

Facial Types in Painting and Recognition Skills: Laymen as Connoisseurs

Astrid Schenk* and Jeroen Stumpel

Department of Art History, Faculty of Humanities, Utrecht University,
The Netherlands

Received 25 November 2016; accepted 27 March 2017

Abstract

The history of art attribution in painting demonstrates that connoisseurs compare faces and facial features in their efforts to ascribe paintings to regions, schools, workshops and specific artists. Connoisseurs do not generally reflect on their application of face recognition or its importance. Since connoisseurs apply both specialist perception skills (recognising a brushstroke technique, for instance) and generic perception skills, an experiment was performed aiming to eliminate a connoisseur's specialist skills. The experiment was performed using laymen observing faces, derived from paintings, that were stripped from all contextual information (i.e., cut-out faces). Thus, only generic skills could be applied in order to categorise these pictures. The results show how laymen arrive at the same categorisation of paintings as connoisseurs do, without prior training in matters of artistic connoisseurship.

Keywords

Pictorial facial types, physiognomy, connoisseurship, face recognition, art attribution, Rogier van der Weyden, Hans Memling, Jean Hey, Rembrandt

1. Introduction

An incongruously large part of a human's cerebral capacity is devoted to the skill of face recognition, helping us to instantly recognise a single face in a crowd. As this paper will bring forth, we apparently respond to faces in paintings in much the same way as we do to faces in real life, meaning that—when present—we focus mostly on the faces in paintings (Tatler *et al.*, 2010; Yarbush, 1967).

*To whom correspondence should be addressed. E-mail: astrid.schenk@ziggo.nl

Human faces all look alike to some extent. Some faces look very much like some others, such as the faces of identical twins. Other faces look quite a bit like some others, while they are also clearly different. This is the case, for example, with ‘normal’ siblings, or parents and their children. They share a certain air, a resemblance of sorts.

Such a family resemblance may also be felt when confronted with pictorial faces. In a trivial sense this will be the case when we see photographs or well-painted portraits of siblings. For this paper it is important that there are other ways in which pictorial faces may share a certain ‘air’, and suggest a kind of family resemblance. One may in fact discern four different kinds of relations that may generate the phenomenon. Obviously, a real face may resemble another real face, and a real face may resemble a face in a painted portrait. But apart from these two possibilities already referred to, there is also another possible relation, e.g., between two pictorial faces that share a certain likeness (Note 1). Here we have two possibilities again: we are confronted with two portraits of the same sitter, or—and this category is essential for the present article—the pictorial faces are not necessarily portraits at all, but facial types that a painter used to paint fictional faces (Fig. 1).

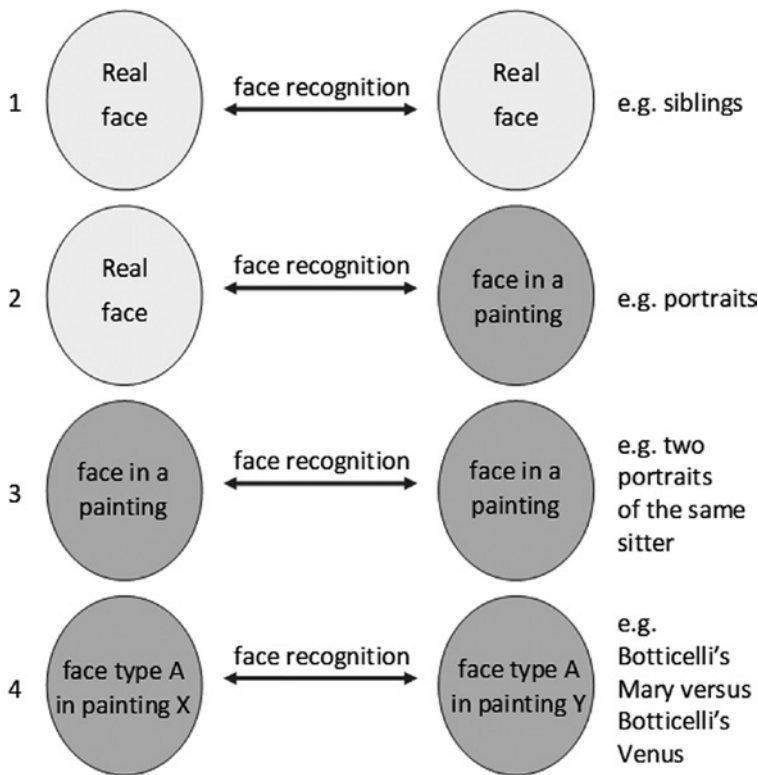


Figure 1. Categories of face comparison.



Figure 2. Gerrit van Honthorst, *Smiling Girl, A Courtesan, Holding an Obscene Image* (detail), 1625, oil on canvas, 81.3 × 64.1 cm, Saint Louis Art Museum, Saint Louis, Inv. no. 63:1954 (left); Hendrick ter Brugghen, *Bacchante with an Ape* (detail), 1627, oil on canvas, 102.9 × 90.2 cm, The J. Paul Getty Museum, Los Angeles. Inv. no. 84.PA.5 (right).

To mention a few of the occurrences of the fourth category of face likeness that are found throughout art history, one needs only to think of the standardised and idealised faces in ancient Greek art, or the rigid face type of the Madonna icons that date from the early Christian era. More interesting from the point of view of face recognition is the likeness between the faces of some of Leonardo da Vinci's (1452–1519) Madonnas and the face of his Mona Lisa, or the faces by Pietro Perugino (c. 1450–1523), who in his own oeuvre painted one particular sort of face again and again. Some distinctive elements in the faces created by Fra Filippo Lippi (c. 1406–1469) can be spotted in the newly invented faces by his pupil Sandro Botticelli (c. 1445–1510) (Gombrich 1986a). There are also the distinct face similarities of Lucas Cranach the Elder (c. 1472–1553), and the less obvious, but unmistakable, resemblances in some of the faces by Albrecht Dürer (1471–1528). Caravaggio (1571–1610) sometimes re-used a certain type of face, and so did some of the artists associated with him, such as the Utrecht Caravaggisti, who seemed to favour a plastic-like round face with the skin stretched tightly over the facial bones (Fig. 2).

One may hold the use of one model by different painters accountable for the presence of similar faces in painting. However, the artists in these examples did not simply copy one model's face. They transformed it into a type by reusing, emphasising, and, perhaps, exaggerating distinct qualities of it. As a result, the faces look quite alike, but they differ in details such as the shape of the eyes and the extent of the facial width.

This sort of pictorial face similarity is somewhat analogous to the aforementioned face similarity of siblings in real life: two or more faces share an essential set of facial features. It is this phenomenon of pictorial face likeness that raises questions about possible function, creation and the detection of it.

Although faces in painting have been studied from many angles (such as their beauty or the identity of the persons they belong to), the phenomenon of facial types in painting has hardly been studied, if at all. This is remarkable, not just because the phenomenon appears to be quite common—within oeuvres of individual painters, as well as across the production of different painters of a certain group or period—but also because of the implications it may hold for various art historical topics and processes. One such topic is connoisseurship.

2. Art Attribution

In art, the perception of differences and similarities is a fundamental skill through which art historians stylistically, technically and historically classify and evaluate works of art. What is depicted, in what style was it executed, and through what means did the artist achieve his results? These are all questions that are to be answered by observation and comparison with other works of art. Another prominent question asked about a work of art concerns its origins. Roughly from the fifteenth century onwards—coinciding with a growing recognition and self-awareness of artists—art dealers, art collectors, and, later, art critics and art scholars, have wished to know who created a particular artwork.

Recognising the ‘hand of the artist’ is in itself a fairly abstruse process that is further complicated by the difficulty of articulating such perceptions (Wind 1963, p. 31). The connoisseur has to make do with a relatively small amount of words to express the vast amount of visual information in a painting, concerning all the peculiarities and interplay of the brushwork, colour, composition, form, and line. Another issue revolves around the approaches of art attribution. Roughly speaking, connoisseurs base their attributions on the basis of a general impression of the whole, or on their rational analyses of minute details. The latter method is famous for assuming that the artist’s identity is revealed through certain peculiarities in the execution of certain forms in the painting, such as a figure’s hands or ears (Morelli 1900). Both methods are used, and alternated between, and both are controversial. A general impression is said to be only useful to ascribe art to a school or a region, instead of a specific artist (Berenson 1962, pp. 122–124). Analysis of the artwork’s details, on the other hand, is a mistrusted method both for its supposed lack of scientific basis and the notion that there too a hunch about the creator underlies the direction of study (Friedländer 1946, pp. 166, 167). The latter notion seems right; one cannot meaningfully study details, without having some idea what one is looking for.

A general impression must somehow be rationalised in order for it to be acceptable as a scholarly method. The actual steps that lead to a general

impression are speedy, fairly automatic, and, as a result, hard to put into words. In fact, this process in art attribution may be rather akin to that of face recognition. Given, firstly, the dominance of faces in observing paintings (Yarbus 1967), and, secondly, the automatic nature of face recognition, it may, therefore, well be that connoisseurs utilise face comparison of the fourth category (Fig. 1) in their attribution activities. Recognising or recalling certain faces in painting may have initiated connoisseurs to examine paintings in the first place. In subsequent stages of investigations, the results of face comparison—either on the basis of the whole face or specific details thereof—may even be valued as evidence. It is precisely this notion that underlies the present exploration into the correlation between face recognition and art attribution.

2.1. Face Recognition as an Art Historical Method

Tracing the role of face comparison in attribution processes requires some adjustment of expectations, because there are not many literal references to the skill of face recognition or the activity of face comparison as such. However, to the contrary, faces are not overlooked in catalogues and other publications that deal with attributions. One can find traces of face comparison in quite a few catalogues. Such traces indicate the use of face recognition as a skill—a connoisseur points out how a face reminds him of another face, for instance, or when an author of a catalogue says the type has become more feminine, for example, surely he is referring to the face. And the mention of the word ‘type’, for instance, may refer to a particular figure with a specific combination of poses, attributes, and gestures, but it may also indicate a sort of face, in which case it is often compared to similar types of faces.

In the following sections, four cases of developing connoisseurship are described and discussed, concerning the art of Rogier van der Weyden, Hans Memling, Jean Hey and Rembrandt. The case of Jean Hey, in particular, is of great art historical significance, but also of importance for the discussion at hand as the oeuvre of this painter was not recognised as a unit before the end of the last century, and facial types played an essential role in this process of attribution and connoisseurship. However, those who are less concerned with detailed art historical discussions of individual masters may want to skip these sections, and continue with Section 2.1.5.

2.1.1. The Case of Rogier van der Weyden

Dirk de Vos, an expert on early Netherlandish painting, uses the standardisation of poses, gestures, and attributes to typologically classify Madonna paintings by Rogier van der Weyden (c. 1399–1464) and to trace Rogier’s types back to their origins (De Vos 1971). Although this was not the aim of his study, in

the process De Vos demonstrates the role of faces in establishing relations between the works of different painters. He argues, for instance, that all the so-called Flémallesque Madonna types have oval-cut faces. Subsequently, he claims that another type, named the *Madonna with the Flower*, does not correspond to this Flémallesque type, because the face shapes differ (De Vos 1971, p. 66).

Throughout his publication, De Vos continues to compare face shapes and also facial elements, such as noses, eyes, and mouths in order to establish stylistic relations between prototypes and Rogier's Madonna types. At one point (in a footnote), he explicitly mentions the activity of comparing faces, as well as its significance in sound attribution processes. According to De Vos, Friedrich Winkler, in *Vorbilder Primitiver Holzschnitte* (1958), justly compares a certain Madonna woodcut to Flémalle Madonna types, but neglects to include face type comparisons. De Vos emphasises that face analyses should be about the relations between face parts and the face as a whole.

2.1.2. *The Case of Hans Memling*

A painter who was quite familiar with the work of Rogier van der Weyden is Hans Memling (c. 1433–1494). With regard to face comparison, his oeuvre, which is well established, is interesting for two reasons. Firstly, his faces have been compared to those of his master or fellow workshop painter Rogier van der Weyden, as well as to those of his fellow countrymen Stefan Lochner (Lane, 2009, p. 45; Bock, 1900, p. 134). Comparing the work of two painters born in the same region is not unusual and, seeing that influences are likely to start in the place where one received his earliest education, quite understandable. It seems curious though that connoisseurs see in one (Memling) face, the likeness of two other faces (those by Rogier van der Weyden and those of Stefan Lochner). This is precisely what makes the phenomenon of pictorial face matching such a fascinating topic. Pictorial faces sometimes seem to have been crossbred. In Memling's case, the parent faces may well have come from Rogier van der Weyden and Stefan Lochner. A pictorial face can have more than two parents, in fact, to all of whom it owes its 'genetic' features.

In his Memling catalogue, Dirk de Vos uses faces and facial elements to compare Rogier van der Weyden and Hans Memling (De Vos, 1994). There are, indeed, striking resemblances between some of the faces by these painters (Figs 3a, b). De Vos states that the degree of likeness in the facial elements points to a close collaboration of the two painters (De Vos 1994, p. 361). Memling's oeuvre is relevant also because connoisseurs have observed a development in the faces Hans Memling created. De Vos, for instance, describes Memling's early facial types as being "rubbery", and rounded as if they have been "planed on the lathe", as in the *Virgin and Child* (Fig. 3c). Later in his career,

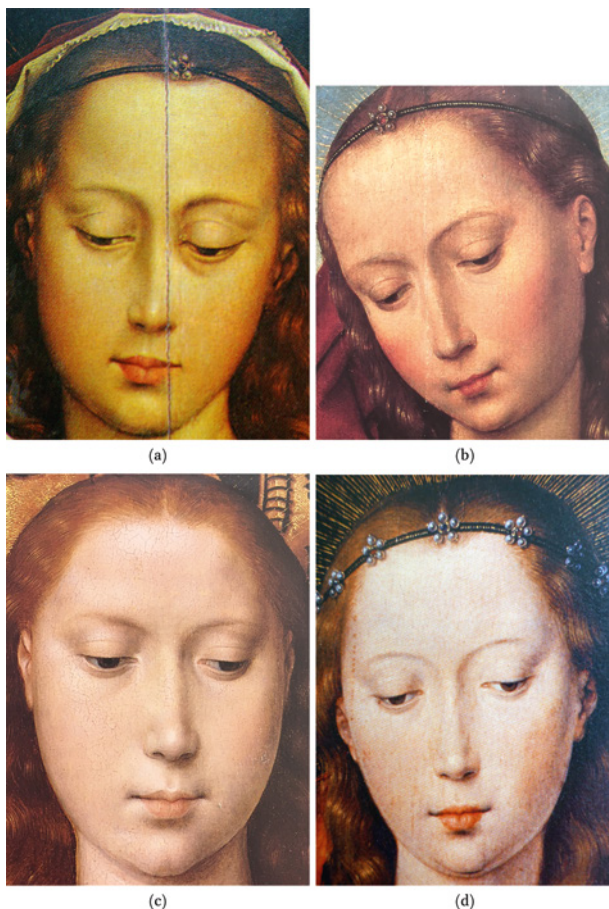


Figure 3. (a) Rogier van der Weyden, *Virgin and Child* (detail), left wing of the Diptych of Laurent Froimont, 1445–1464, oil on wood, 51.5 × 33.5 cm, Musée des Beaux-Arts, Caen; (b) Hans Memling, *Virgin and Child* (detail), c. 1485, oil on wood, 44 × 32 cm, Inv. no. 1065 Pint, Museu Nacional de Arte Antiga, Lisbon. (c) Hans Memling, *Virgin and Child* (detail), about 1475, oil on oak, 37.9 × 28 cm, The National Gallery, London. inv.nr. NG709; (d) Hans Memling, *Diptych Maarten van Nieuwenhove* (detail), 1487, oil on panel, 44.7 × 33.5 cm, Sint-Janshospitaal, Memling Museum, Brugge, Inv. no. O.SJ178.I.

Memling's faces became more lengthened, the nose narrower and the mouth turned into a small pout, as in the *Diptych Maarten van Nieuwenhove* (Fig. 3d). These faces show how two faces can resemble each other as if they belong to two sisters.

The examples of Rogier van der Weyden and Hans Memling are cases in point of how connoisseurs have used faces in order to map painters' oeuvres. The following example will demonstrate how faces in paintings can first help assemble an oeuvre and subsequently lead to its creator.

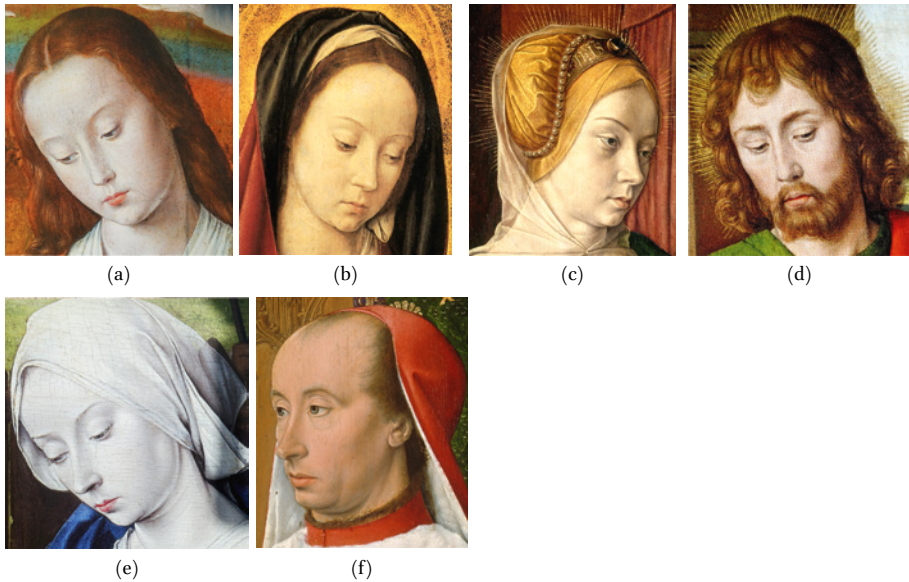


Figure 4. (a) Jean Hey, *Virgin in Glory Triptych* (detail), The Moulins Triptych, c. 1497, oil on wood, 157 × 283 cm, Moulins Cathedral, Moulins; (b) Jean Hey, *Virgin and Child Adored by Angels* (detail), c. 1490, oil on wood, 38.5 × 29.5 cm, Musées Royaux des Beaux-Arts, Brussels; (c) Jean Hey, *Madeleine of Burgundy presented by Saint Mary Magdalene* (detail), 1490–1495, oil on wood, 56 × 40 cm, Musée du Louvre, Paris; (d) Jean Hey, *Anne of France, Duchesse de Bourbon, accompanied by saint John the Evangelist* (detail), 1492–1493, oil on wood, 73 × 53 cm, Musée du Louvre, Paris; (e) Jean Hey, *Nativity with cardinal Rolin* (detail), c. 1480, oil on wood, 55 × 71 cm, Musée Rolin, Autun; (f) Jean Hey, *Portrait of Charles II of Bourbon* (detail), c. 1485, panel, 34 × 25 cm, Alte Pinakothek, Munich.

2.1.3. The Case of Jean Hey

The century-long history of publications concerning the painter, who has long been called the Master of Moulins, perfectly illustrates the magnetic and guiding effect of faces in attribution processes. With regard to establishing his oeuvre, the faces in the Master of Moulins' paintings were important triggers that started off several connoisseurs in ascribing paintings to him. Moreover, this process of grouping together paintings based on face recognition ultimately led to the anonymous master being identified as Jean Hey. It all started with the fifteenth-century *Moulins triptych* (Fig. 4a) that had gone unnoticed until 1838 (Châtelet, 2001). An initial attribution to an Italian painter was rejected because connoisseurs saw a Gothic influence that suggested Northern origins (Mantz, 1878, p. 866). The anonymous painter was then named the Master of Moulins (Benoit, 1901, p. 322).

In 1902 the famous *Flemish Primitives* exhibition was held in Bruges. Some of the paintings that were juxtaposed at the exhibition reminded the Belgian art historian George Hulin de Loo of the Moulins Triptych (Hulin de

Loo 1902a, pp. 38–53, 1902b, pp. XLVIII–L). The Master of Moulins' oeuvre was now extended with paintings such as *The Virgin with Child Adored by Angels* (Fig. 4b), *Madeleine of Burgundy Presented by Saint Mary Magdalene* (Fig. 4c), and the *Portrait of Anne of France Accompanied by John the Evangelist* (Fig. 4d). Since we know that the face in a painting is the dominant object of attention, the faces in these paintings triggered connoisseurs to believe that these paintings were from the same hand.

Two years later the Master of Moulins' oeuvre expanded even more. At the 1904 exhibition called the *French Primitives* they juxtaposed the aforementioned paintings as well as the *Armoured Saint and Unknown Donor*, continuing past the portraits of Pierre II, Anne of France and Margaret of Austria (at the time still identified as Suzanne), *Nativity with Cardinal Rolin*, and the *Portrait of Charles II of Bourbon* (Figs 4e and f) (Bouchot 1904, section Table des planches). From this group of paintings it is possible to examine what it was that made connoisseurs ascribe them to this one, but still mysterious, painter of Moulins.

In the exhibition's catalogue, the organiser of the 1904 exhibition of French primitives, Henri Bouchot, recognises the same type of face in all of the paintings, and even mentions how one of the faces is an overweight version of the same facial type (Bouchot 1904, section Planche LXXX). Thus, Bouchot touches upon our ability to recognise a face that has changed. Gombrich explains this phenomenon, of how we can still recognise a face that has changed, through its surviving typifying characteristics (Gombrich, 1986b, pp. 107, 108). Bouchot also specifically mentions the similar eyes, noses and mouths of several of the Madonnas of the Moulins master. He also observed a resemblance between the angels' faces in a miniature from the Book of the Order of Saint Michael, and those in the *Virgin and Child* (Bouchot 1904, section Planche LXXXI and XXXVI). Many of the angels' faces in the oeuvre of Jean Hey are, indeed, remarkably similar (Fig. 5a–c), especially where the bulging of the cheek near the nose and the mouth is concerned. Viscount and connoisseur Charles Boëll in his report on the 1904 exhibition claims how easy it is to spot a resemblance between several of the faces of the Virgins the master of Moulins' painted (Boëll 1904, pp. 438–440).

Now that art historians and critics had reached consensus on an oeuvre, the focus shifted to the question of authorship. The English art historian Roger Fry claimed the anonymous master's teacher was Hugo van der Goes. The latter's Virgin in the *Monforte Altarpiece* (Fig. 5d) indeed reminds us of the Virgin in the Moulins triptych (Fig. 4a). The angels in the Moulins triptych reminded Fry of angels in a painting then ascribed to Hans Memling, and now attributed to Rogier van der Weyden (Fry, 1904). Fry mentions the oblique eyes as a critical point of resemblance. In 1906 Fry added the *Annunciation* (Fig. 5b) to the Moulins master's oeuvre (Fry 1906, p. 331).

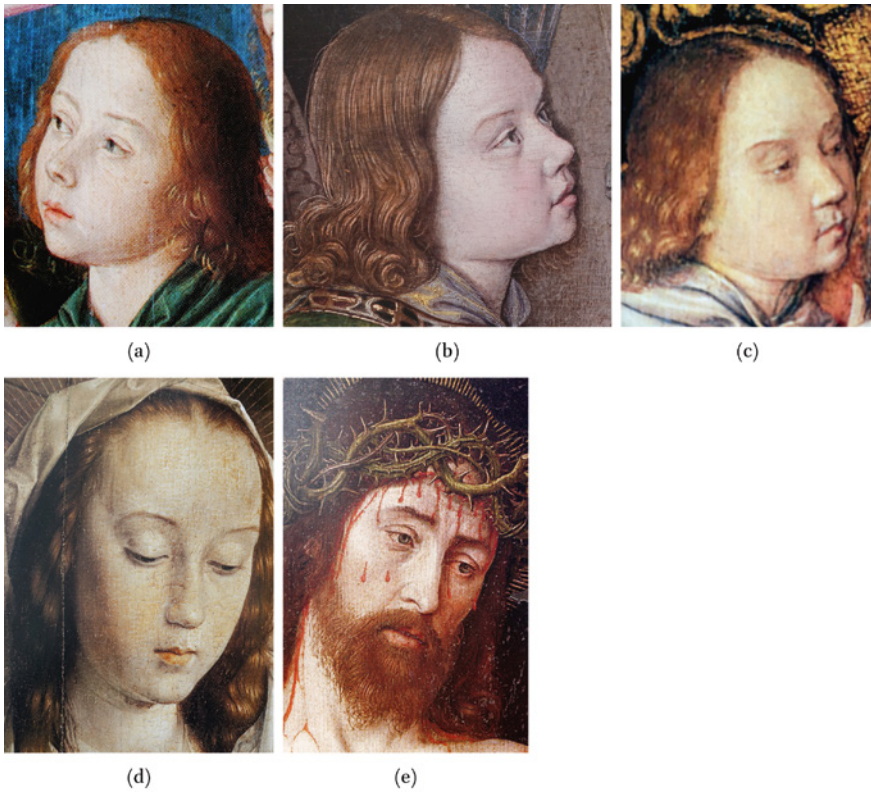


Figure 5. (a) Jean Hey, *Virgin in Glory Triptych* (detail of the central panel), The Moulins Triptych, c. 1497, oil on wood, 157 × 283 cm, Moulins Cathedral, Moulins; (b) Jean Hey, *The Annunciation* (detail), 1490–1495, oil on canvas, 72 × 50.2 cm, Art Institute of Chicago; (c) Jean Hey, *Virgin and Child Adored by Angels* (detail), c. 1490, oil on wood, 38.5 × 29.5 cm, Musées Royaux des Beaux-Arts, Brussels; (d) Hugo van der Goes, *Monforte Altarpiece* (detail), 1470, oil on wood, 150 × 247 cm, Staatliche Museen, Berlin; (e) Jean Hey, *Ecce Homo* (detail), 1480–1500, oil on wood, 39 × 30 cm, Royal Museums of Fine Arts of Belgium, Brussels.

Throughout the twentieth and early twenty-first centuries, scholars continued to speculate about the Master of Moulins' identity. Several painters were eligible for abolishing the master's anonymity, but nowadays it is widely accepted that the Master of Moulins is in fact Jean Hey (c. 1475–1505). In 1968, it was the French Primitive specialist Charles Sterling who first made a serious effort of comparing the panel *Ecce Homo* (Fig. 5e) with those in the oeuvre of the Master of Moulins. Sterling indicates similarities in facial features in the *Ecce Homo* painting and in the paintings by the Master of Moulins, such as the oblique eyes (Sterling, 1968, p. 31). It was the *Ecce Homo* panel that finally gave the Master of Moulins his name, because on the reverse of this Brussels's panel an original inscription was found, indicating its maker: Jean Hey.

2.1.4. *The Case of Rembrandt*

In the late 1960s, the Rembrandt Research Project (RRP) was launched, aiming to reassess Rembrandt's painted oeuvre. In October 2014, the sixth and final volume of the *Corpus of Rembrandt Paintings* was published. In it, its author, Ernst van de Wetering, has summed up the 'definite' oeuvre of Rembrandt paintings. The project's activities span more than 45 years, and include state-of-the-art technical research, the possibilities and quality of which improved alongside the project's progress. One might perhaps expect that the impact of the human eye as a tool of connoisseurship would, therefore, have decreased accordingly. This is not the case. Van de Wetering explains his research approach as a conglomerate of different methods, delivering pieces of evidence, each of which may, on its own, be insufficiently conclusive, while together they may force a decision in the one direction (Van de Wetering, 2014, p. 65).

A brief analysis on the methods used in the six volumes shows that face comparison is used throughout the project, and on a structural basis. Several terms indicate this activity, such as: physiognomy (in the texts the word occasionally refers to personality, but mostly it indicates facial features), facial likeness, facial features, and face or facial types. In the sixth volume alone, the method of face comparison occurs in more than 40 instances (Note 2). In all of these cases, the activity of comparing faces and facial features is demonstrated. The project has executed pictorial face matching both at the level of facial elements, and also holistically, where faces as a whole are compared. Some of the texts indicating the first type of face comparison are: "the relatively short upper lip and the small mouth with strikingly red lips and clearly marked paramedial points of the Cupid bow. One finds precisely these characteristics in [four other paintings]" (Van de Wetering, 2014, p. 665). The second sort of analysis is demonstrated through texts such as: "[...] the type of woman we often see in Rembrandt's single-figure history pieces or allegories. That is a somewhat plump type of face [...]" (Van de Wetering, 2014, pp. 526–527), and "[...] a woman with a strikingly round forehead and a broad face with fleshy cheeks. One finds the same facial type, showing similar physiognomic characteristics, in [...] and several of Rembrandt's paintings from the 1650s [...] and early 60s [...]" (Van de Wetering, 2014, p. 614).

Van de Wetering uses the tool of face recognition for paintings in and outside the genre of portraiture, as appears from this line in the fifth volume: "[...] But the differences in physiognomy between, for instance, the so-called 'Portraits' of [...] and, say, the 'Portrait' of [...] are so great that one can scarcely believe that it is the same woman who posed for these two paintings, even when one allows that these are tronies rather than portraits. There is also insufficient reason to identify the model for the Paris Bathsbeba as one and the same woman who might have sat for the two paintings cited above." (Van de Wetering, 2011, p. 526).

Perhaps it seems obvious that face recognition is used for portraits. In the fourth volume, dedicated entirely to Rembrandt's self-portraits, at least 30 separate instances relate to face matching. One must, however, realise that these faces are faces in a painting, not real or photographed ones. Even if a painted face was meant to represent the face of a particular person, it is still the product of paint on a flat surface. We have no way of knowing if and, especially, to what extent these portrayed faces look like the persons they represent. The same goes for models: the painter, obviously, was free in choosing the degree of likeness or deformation in representing a real face in paint. Also, as Van de Wetering points out on several occasions, Rembrandt's self-portraits show variations in facial features that nevertheless hint at belonging to one person, namely Rembrandt himself. Artistic will aside, there is also the issue of Rembrandt's talent, or rather lack thereof, to represent a person accurately, illustrated by Van de Wetering through a witty epigram by Constantijn Huygens that says how Rembrandt's portrait of Jacques the Gheyn would have been perfect, had The Gheyn's face looked like the one in the portrait (Van de Wetering, 2005, p. 211).

In the corpus, the tool of face recognition operates in conjunction with technical, archival, and documental research. The results of the activities are considered to have the same evidential value, judging from lines such as this one in volume VI: "The many overpaintings in the head complicate a reliable assessment of the physiognomy in the present painting [...]" (Van de Wetering, 2014, p. 640). It is demonstrated best, however, by the fact that the likeness of physiognomy, as well as the lack thereof, on several occasions contributes to a decision towards or away from attributing a painting to Rembrandt. Quite a literal example is shown in this line: "The proposed re-attribution to Rembrandt of this sketch rests on few arguments: the quality of the execution of the face and the facial likeness to Titus" (Van de Wetering, 2014, p. 669).

These examples and remarks on face matching as a tool used in the RRP clearly demonstrate the use of face recognition and imply that the skill is considered to be a valid means of connoisseurship.

2.1.5. Implications

The cases of connoisseurship used in the oeuvre catalogues and other outings of connoisseurship concerning the art of Rogier van der Weyden, Hans Memling, Jean Hey and Rembrandt demonstrate how connoisseurs have used faces to connect paintings to artists and vice versa, in various ways.

Connoisseurs compare faces as a whole, but they combine this with and also alternate between this and feature analysis. Since Galton (1907), it has been commonly accepted among psychologists that, in the process of identification, the face is perceived as a whole, not as a collection of separate traits (Sergent, 1984). However, holistic face perception—in which separate facial

features cohere into a Gestalt (Maurer *et al.*, 2002) and not as a collection of separate elements (Tanaka and Farah, 1993)—does not exclude the use of separate facial features in it, it merely means that their contribution to face identification is of a secondary nature (Tanaka and Gordon, 2011). It appears, therefore, that the identification of pictorial faces is somewhat analogous to that of real faces, although it is not clear whether connoisseurs use separate face analyses only in a secondary manner.

Although connoisseurs do make use of separate facial features, they rarely refer to the configural information of a face—concerning the shapes of and the relations between the separate features (Maurer *et al.*, 2002)—as a method of face comparison. They do not often use it as a specific means of analysis. Nor do they specifically compare relations between separate features of different faces, even though configural information is of essential importance for distinguishing between *a* face and a *particular* face, and therefore for spotting similarities between two faces (Diamond and Carey, 1986). Then again, it is perhaps quite understandable when one reckons the obscure and implicit nature of face comparison as an art historical method.

Besides using face comparison in various ways, connoisseurs occasionally refer to their application of the tool in various stages of their activities. Perhaps the most surprising result from analysing connoisseurship in relation to face comparison is that connoisseurs do not reflect on the fact that they apply their face recognition and face memory skills. Although, in volume IV of the Rembrandt corpus, Van de Wetering dedicates a separate paragraph to physiognomy and discusses it with great insight, and quite elaborately, he does not reflect on the skill and the use thereof. Instead, it is yet another example of Van de Wetering actually employing the skill as such.

The reasons why connoisseurs do not reflect on face recognition may be related to some of the characteristics of the perceptual skill. Firstly, it is an ability that most human beings apply with great ease, but precisely what is recognised, is less easy to put into words. Secondly, recognising faces is a universal skill, and therefore art historians may have considered it to be outside the realm of art historical study. Finally, art scholars and connoisseurs may find face recognition perhaps too much of an everyday ability in order to meet the bar of sophistication of art historical method. The latter notion automatically raises the question whether laymen can see what connoisseurs see when it comes to faces in paintings. In other words: are we all, potentially, connoisseurs when it comes to recognising faces in art?

3. Judging Face Similarity in Painting: An Experiment

An experiment was performed to establish whether paintings could be categorised on the basis of facial types in those paintings. When art connoisseurs

categorise paintings – in the process of attributing them to particular artists, workshops, schools, or followers – they use generic as well as professional specific perception skills. ‘Generic’ refers to the perception skills that connoisseurs share with most human beings. They are present from early on in a person’s life, and improve with experience throughout one’s lifetime (Scott, 2011). In art attribution, connoisseurs use generic skills to perceive basic visual information in paintings. Distinguishing between different colours and objects is an example hereof, and so is face recognition. A connoisseur analysing brush strokes, compositions, painting styles, and techniques, however, uses perception skills that are profession-specific. These skills may be rooted in generic perception, but they have been trained through the experience and knowledge gained from a connoisseur’s particular line of work. This ambiguity of the connoisseur’s eye is what makes it difficult to analyse his visual methods. The connoisseur uses the eye we all have, but he also uses the learned eye that has been trained to perceive visual information that is not obvious or incomprehensible for laymen.

Art connoisseurs, obviously, cannot turn off their profession-specific perception skills. Instead of with art connoisseurs, the experiment, therefore, was performed using laymen. Obviously, laymen performing face recognition tasks on faces in paintings do not use profession-specific perception skills because they do not have those skills. In order to make sure that these laymen use only face recognition skills, and no other elements to categorise the paintings, the faces were cut out from their backgrounds. By using isolated faces only, it may appear that art connoisseurs could be tested after all, but this is not the case, since it is highly likely that, even without their backgrounds, the cut-out faces would already be too familiar to art connoisseurs. In other words, they would have prior knowledge on which face is from which artist and categorise the faces accordingly, not by comparing the faces.

To rule out the possibility that laymen see a facial resemblance between the paintings due to the fact that the artists used an actual live model (portrait), the experiment was conducted using paintings for which artists relied on generalised facial types in their paintings.

3.1. Goal

The experiment aimed to demonstrate that laymen categorise faces that have been isolated from the paintings they belong to in the same way that these paintings have been categorised by art experts, based on the phenomenon that different groups of paintings share different facial types. A positive result means that laymen use their face recognitions skills to categorise the paintings, which in turn may suggest that art connoisseurs, too, use face recognition as a tool in their activities.

3.2. Method

In the experiment, 106 participants performed two different visual perception tasks. In the first task they had to choose ‘the odd-one-out’ from several rows of faces. In the second task they had to grade the likeness in several pairs of faces. The faces in both tasks were faces digitally cut from digital images of paintings (see Tables A1 and A2 in the Appendix).

3.3. Participants

In total, 106 people (39 men, and 67 women) aged 19 to 73 years old (M_{age} 39, SD_{age} 11.2) of various educational and professional backgrounds, took part in the experiment. They responded to the researcher’s personal invites in the public area (9), to the researcher’s personal invites in her personal network (21), and through invites by other participants in their professional and personal network (76). To ensure a population of participants with sufficient face recognition abilities, each participant also took the online Cambridge Face Memory Test (CFMT). In the CFMT, participants look at a target face from a left 1/3 profile, a frontal, and a right 1/3 profile view for 3 s. After this the target face is shown in a line-up of three faces, two of which are not the target face. Participants have to pick the target face from this line-up. This task is performed for six target faces. The task is then repeated with the same six target faces and novel line-up faces, only this time different levels of changed lighting and noise are added to the lined up faces (Duchaine and Nakayama, 2006). The online CFMT makes use of the faces from the Australian National University Face Database and the Glasgow Unfamiliar Face Database. In the online CFMT it is stated that a score of 60% or below may indicate prosopagnosia (i.e. the ability to recognise familiar faces is impaired). The CFMT scores of six participants (one man, five women) were 60% or below. Therefore, the results of these six participants were not analysed further. The same goes for four participants who did not perform the tasks correctly (in one or more face pairs, more than one box was checked, for example). These exclusions led to a total of 96 participants (37 men, and 59 women) in the experiment.

Participants were informed about the general theme of the experiment (face perception in art) through an e-mail (in which it was pointed out that partaking in the experiment implied their approval of their anonymised data being used for this and future studies on the subject). The e-mail contained instructions on where to find the online CFMT, and on how to approach and perform the two tasks: “the goal for you is to ask yourself if you see a resemblance. Therefore, look closely, but try not to overdo this. After all, ‘real face recognition’ is also fairly automatic. Please ignore differences in colour, contrast, and brightness of the images.”

3.4. Tasks

The experiment consisted of two visual perception tasks.

3.4.1. Task 1

The aim of the first task was to find out whether laymen perceive a difference between faces from two regions or ‘schools’ of painting, being those of the Northern/Southern Netherlands and Italian regions of the same era. In this task, participants were presented with three rows with four different faces each. For each row, participants were asked to indicate the face that least resembled the other three faces in the same row. Each participant was presented with the same faces, in the same order within each row, and the same order of rows.

3.4.2. Task 2

In the second task, the goal was to find out whether participants indicate a higher face likeness between two faces that are considered to be from the same artist, region or ‘school’, or circle of influence, according to art historical studies. Participants were asked to grade the degree of likeness in 12 pairs of faces. Participants had to choose from five scores: 1, very poor likeness; 2, poor likeness; 3, reasonable likeness; 4, good likeness; and 5, very good likeness). Each participant was presented with the same faces, in the same order within each pair, and with the same order of pairs.

3.5. Faces and Artists

The underlying assumption in the experiment is that the painters of a certain region or ‘school’ used one or more recognisable facial types that can be distinguished from facial types that were created and re-used by another region or ‘school’ of painting. The facial type(s) created by the so-called Early Netherlandish painters, for instance, can be distinguished from those that were created by Italian painters in the same era. The faces that were used in the experiment, therefore, come from Early Netherlandish and Italian paintings that were created between the late fourteenth and the early fifteenth centuries. Moreover, all of the faces that were used in the test are of the Madonna, so that we can be sure that the painters all aimed at representing the same type figure.

Besides the requirements of geography, time and subject, the faces were chosen according to a consistency of clarity and pose; all faces were presented in a right 1/3 profile view.

In the first task, the first and third row each consisted of three faces from Italian origin and one face from Early Netherlandish origin. The second row consisted of one face from an Italian painting and three from Early Netherlandish paintings.

In the second task, participants were confronted with 12 pairs of faces. Five of these pairs consisted of one face of Italian origin and one face of Early Netherlandish origin. In three cases both faces were of Italian origin, and in four cases both faces were of Early Netherlandish origin.

A total of 36 faces were used in the tasks (task 1: 3×4 faces; task 2: 12×2 faces), some of which were used more than once (in different rows of task 1 and in different pairs in task 2). In total 22 different faces, painted by 18 different artists were used. The Early Netherlandish painters involved were: Rogier van der Weyden, a member of Rogier van der Weyden's workshop, Hans Memling, Dirck Bouts, Hugo van der Goes, Jean Hey, Geertgen tot Sint Jans and Jan Massijs. The Italian painters involved were: Domenico Ghirlandaio, a member of Andrea del Verrocchio's workshop, Fra Filippo Lippi, Sandro Botticelli, a member of Lorenzo di Credi's workshop, Pinturicchio, Pietro Perugino, Raphael, and two anonymous Umbrian painters.

3.6. Face Presentation

The faces that were used in the experiment were cut out from digital images of the paintings they belong to, thus presenting them without hair, hats, clothes, compositional elements, backgrounds, and all other contextual information in the painting. The observer has no other object to observe and compare than the lines and shades that make up for the actual painted face. Firstly, all faces were converted from colour to black and white. Subsequently, the faces were cut out from their backgrounds by selecting the face contours and then cutting the selection out of the image. Finally, when the face was a left 1/3 profile view, it was mirrored horizontally into a right 1/3 profile view. These preparations were performed using Adobe Photoshop Elements 13, version 13.1 © 2001–2014.

3.6.1. Results

Descriptive and inferential analyses were performed using Excel® 2016 and IBM® SPSS® (version 24).

3.6.1.1. Task One: Choosing the Odd One Out. The results of the first task are visualised in Fig. 6. It is easy to see that the choices are not purely random (i.e., 25% for each face in a row) but also not perfectly correct (i.e., 100% for the odd one out based on an Italian or Early Netherlandish origin). The level of correctness varies considerably between rows (from 99% in the first row to 36.5% in the third row).

The lower performance for the third row can be explained by the style of the Early Netherlandish, correct odd-one-out face in this row. This particular face is of a style period that is labelled the Northern Renaissance, because painters

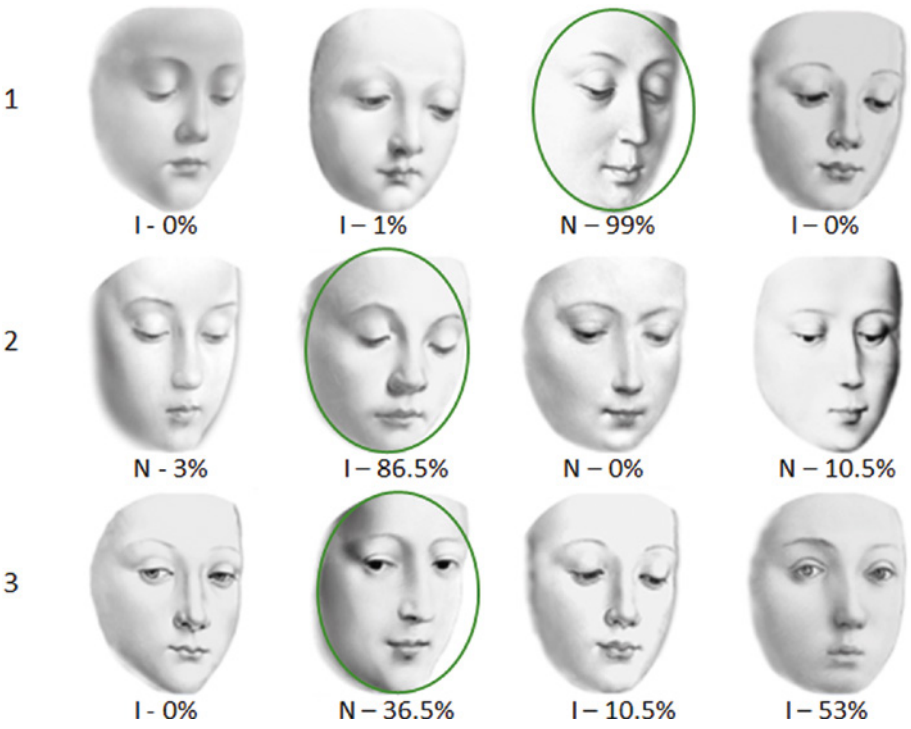


Figure 6. Task 1 results: the norm is encircled; The task results are indicated in percentages under each image. (I) Faces are of Italian origin; (N) faces are of Early Netherlandish origin.

from Northern Europe increasingly Italianised their paintings and came in contact with paintings from the Italian ‘school’. Their art shows stylistic influences from the paintings of Italian artists and workshops. Therefore, the face is the product of an ambiguous style: it has both Northern and Italian traits.

3.6.1.2. Task Two: Grading the Degree of Likeness. The results of the second task are visualised in Fig. 7. Of the 12 face pairs, seven are homogeneous (I–I and N–N) face pairs, and five are heterogeneous (I–N) face pairs. The mean rating for heterogeneous pairs is 2.0. The mean rating for homogeneous pairs is 3.8. A paired-sample *t*-test was conducted to compare the judgement of face similarity for the homogeneous face pairs ($M = 3.8$, $SD = 0.38$) with that of the heterogeneous face pairs ($M = 2.0$, $SD = 0.44$): $t(95) = 36.34$, $p < 0.0001$. This difference is highly significant.

Face pair 8 consists of faces from paintings by Jean Hey (left) and Hugo van der Goes (right). Art connoisseurs have repeatedly connected the two painters stylistically. Judging from the high score of likeness (4.0), laymen see a similar strong resemblance, just by looking at the faces.

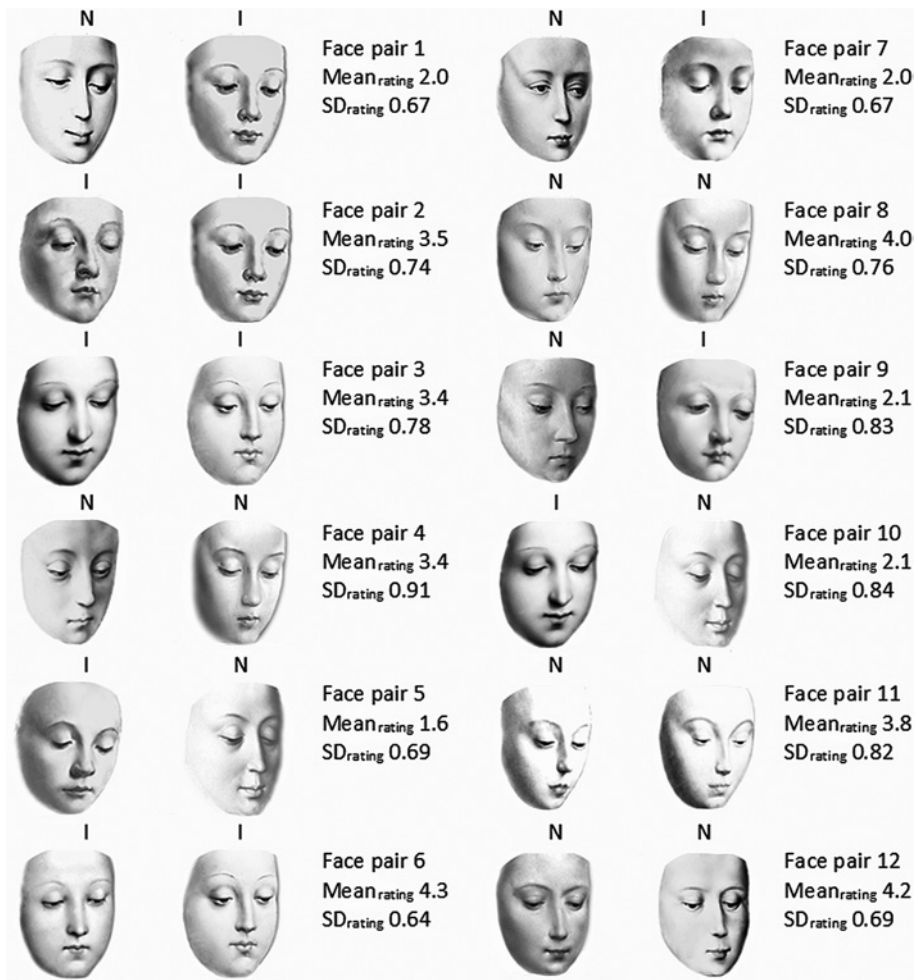


Figure 7. Task 2 results: norm grades per pair versus averages of all participants grades per pair (with corresponding face pairs). (I) Faces are of Italian origin; (N) faces are of Early Netherlandish origin.

Finally, among the highest and most conclusive scores on face resemblance is face pair 6 (average score of 4.3) with two faces by painters that connoisseurs believe to be connected stylistically. The left face in this pair is by Pietro Perugino while the right one is created by an unknown painter whom connoisseurs believe to have worked in Umbria. None of the participants scored this face resemblance with a 1 or a 2 score. The conclusiveness on good likeness is revealing, considering that art scholars stylistically place Perugino in the Umbrian ‘school’.

3.7. *Summary of the Experimental Results*

The results demonstrate that, in the vast majority of cases, laymen categorise faces that have been isolated from the paintings they belong to, in the same way that these paintings were categorised by art experts. Participants had only the faces from the paintings to categorise them. The experiment, therefore, sustains the notion that artists from different regions and ‘schools’ used and re-used recognisable pictorial facial types.

4. Conclusion

The survey of connoisseurs comparing faces in their art attribution activities suggests a high level of confidence in the skill of face recognition and the conclusions reached through it. The face perception experiment shows that laymen, on the basis of cut-out faces from paintings, come to the same categorisation as art connoisseurs did when they attributed these same paintings to regions and schools of painting. The combined results of the art-historical survey and the perception experiment demonstrate that the artists of the regions and schools involved used and re-used recognisable facial types and that, moreover, connoisseurs may make use of this apparent phenomenon.

The presence of these pictorial facial types has interesting implications, not just for attribution processes. The recycling of a facial type—by one painter in his oeuvre, but also by other painters in the same workshop or region of artistic influence, and even over barriers of time and geography—must have materialised in the field of painting somehow. Interesting questions, therefore, are: how did these face similarities become present in paintings, and: why? What determinants are involved in recurring facial types in painting?

Applying face recognition in art-historical methods is not without its challenges. It is not always easy, for instance, to express exactly what it is we see when we identify a face or spot face resemblances. Another difficulty lies in the nature of pictorial faces. They are not made up of bone, cartilage, muscle tissue, fat tissue, and skin. They are the product of paint materials, techniques, and styles. Although perception suggests otherwise, their genesis plays a part in dealing with them. The hybrid nature of pictorial facial types places them on the crossroads of art history and psychology of perception, and they can, therefore, only be discussed meaningfully taking both concepts of ‘faces’ into account. These kinds of problems demonstrate the necessity to study pictorial facial types and their art-historical implications, as well as a multidisciplinary approach thereof, combining theories of art history, psychology of perception, and preferably, computer aided pattern recognition.

The re-use of pictorial facial types has implications for three art-historical areas of expertise: art creation (including education), art reception, and art

authentication. We intend to study these implications in the context of the psychological workings of face perception, identification, and valuation (or attraction). Thus, the phenomenon of kindred faces in painting may be better understood by its purpose, workings and effects in art history.

Notes

1. Seventeenth-century art theorists Willem Goeree and Samuel van Hoogstraten also recognised similarities in (pictorial) faces. In their treatises they discuss the matter in terms of ‘zweem’ and ‘kroostkunde’.
2. These examples include references to face comparisons by prior Rembrandt connoisseurs.

References

- Benoit, C. (1901). La peinture française à la fin du XVe siècle (1480–1501), *Gaz. B.-Arts* **3**, 318–332.
- Berenson, B. (1962). *Rudiments of Connoisseurship. Study and Criticism of Italian Art*, Shocken Books, New York, NY, USA.
- Bock, F. (1900). *Memling Studien*, Schaub, Düsseldorf, Germany.
- Boëll, Ch. (1904). Notre rapport dans le procès-verbal de la séance du 16 juin 1904 *Mém. Soc. Éduenne* **32**, 438–440.
- Bouchot, H. (1904). *Les Primitifs Français. 1292–1500. Complément Documentaire au Catalogue Officiel de l'Exposition*, 2nd ed., Librairie de l'Art Ancien et Moderne, Paris, France, unpaginated (sections Table des Planches, and Planches LXXX, LXXXI and XXXVI).
- Châtelet, A. (2001). *Jean Prévest. Le Maître de Moulins*, Gallimard, Paris, France.
- De Vos, D. (1971). Madonna en kindtypologie bij Rogier van der Weyden en enkele minder gekende Flemalleske voorlopers, *Jahrb. Berl. Mus.* **13**, 60–161.
- De Vos, D. (1994). *Hans Memling. Het volledige oeuvre*, Mercatorfonds Paribas, Antwerpen, Belgium.
- Diamond, R. and Carey, S. (1986). Why faces are and are not special: An effect of expertise, *J. Exp. Psychol. Gen.* **115**, 107–117.
- Duchaine, B. and Nakayama, K. (2006). The Cambridge Face Memory Test: Results for neurologically intact individuals and an investigation of its validity using inverted face stimuli and prosopagnosic participants, *Neuropsychologia* **44**, 576–585.
- Friedländer, M.J. (1946). *On Art and Connoisseurship*, 4th ed., B. Cassirer, Oxford, UK.
- Fry, R. (1904). The exhibition of French Primitives. Part II (Conclusion). *Burlingt. Mag. Connoisseurs* **5**, 356, 359, 361, 363, 365, 367.
- Fry, R. (1906). The Maître de Moulins. *Burlingt. Mag. Connoisseurs* **9**, 331.
- Galton, F. (1907). *Inquiries into Human Faculty and its Development*, 2nd ed., J. M. Dent & Co, London, UK / Dutton & Co, New York, NY, USA.
- Gombrich, E. H. (1986a). Ideal and type in Italian renaissance painting, in: *Gombrich on the Renaissance. Volume IV. New Light on Old Masters*, Ernst H. Gombrich, pp. 89–125, Phaidon Press, London.

- Gombrich, E.H. (1986b). The mask and the face. The perception of physiognomic likeness in life and in art, in: *The Image and the Eye. Further Studies in the Psychology of Pictorial Representation*, 2nd ed., E. H. Gombrich, pp. 107–108, Phaidon Press, Oxford, UK.
- Hulin de Loo, G. (1902a). *De L'identité de Certains Maîtres Anonymes*, A. Siffer, Ghent, Belgium.
- Hulin de Loo, G. (1902b) *Bruges 1902. Exposition de Tableaux Flamands des XIVe, XVe et XVIe Siècles. Catalogue Critique*, A. Siffer, Ghent, Belgium.
- Lane, B. (2009). *Hans Memling. Master Painter in Fifteenth-century Bruges*, Harvey Miller, London, UK / Turnhout, Belgium.
- Mantz, P. (1878). Les portraits historique au Trocadéro, *Gaz. B.-Arts* **18**, 857–882.
- Maurer, D., Le Grand, R. and Mondloch, C. J. (2002), The many faces of configural processing, *Trends Cogn. Sci.* **6**, 255–260.
- Morelli, G. (1900). *Italian Painters. Critical Studies of their Works*. Translated from the German by Constance Jocelyn Ffoulkes, J. Murray, London, UK.
- Scott, L. S. (2011). Face perception and perceptual expertise in adult and developmental populations, in: *The Oxford Handbook of Face Perception*, A. J. Calder, G. Rhodes, M. H. Johnsons and J. V. Haxby (Eds), pp. 195–213, Oxford University Press, Oxford, UK.
- Sergent, J. (1984), An investigation into component and configural processes underlying face perception, *Br. J. Psychol.* **75**, 221–242.
- Sterling, Ch. (1968). Jean Hey Le Maître de Moulins, *Rev. Art* **1–2**, 27–33.
- Tanaka, J. W. and Farah, M. J. (1993). Parts and wholes in face recognition, *Q. J. Exp. Psychol.* **A 46**, 225–245.
- Tanaka, J. W. and Gordon, I. (2011). Features, configuration, and holistic face processing, in: *The Oxford Handbook of Face Perception*, A. J. Calder, G. Rhodes, M. H. Johnsons and J. V. Haxby (Eds), pp. 177–194, Oxford University Press, Oxford, UK.
- Tatler, B. W., Wade, N. J., Kwan, H., Findlay, J. M. and Velichkovsky, B. M. (2010). Yabus, eye movements, and vision, *i-Perception* **1**, 7–27.
- Van de Wetering, E. (2005). *A Corpus of Rembrandt Paintings, Vol. IV*, Springer, Dordrecht, The Netherlands.
- Van de Wetering, E. (2011). *A Corpus of Rembrandt Paintings, Vol. V*, Springer, Dordrecht, The Netherlands.
- Van de Wetering, E. (2014). *A Corpus of Rembrandt Paintings, Vol. VI*, Springer, Dordrecht, The Netherlands.
- Wind, E. (1963). *Art and Anarchy*, 3rd ed., Northwestern University Press, Evanston IL, USA.
- Yarbus, A. L. (1967). *Eye movement and Vision*, Plenum Press, New York, NY, USA.

Website

Cambridge Face Memory Test, Birkbeck University of London. Accessed March 11, 2016. <http://www.bbk.ac.uk/psychology/psychologyexperiments/experiments/facememorytest/startup.php>.

Appendix

Table A1.

The faces used in task 1 of the experiment are details of the following paintings

Row	Face 1	Face 2	Face 3	Face 4
1	Domenico Ghirlandaio, <i>Adoration of the Magi</i> , tempera and oil on panel, 1485–88, 285 × 243 cm, Ospedale degli Innocenti, Florence.	Lorenzo di Credi (workshop), <i>Madonna and Child</i> , tempera possibly mixed with oil on panel, 76.2 × 53.3 cm, J. Paul Getty Museum, Los Angeles, Inv. no. 70.PB.28.	Dirk Bouts, <i>The Virgin and Child</i> , c. 1465, oil with egg tempera on oak, 37.1 × 27.6 cm, The National Gallery, London, Inv. no. NG2595.	Unknown (Umbrian school), <i>The Virgin and Child</i> , c. 1473, tempera on wood, 48.3 × 36.8 cm, The National Gallery, London, Inv. no. NG2483.
2	Hugo van der Goes, <i>Monforte Altarpiece</i> , c. 1470, oil on oak wood, 147 × 242 cm, Gemäldegalerie, Staatliche Museen zu Berlin, Inv. no. 1718.	Sandro Botticelli, <i>The Virgin and Child with Two Angels and a Young St. John the Baptist</i> , c. 1470, tempera on panel, 85 × 62 cm, Galleria dell'Accademia, Florence.	Hans Memling, <i>Virgin and Child</i> , c. 1485, oil on oak, 44 × 32 cm, Museu Nacional de Arte Antiga, Lisbon, Inv. no. 1065 Pint.	Hans Memling, <i>Virgin and Child</i> , c. 1467, oil on oak, 40 × 29 cm, Musées Royaux des Beaux-Arts, Brussels, Inv. no. 3560.
3	Pinturicchio, <i>Virgin and Child with St. Jerome</i> , c. 1475–80, oil on panel, 52.7 × 39 cm, Museum of Fine Arts, Boston, Inv. no. 20.431.	Jan Massijs, <i>Judith with the Head of Holofernes</i> , 1543, oil on panel, 102.2 × 75.6 cm, Museum of Fine Arts, Boston, Inv. no. 12.1048.	Unknown (Umbrian school), <i>The Virgin and Child</i> , c. 1473, tempera on wood, 48.3 × 36.8 cm, The National Gallery, London, Inv. no. NG2483.	Fra Filippo Lippi, <i>Madonna and Child</i> , c. 1440, tempera on poplar panel, 79 × 51.1 cm, National Gallery of Art (Samuel H. Kress Collection), Washington, Inv. no. 1939.1.290.

Table A2.

The faces used in task 2 of the experiment are details of the following paintings

Pair	Left face	Right face
1	Rogier van der Weyden (workshop of), <i>Virgin and Child</i> , 1460–65, oil on panel, 38.4 × 28.3 cm, Art Institute Chicago, Inv. no. 1933.1052.	Unknown (Umbrian school), <i>The Virgin and Child</i> , c. 1473, tempera on wood, 48.3 × 36.8 cm, The National Gallery, London, Inv. no. NG2483.
2	Andrea del Verrocchio (workshop of), <i>Madonna and Child</i> , 147–75, tempera and gold on panel, 66 × 48.3 cm, Metropolitan Museum of Art, New York, Inv. no. 14.40.647.	Unknown (Umbrian school), <i>The Virgin and Child</i> , c. 1473, tempera on wood, 48.3 × 36.8 cm, The National Gallery, London, Inv. no. NG2483.
3	Raphael, <i>Madonna Terranuova</i> , c. 1505, oil on poplar wood, diameter 88.5 cm, Staatliche Museen zu Berlin, Inv. no. 247A.	Unknown (Umbrian school), <i>Madonna and Child with the Infant St. John</i> , 1500–25, tempera on wood panel, 55.2 × 43.8 cm, Philbrook Museum of Art (Samuel H. Kress Collection, Tulsa (OK), Inv. no. K-1154).
4	Hugo van der Goes, <i>Portinari Triptych</i> , c. 1473–78, oil on oak, 253 × 304 cm (central panel) 253 × 141 cm (each wing), Galleria degli Uffizi, Florence.	Hugo van der Goes, <i>Monforte Altarpiece</i> , c. 1470, oil on oak wood, 147 × 242 cm, Gemäldegalerie, Staatliche Museen zu Berlin.
5	Sandro Botticelli, <i>The Virgin and Child with Two Angels and a Young St. John the Baptist</i> , c. 1470, tempera on panel, 85 × 62 cm, Galleria dell'Accademia, Florence.	Dirk Bouts, <i>The Virgin and Child</i> , c. 1465, oil with egg tempera on oak, 37.1 × 27.6 cm, The National Gallery, London, Inv. no. NG2595.
6	Pietro Perugino (associate of), <i>The Virgin and Child with St. John</i> , 1480–1500, tempera on poplar wood, 68.5 × 44.5 cm, The National Gallery, London, NG181.	Unknown (Umbrian school), <i>Madonna and Child with the Infant St. John</i> , 1500–25, tempera on wood panel, 55.2 × 43.8 cm, Philbrook Museum of Art (Samuel H. Kress Collection, Inv. no. K-1154).
7	Rogier van der Weyden, <i>Diptych of Philip de Croij with the Virgin and Child</i> (left wing), c. 1460, oil on oak, 52.2 × 34.6 cm, The Huntington Library, San Marino (CA), Inv. no. 26.105.	Domenico Ghirlandaio, <i>Adoration of the Magi</i> , tempera and oil on panel, 1485–88, 285 × 243 cm, Ospedale degli Innocenti, Florence.
8	Jean Hey, <i>The Moulins Triptych</i> , c. 1497, oil on wood, 157 × 283 cm (central panel) Cathédrale de Notre-Dame-de-l'Annonciation de Moulins.	Hugo van der Goes, <i>Monforte Altarpiece</i> , c. 1470, oil on oak wood, 147 × 242 cm, Gemäldegalerie, Staatliche Museen zu Berlin.
9	Jean Hey, <i>Virgin and Child Adored by Angels</i> , c. 1490, oil on wood, 38.5 × 29.5 cm, Musées Royaux des Beaux-Arts, Brussels, Inv. no 3638.	Lorenzo di Credi (workshop), <i>Madonna and Child</i> , tempera possibly mixed with oil on panel, 76.2 × 53.3 cm, J. Paul Getty Museum, Los Angeles, Inv. no. 70.PB.28.

Table A2. (Continued)

The faces used in task 2 of the experiment are details of the following paintings

Pair	Left face	Right face
10	Raphael, <i>Madonna Terranuova</i> , c. 1505, oil on poplar wood, diameter 88.5 cm, Staatliche Museen zu Berlin, Inv. no. 247A.	Dirk Bouts, <i>The Virgin and Child</i> , c. 1465, oil with egg tempera on oak, 37.1 × 27.6 cm, The National Gallery, London, Inv. no. NG2595.
11	Geertgen tot Sint Jans, <i>The Adoration of the Magi</i> , c. 1480–85, oil on panel, 91.6 × 71.8 cm, Rijksmuseum Amsterdam, Inv. no. SK-A-2150.	Geertgen tot Sint Jans, <i>Virgin and Child</i> , c. 1485–95, oil on oak, 81 × 52 cm, Staatliche Museen zu Berlin, Inv. no. 1853.
12	Hans Memling, <i>Virgin and Child</i> , c. 1485, oil on oak, 44 × 32 cm, Museu Nacional de Arte Antiga, Lisbon, Inv. no. 1065 Pint.	Hans Memling, <i>Virgin and Child</i> , c. 1467, oil on oak, 40 × 29 cm, Musée des Royaux des Beaux-Arts, Brussels, Inv. no. 3560.