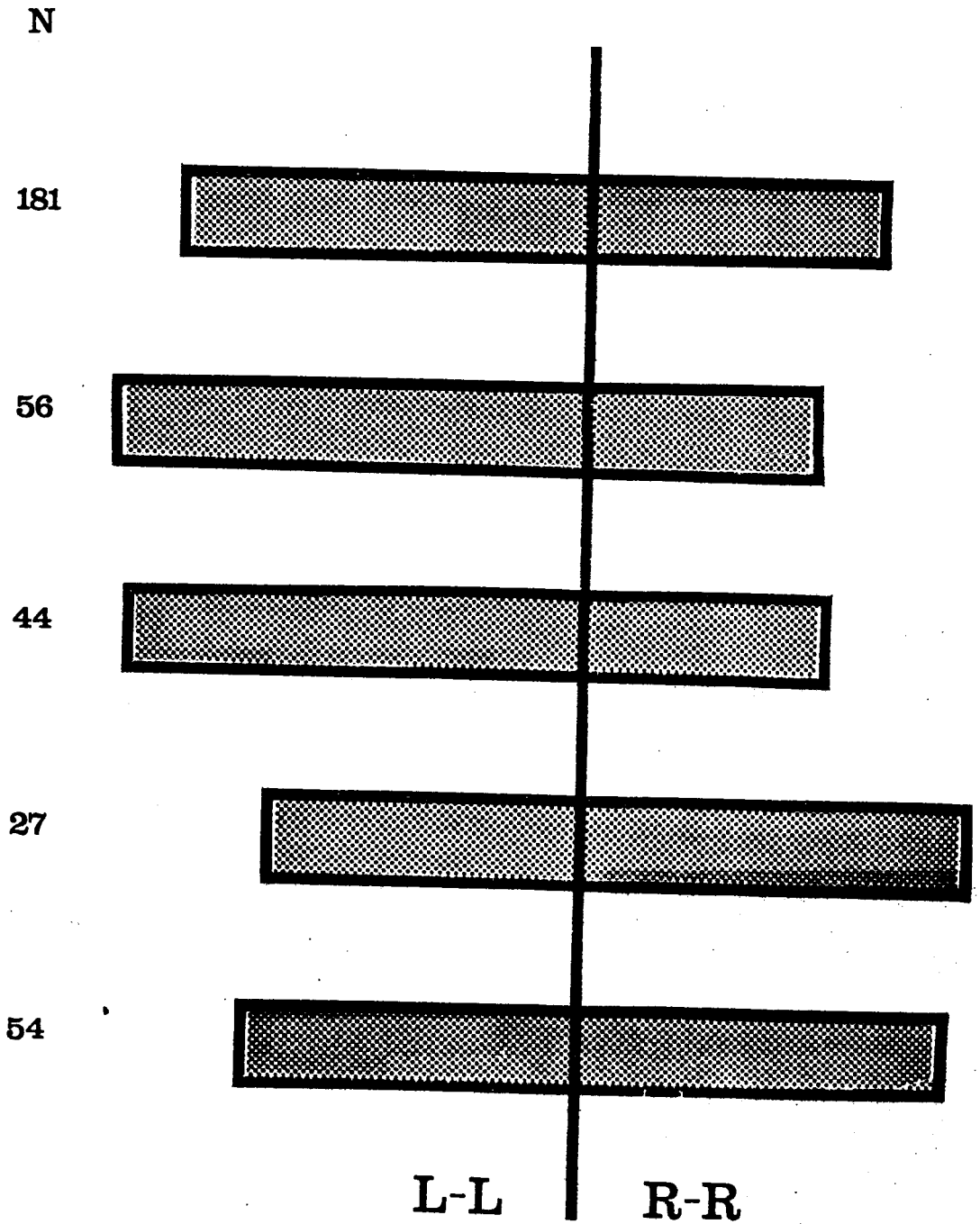


Figure A13:3.3 shows the proportions of symmetry errors in Italian Renaissance polyptychs, by type of error. L-L errors are those in which two left cheeks are actually shown, whilst R-R errors are the converse. The column marked 'per cent errors' is the number of errors overall (see Figure A13.3.1). In the total group the number of L-L errors is significantly greater than the number of R-R errors ($X^2 = 4.34$, 1 df, $p < 0.05$). Further anslysis reveals that this difference is significant only for the Florentine and Central groups ($X^2 = 6.41$, 1 df, $p < 0.02$; and $X^2 = 3.84$, 1 df, $p = 0.05$ respectively), and not for the Venetian and Northern groups ($X^2 = 0.14$, 1 df, NS and $X^2 = 0.02$, 1 df, NS respectively). The difference between the combined Florentine and Central groups, and the combined Venetian and Northern groups is significant ($X^2 = 6.61$, 1 df, $p < 0.02$).



N	per cent L-L		per cent Errors
181	58.0	Total	27.4
56	67.8	Florentine	24.5
44	65.9	Central	27.6
27	44.4	Northern	25.5
54	48.1	Venetian	32.4

Figure A13:4.1 shows the proportion of mediaeval and Renaissance crucifixions in which a spear wound is visible in the right side. Taking the groups pre-1150, 1150-1400 and Renaissance, there is a significant increase in the proportion of Crucifixions with spear wounds ($X^2 = 26.34$, 2 df, $p < 0.001$). The difference between the pre-1150 group and the 1150-1400 group does not achieve statistical significance ($X^2 = 1.61$, 1 df, NS) but the sample size is small.

Crucifixions: Spear Wound

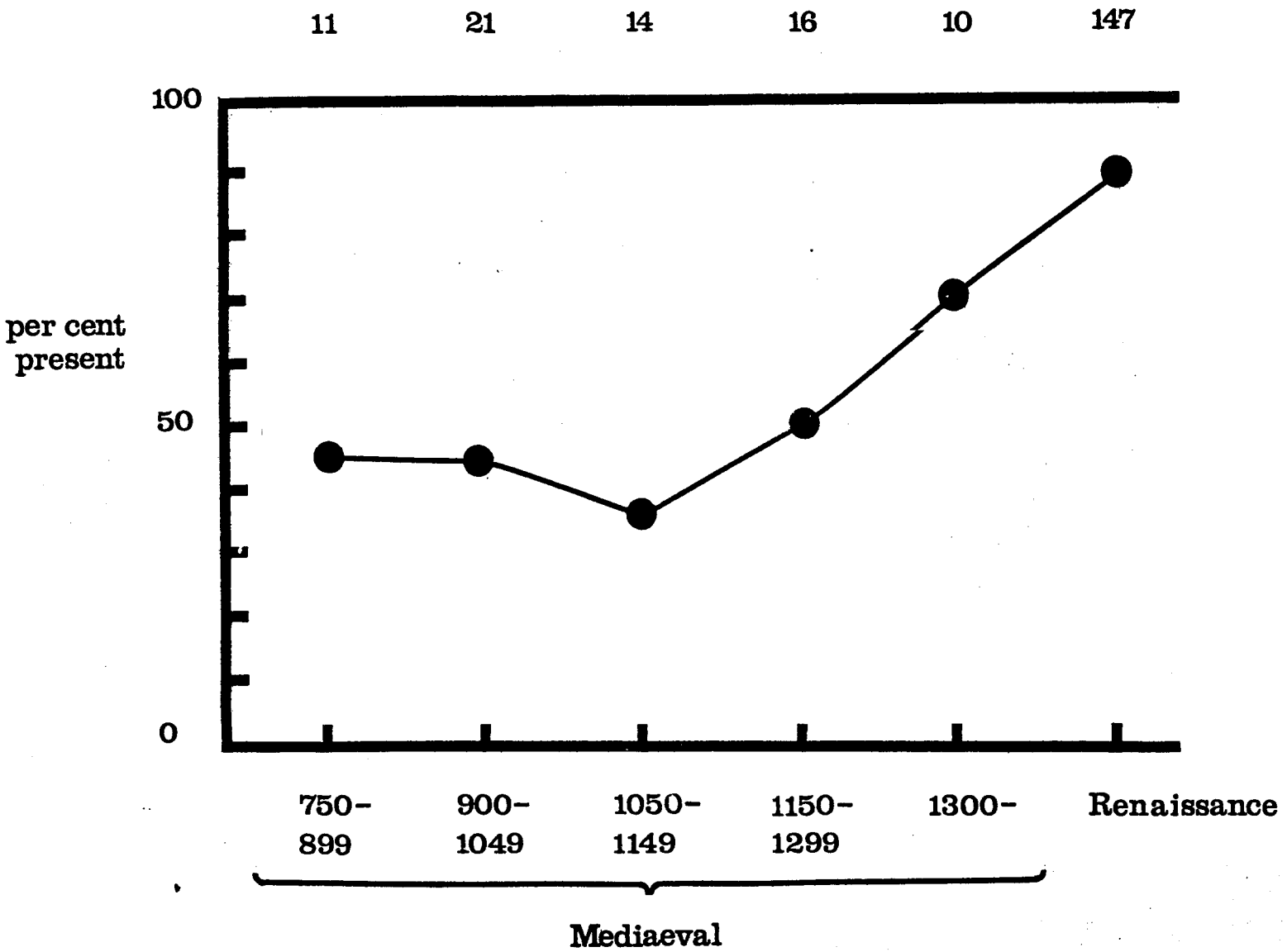
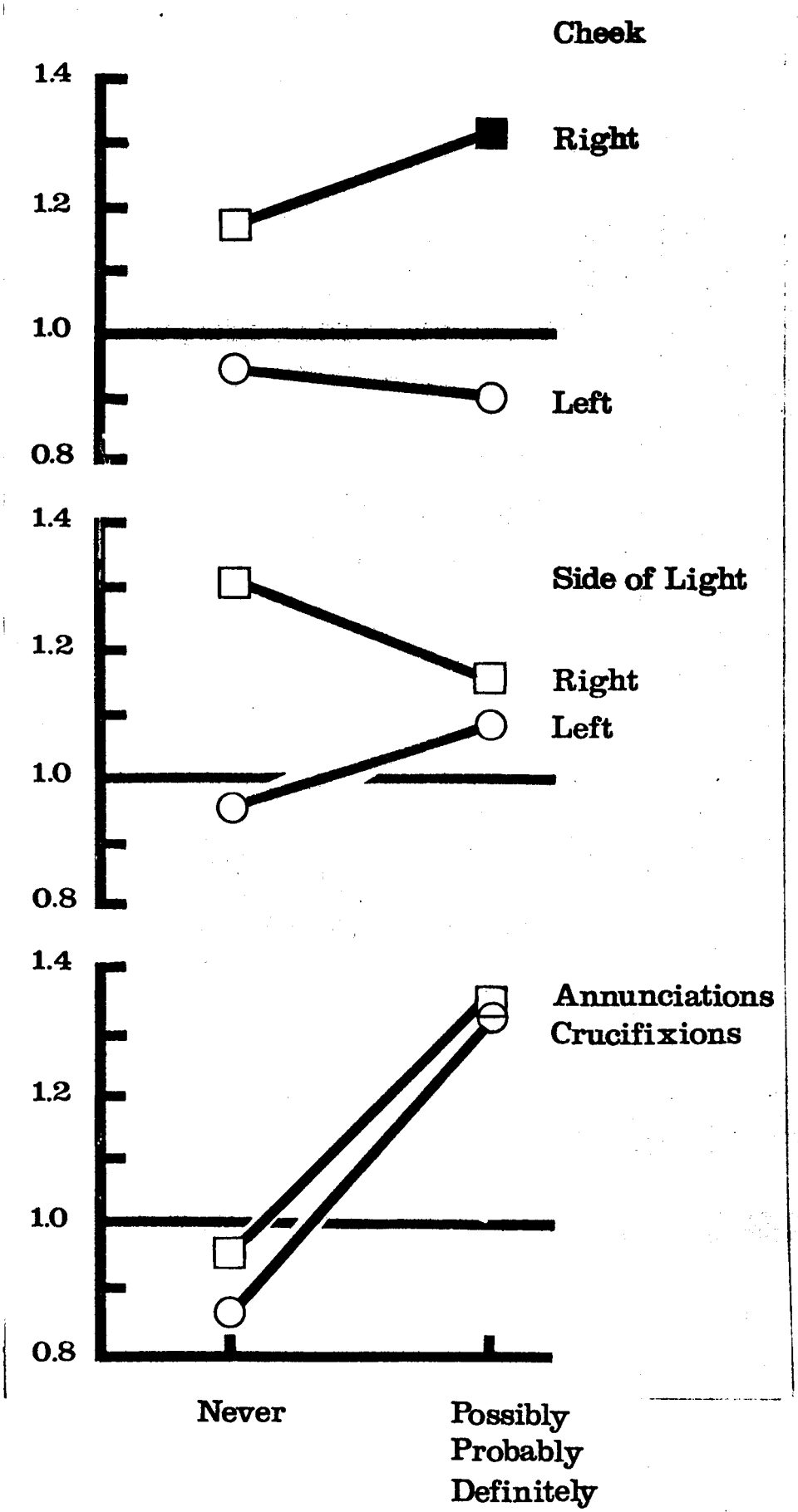


Figure A13:5.1 shows the ability of subjects to distinguish the correct version of a picture from its mirror image. Ordinate represents the ratio of total correct to incorrect choices; chance alone would thus produce a value of 1.0. The abscissa shows the subjects's relative estimates of whether they have seen the picture before; 'possibly', 'probably' and 'definitely' have been lumped together for the purposes of this analysis. Open data points are not significantly different from chance expectations on a X^2 test with 1 df at a probability level of 0.05; the solid point is significantly different from chance. Other details of the experimental groups may be found in the text.


Cheek
1.4
1.2
1.0
0.8
Right
Left
Side of Light
Right
Left
Annunciations
Crucifixions
Never
Possibly
Probably
Definitely

rect
rrect

Plate 13:1 Jacopo Bassano's The Annuncia

(National Gallery of Art, Washington: al

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Plate 13:3 A typical Byzantine Madonna and Child with almost total symmetry (except for the hands). Mosaic in the apse of the Euphrasian basilica, Porec (from Beckwith (1970), Figure 97). ca. 550 AD.

Plate A13:3.1. The Madonna and Child enthroned with various saints, by Gregorio Schiavone (National Gallery, London)

Plate A13:3.2. Madonna and Child with Saints, by Carlo Crivelli (National Gallery, London)

Plate A13:4.1 Shows a complete view of the Shroud of Turin, front and rear, in negative.

Plate A13:4.2 shows a detail view of the face of the Shroud of Turin, in negative view.

Plate A13:4.2 shows a computer reconstruction of the three dimensional characteristics of the face of the Shroud of Turin (from Jackson et al., 1977). Note that it is suggested that the small circular objects on the eyes are coins (see Wilson, 1978 for details), and that the irregular object on the forehead might be a Jewish phylactery.

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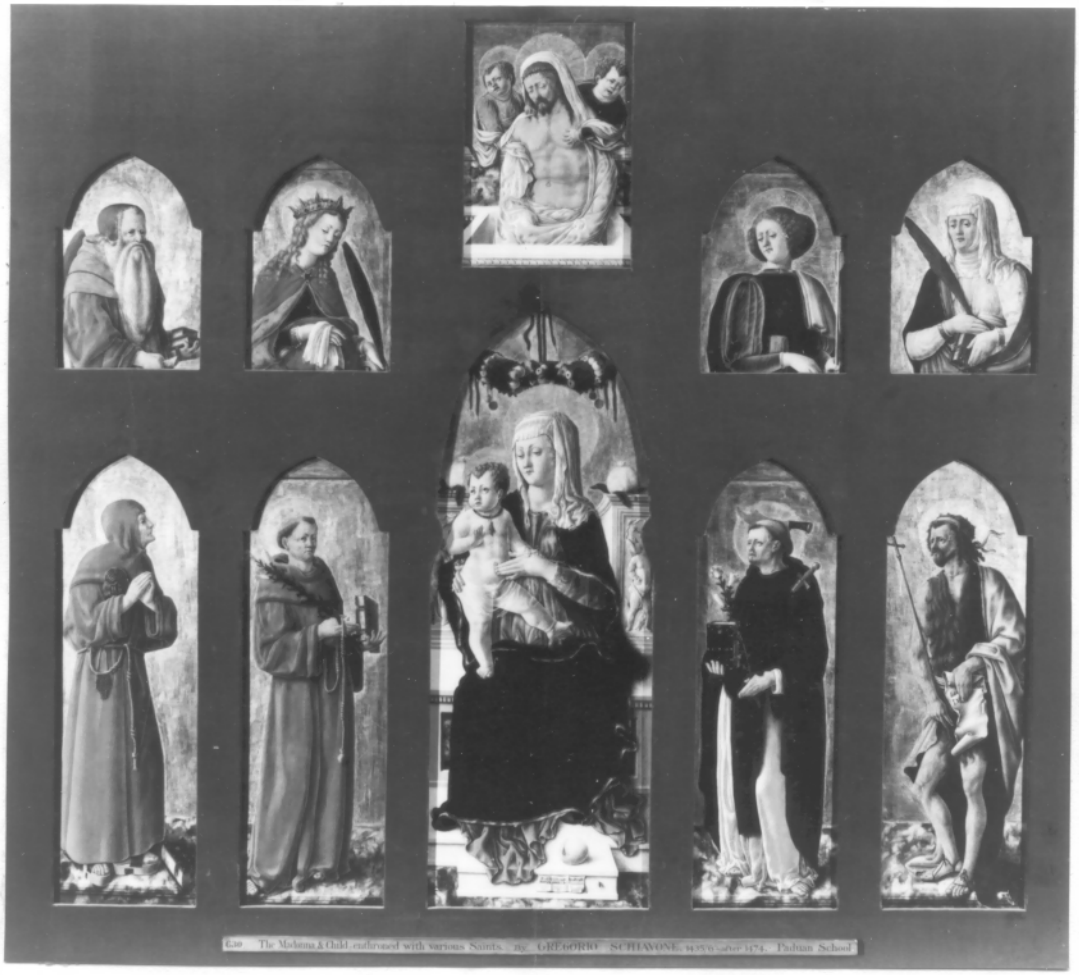

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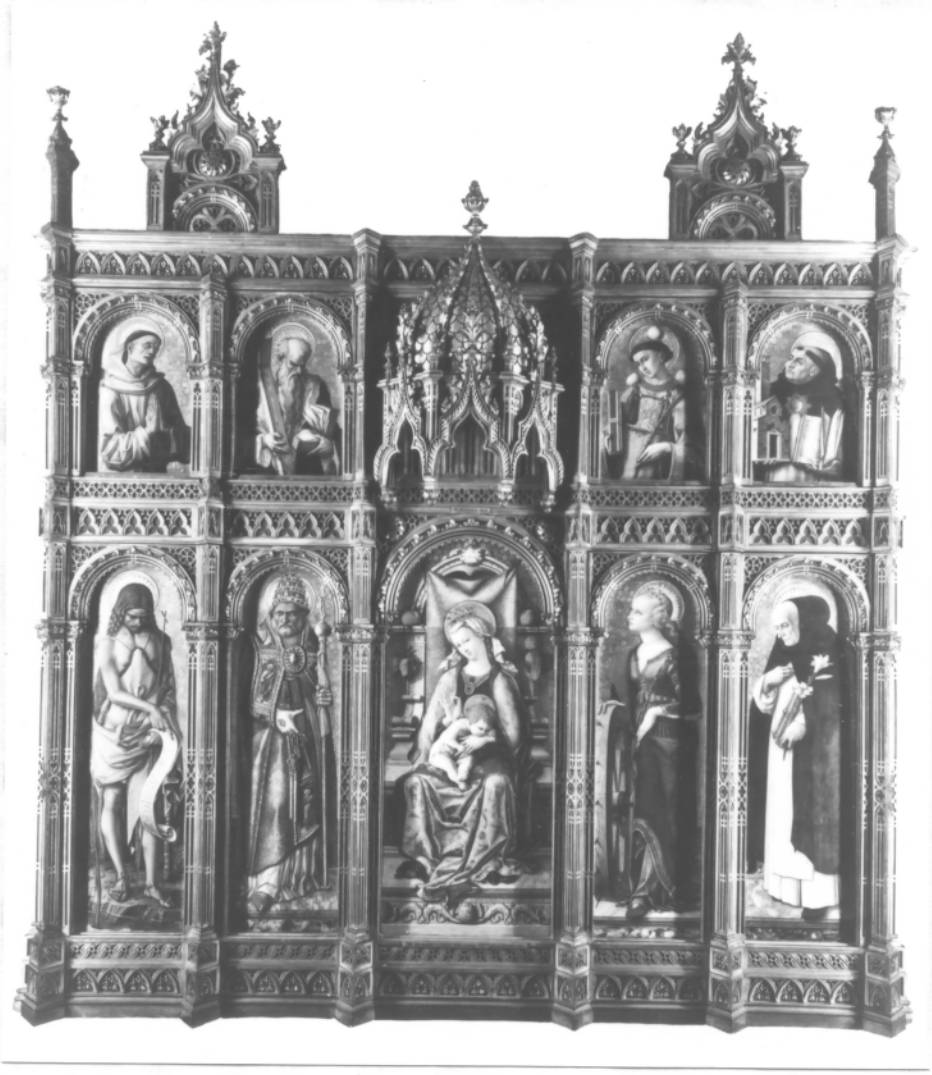

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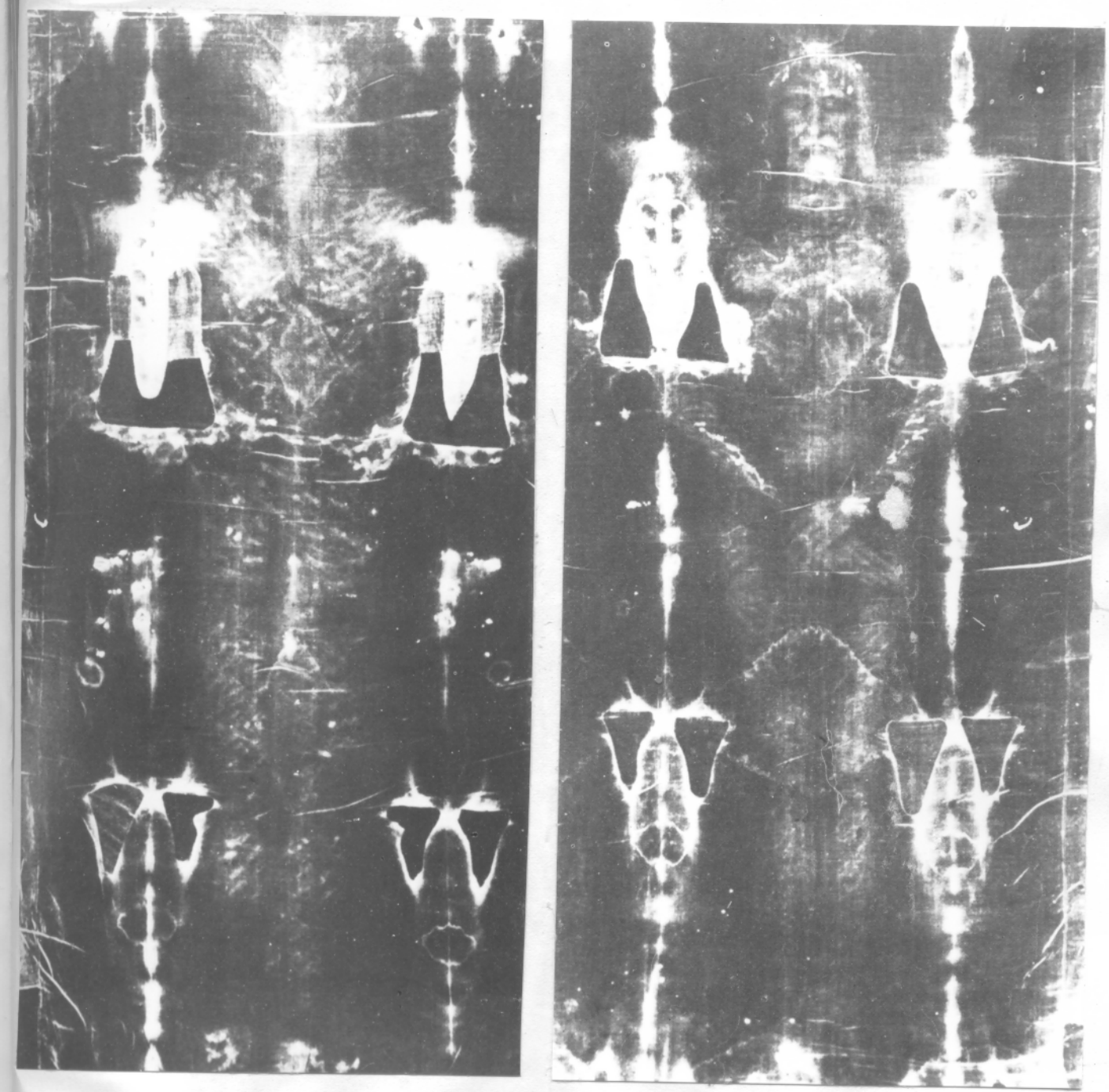

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