# Maori facial tattoo (Ta Moko): implications for face recognition processes.

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## Abstract

Ta Moko is the art of the Maori tattoo. It was an integral aspect of Maori society and is currently seeing resurgence in popularity. In particular it is linked with ancestry and a sense of "Maori" pride. Ta Moko is traditionally worn by Maori males on the buttocks and on the face, while Maori women wear it on the chin and lips. With curvilinear lines and spiral patterns applied to the face with a dark pigment, the full facial Moko creates a striking appearance. Given our reliance on efficiently encoding faces this transformation could potentially interfere with how viewers normally process and recognise the human face (e.g. configural information). The pattern's effects on recognising identity, expression, race, speech, and gender are considered, and implications are drawn, which could help wearers and viewers of Ta Moko understand why sustained attention (staring) is drawn to such especially unique faces.

The human face is an extraordinary communication tool. Its social significance is tremendous in terms of conveying both voluntary and involuntary information. A face indicates gender and race, as well as conveying the emotional state through facial expressions, and allows the owner to convey information through speech. Moreover, we are all experts in differentiating one face from another, which allows us to recognise individual faces despite faces being a homogenous group of stimuli. Taken together it is evident that face perception and recognition are invaluable processes.

Given the communicative nature of the face, it is fascinating to consider that the Maori art of the facial tattoo (*Ta Moko*) provides wearers with another means of communicating information through the face. However, to those unaccustomed to viewing faces with Moko it is possible that the intricate spiral and line patterns may disrupt typical face recognition processes, such as configural processing. This may explain why a face Moko might be viewed as appearing 'alien', in addition to the cultural/social novelty of encountering it.

This article intends to review the face perception literature with a view to theorising how viewing Moko may affect our face perception processes. The first part of this article will introduce the reader to the significance of Moko. The second part will review models of face recognition, and from there will discuss the components of these models and how Moko may relate to them: face recognition (including familiarity), expression, speech, race, and gender will be considered. The final section will summarise these postulations with suggestions for future experimental research and advice on informing potential Moko wearers of adaptation issues.

## Ta Moko

Traditional Maori tattooing (*Ta Moko*) was an integral aspect of Maori society before the arrival of European missionaries to Aotearoa/New Zealand in the nineteenth

century (Rua, Tuhoe, Awa, & Whakaue, 1999). Males with Moko were tattooed on the face and buttocks, and females on the chin and lips. The method of applying the Moko was through chiselling the skin with a dark pigment. This process led to blood being spilt, which made the process all the more *tapu* (sacred). In terms of facial Moko, Gathercole (1988) recognises the following elements of the curvilinear style:

> "spiral chin patterns; sets of parallel curved lines from the chin to the nose; multiple spirals on the cheek; nose spirals; and sets of curving lines from the inside edge of the eyebrows, rising above the brows and turning downwards over the ears. Patterns on the forehead and the area between the ear and cheek spirals completed the designs on a fully tattooed male." (p. 173)

To endure the process of having Moko carved into the face (it was sometimes necessary to feed the Moko owner through a tube due to swelling) and to then have this dramatic and permanent new appearance was and is to do something highly meaningful. This obviously is not a mere fashion statement, but a way to convey important information about identity, whakapapa (geneology), and status (Rua et al., 1999).[1]

On the face there are four major design fields for Moko: left and right forehead down to the eyes, the left, lower face, and the right, lower face. There are also a number of secondary design areas along the jaw-line, on the chin, by the ears, and on the upper forehead. However, for the most part the left and right areas are designed symmetrically (Simmons, 1986). The lines and spirals employed in the design follow a number of rules, including that "the motif follows the contours of the face, enhancing and tracing the natural 'geography'" (Simmons, 1986: p.25). Certain

divisions of the face contain key types of information. Simmons (1986) describes the divisions according to "Te tuhi Moko", where all divisions, except the first, are symmetrical for each side of the face:

"1. Ngakaipikirau, rank (centre forehead)
2. Ngunga, position in life (forehead)
3. Uirere, lines of rank by hapu [tribe] (eyes)
4. Uma, first or second marriage (temples)
5. Raurau, signature (nose)
6. Taiohou, work (cheek)
7. Wairua, mana [spiritual authority](chin)
8. Taitoto, position at birth (jaw)." (p. 131)

On reflection it may seem a rather meagre offering that for most of us our face only informs others of our gender and race, where should a stranger wish to know more then they have to enter into a dialogue with us. According to King (1978: p.14) the significance of the Moko was so great that "Many nineteenth-century chiefs chose to sign documents such as land deeds and the Treaty of Waitangi with their Moko in preference to a signature so as to increase the tapu of the document."[2]

Aside from the aim of displaying information of identity, status, and genealogy, other observations have been made as to the effect (or benefit) of Moko. Jackson (1972) observed the following explanations: (1) it made facial painting more enduring; (2) it disguised age by marking the natural lines of the face, and (3) it provided a way to differentiate tribes and chiefs from one another. However, the issue of identity, status, and genealogy clearly seems to be the prominent driver.

While Moko was suppressed as an activity with the arrival of nineteenth century missionaries, the art of the facial Moko is still worn by some Maori today, albeit not so prevalent. In fact it is claimed that over the last fifteen to twenty years there has been a rise in the number of people acquiring Moko in order to symbolise Maori pride and identity, and that "it is at the forefront of Maori activism and a focus for media attention." (Rua et al. 1999: p.2). However, this resurgence has at times been met with "societal scepticism and trepidation" (Rua et al., 1999: p. 2).

Naturally, the appearance of a fully tattooed face is strikingly unusual when viewed by people of cultures that do not have such a tradition and this of course is true for people from Western traditions. Hence, it follows that such scepticism and trepidation might arise in terms of perceiving different cultural norms. However, aside from the cultural distinction in traditions, the transformation of a face from having the regular configuration (two eyes above a nose that is above a mouth presented on a uniform background) to a face containing additional lines and spirals that may appear to create new and additional features could present difficulties for what is typically a visual system with face expertise.

Evidence that some reactions to Moko may stem from perceptual difficulties in encoding the face come from case studies of Moko wearers who have observed people's initial reactions. Rua et al. (1999) provided an example of a Moko wearer who found that people liked his 'in progress' Moko as it still allowed people to see his face:

"A lot of them go to me 'gee that's beautiful. Well balanced and there's not too much.'….Some Moko when you look at them you can't see the person. You can't see the face….But with mine you can see my face, you can see who I am…" (p. 5)

Moreover, even for the wearer of the newly acquired Moko a process of adaptation is needed and this can be a major challenge in life. For example, one wearer commented: "…I had to get used to having it myself. That was the biggest thing I've ever had to deal with. The biggest challenge was having this permanent addition to my appearance." (Rua, et al., 1999: p. 6). It is quite apparent that the application of Moko brings about quite a transformation to a face. However, in what way might the Moko patterns affect our face recognition processes?

## Face Recognition

According to functional models of face recognition there are a number of components involved in visual facial analysis (Bruce & Young, 1986, Ellis & Young, 1990). Recognition is considered to occur from any type of stored visual information (including seven types of code: pictorial, structural, visually derived semantic, identity-specific semantic, name, expression, and facial speech) extracted from faces that leads to an interaction with a number of these functional components. Most relevant to this discussion is the role of the 'structural codes', where the essential details that differentiate one face from another are encoded. It is these codes that are proposed to mediate everyday recognition of familiar faces and produce different codes to those of unfamiliar faces, as experience over time permits them to be elaborated and represented within recognition units. A familiar face is represented through an inter-linked set of expression-independent structural codes, which contain information on head-angles, global configurations, and distinctive features. However, according to this model there are two face processing routes. The first route, as described, mediates recognition of familiar faces, while the second route involves view-centred descriptions that function irrespective of familiarity and provide analysis

of expression, facial speech, gender, and race. I will address the issue of familiarity first, and then address each of the aspects of the view-centred descriptions in turn.

**Familiarity**

In discussing face recognition and our ability to easily become familiar with the faces of different individuals, it is important to reflect on the fact that despite the overall similarity of each face with every other face (e.g. two eyes, one mouth, one nose, two ears etc), we are better at discriminating and recognising faces than we are other objects (Yin, 1969). However, this is only true when such items are displayed in their familiar orientation (e.g. upright), as Yin's (1969) face inversion effect reveals that when items are presented upside-down then faces no longer maintain their advantage. Moreover, if the eyes and mouth are placed upside-down in a face it looks noticeably strange when the face is upright. However, if the face is inverted there does not on initial examination seem to be anything strange about the image. This "Thatcher illusion" demonstrates faces are difficult to recognise when inverted compared to upright (Thompson, 1980). Similar effects to inversion have been obtained by disrupting configural information through misaligning parts (Moscovitch, Wincour, & Behrmann, 1997; Nakayama, Shimojo, & Silverman, 1989), exploding, (Farah, Tanaka, & Drain, 1995), and scrambling (Tanaka & Farah, 1993). These observations have provided researchers with a strong indication of how our processing expertise for recognising faces arises.

The main theory for the face inversion effect is that face perception involves a greater reliance on configural information than on component featural information (e.g. Farah et al, 1995; Moscovitch et al., 1997; Nakayama et al., 1989; Tanaka & Farah, 1993). When faces are inverted the familiar arrangement of facial features is disrupted. Whereas the information extracted from other types of object tends to be

based more on individual features than configuration and is therefore less affected by inversion. However, the term *configural* does not in itself determine in what way we might process faces configurally. Consequentally, Leder and Bruce (2000) distinguish between two possible explanations. One is that faces are processed holistically, as gestalts, where neither the features nor the spatial relations between the faces are explicitly represented. Support for this view comes from correlations between successful reconstructions using principal components analysis (PCA) and human memory for individual faces (O'Toole, Deffenbacher, Valentin, & Abdi, 1994). PCA uses *eigenfaces* to encode lower-order (that capture most of the variance between a set of faces) and higher-order (idiosyncratic details within the face set) components of a set of faces. The eigenface representation is an efficient way to code large numbers of faces, where only the stored weights for each face are needed along side the encoded eigenface image for recognition to occur.

Alternatively, *relational* processing may occur, where emphasis is placed on representing spatial relations between different local features (Diamond & Carey, 1986). Leder & Bruce (2000) tested the inversion effect on two types of facial stimuli: a set of faces that consisted of faces with the same local features but different relational information, and a set of faces that consisted of faces with the same spatial information but different local details. Hence, the two sets did not differ holistically. Only the first set of faces produced the typical face inversion effect. This is entirely consistent with a relational processing account, as the faces that demonstrated an inversion effect only differed in terms of relational information.

The reliance on configural processing in face perception is not only important for recognising a face as a face, or distinguishing one face from another, but is also implicated in recognition of familiar, including highly-familiar, faces (Buttle &

Raymond, 2003; Tong & Nakayama, 1999). When we encounter a face for the first time or we have only met a person a few times, there appears to be a tendency to recognise faces through the encoding of the face's external features, such as the hair. However, with increasing familiarity with a face the reliance on external features for recognition is replaced by a reliance on configural processing of internal features (Buttle & Raymond, 2003; Ellis, Shepard, & Davies, 1979; Nachson, Moscovitch, & Umiltá, 1995; Young, Hay, McWeeny, Flude, & Ellis, 1985). The reason why processing and recognition strategies change with increased familiarity seems to be due to the processing benefits of familiar and in particular *superfamiliar* face stimuli (Buttle & Raymond, 2003; Tong & Nakayama, 1999). Tong and Nakayama (1999) suggest that familiar faces require less attentional resources to process and that highly familiar faces are processed faster and/or more efficiently that unfamiliar faces. Moreover, the mechanism for achieving this benefit has been proposed to involve configural processing. Buttle & Raymond (2003) were able to demonstrate a *superfamiliarity* effect using a change detection task, whereby highly familiar faces were detected undergoing a change more accurately than unfamiliar/recently learned faces. However, this advantage only held when presented in their upright orientation; when the faces were inverted, thus disrupting configural processing, the difference between familiar and unfamiliar faces was attenuated. Hence, research evidence suggests that we rely on configural information to process and recognise familiar faces, and that a face which has this information disrupted may lead the observer to have difficulty processing the face.

That disruption to configural processing may hinder face recognition has implications for how a person may react to a familiar, but now altered face, such as the effect of newly applied Moko. For instance, the *discrepancy-attribution*

*hypothesis* (Whittlesea & Williams, 1998, 2000, 2001a, 2001b) indicates that if a stimulus is processed fluently and yet the stimulus is barely familiar, participants will nevertheless attribute familiarity to that stimulus. If an easy to process but unfamiliar stimuli is experienced as familiar, it is possible that hard to process but familiar stimuli maybe experienced as unfamiliar.

Moreover, research using scrambled faces which have only a couple of features out of position, suggests that moderate alterations to the configuration of a face also lead to sub-optimum processing (Donnelly, Humphreys, & Sawyer, 1994). Donnelly et al. (1994) argue that while upright and inverted faces are categorised by being matched in parallel to a stored mental representation, scrambled faces are categorised following a serial search of facial features. Hence, their results showed that on a categorisation task of face/scrambled decisions, moderately scrambled faces were slowest to be categorised. This indicates that even moderate transformations (one or two features) of face stimuli can have noticeable effects on face processing abilities.

When taken together the research on configural processing and the effects of facial alterations on familiarity indicate a number of potential implications to wearers and potential wearers of Moko. Regardless of which theory of configural processing is more correct (holistic or relational accounts), the face of a Moko wearer may lead to sub-optimal processing for viewers who 1) have not had experience of and adapted to encoding faces with Moko, and 2) though familiar with a face before Moko is applied then have to adapt to the Moko version. Note that this latter possibility may include the wearer himself and be irrespective of familiarity with Moko faces.

The key aspects that might affect processing are the effects of shading contrasts created by the addition of dark lines and curves. This may alter the perceived

salience of features (making them either more exaggerated or less prominent), making it harder to recognise a known face as being familiar once the Moko is applied, and/or making faces with Moko harder to distinguish from one another. Hence, the addition of new features, such as spiral patterns, may make it harder to distinguish the facial features from the Moko patterns and create an effect similar to scrambling that disrupts configural processing. Therefore, viewers may have to rely on serial processing strategies that use features rather than the more efficient configural processing routes when perceiving faces with Moko, at least until adaptation has occurred.

Note that if a viewer has only ever experienced one face with Moko then the distinctiveness effect would predict that this one face would be easily recognised again (Brigham, 1990; Shepherd, Gibling, & Ellis, 1991; Valentine, 1991). However, as regards familiarity in before-and-after situations and where many faces may have Moko then sub-optimal processing may occur. This may involve viewers needing to take longer to look at a face. Hence, staring may occur that makes the wearer feel as if they are being viewed as 'alien'.

Furthermore, when considered in terms of the configural accounts identified earlier (holistic and relational), both accounts would suggest that the application of Moko to a face would potentially create processing difficulties for viewers in the short-term. There are two potential problems that might occur in terms of the holistic account: i) the previous weighting of a face's components may become obsolete. The addition of spiral patterns to the face, may make higher order component weightings briefly confusable, as the usual weightings for two eyes may be mistaken with spirals, suggesting 3 or 4 eyes rather than 2, and ii) because of the extra information contained on Moko faces, the coding of higher-order components would have to contain more

detail. Thus the stored weightings would have to increase to allow for a number of additional elements that are not common to all faces.

Similarly, the relational processing account would also be potentially affected by the addition of Moko to a face, as i) there are more features, and therefore more relations between features to be calculated, and ii) some Moko patterns may be more noticeable than some regular facial features, making the face seem scrambled as regards relations and orders between features.

In summary, Moko may disrupt our configural processing strategies for faces. Thus, familiarity and recognition becomes sub-optimal, requiring increased attentional resources to be allocated to face processing, until a viewer has adapted to the new presentation of the face or faces.

**Facial Expressions**

Recognising and correctly interpreting the facial expressions of others is a valuable skill for understanding and reacting to people's emotional states. For example, faces can inform whether others are delighted to see us and we should approach, or whether others are angry and we should avoid them. The expressions that convey these emotions have been classified into six universal categories that vary little across cultures: fear, happiness, anger, disgust, sadness, and surprise (Ekman & Friesen, 1975; Izard, 1971). Humans, therefore, should benefit from a visual system that is able to quickly and efficiently process and distinguish between these expressions.

Quite clearly it is highly beneficial to efficiently encode the emotions portrayed by emotional expressions, but what we need to consider is how the application of Moko might affect this process. Calder, Young, Perrett, Etcoff, and Rowland (1996) created morphed photographic images of faces to examine

categorical perceptions of facial expressions. This included manipulating shape cues, such as raising/lowering eyebrows and corners of the lip, and widening/narrowing the eyes, as well as altering cues relevant to pigmentation and texture, such as opening/closing the mouth and baring the teeth. Two sets of stimuli were created: one where the faces retained their shape but pigmentation changed, and one where the pigmentation was retained but shape was changed. Notably, as Bruce and Young (1998) observe, both shape and pigmentation cues make a contribution to our ability to recognise emotions. However, shape seems more important. Moreover, Bruce & Young suggest that

> "the way we recognise facial expressions is through combinations of features which have become communicative signals…Each of these features may itself be encoded as a continuous dimension, but the effect of using several different dimensions simultaneously is to create distinct categories based on specific feature constellations…An implication is that recognising expressions is not dependent only on the presence or absence of a single feature." (p. 202)

It is interesting to observe that the recognition of emotional expression relies on 'feature constellations', as this implies that the arrangement or configuration of features is crucial. Therefore, again we need to consider the impact of Moko. Although the pigmentation changes would appear to have only a marginal effect on emotion recognition, if the pattern interfered with the interpretation of the features' shapes then encoding of emotional expression could be disrupted.

Calder, Young, Keane, and Dean (2000) examined configural processing of emotional expressions in a series of studies, using composite faces, where the top of

one face and the bottom of another face are formed to create another face, either aligned or misaligned (the top half is slightly offset from the bottom half). These composite faces were originally used by Young, Hellawell, and Hay (1987) with faces of different individuals on an identity task, where it was observed that the face halves were easier (faster) to identify when shown in the misaligned image than the aligned image. The explanation being that the aligned version created a new configuration and a new face, making it harder to identify the individual part. That configural information was key was tested by inverting the stimuli and observing the attenuation of the effect.

Similarly, Calder et al. (2000) used images of the tops and bottoms of faces to create composites on an expression judgment task. They demonstrated, just as had been shown previously with identity tasks, that expression judgments were slower when the aligned composites were shown compared to the noncomposite images, and that this effect was attenuated by inversion. However, the striking finding was that although both identity and expression judgments were affected by these manipulations of configural information, the type of configural information used in these respective tasks was different. This demonstrated "the participants' ability to selectively attend to different types of configural information; one relating to the representation of facial identity the other to the representation of facial expression" (Calder et al., 2000).

That there is a difference in the type of configural information used led Calder et al (2000) to propose that attention to first- and second-order relational properties, as identified by Diamond and Carey (1986) may account for the difference. Identity processing uses second-order relations between features (e.g. configural features that distinguish one identity from another), while expression processing may use first-order relations (e.g. interfeature relationships that are common to all faces) where

each emotional facial expression is associated with its own average configuration. If this is the case then the affect of Moko on configural processing may apply to both expression and identity recognition depending on whether the first- and/or second-order relationships are disrupted. Note this is in addition to any perceptual change that may occur to make an individual feature harder to judge.

In summary, just as judgments of familiarity and identity are influenced by configural processing and therefore potentially disrupted by the application of Moko, so to, albeit in a different way, are judgments of facial expression. Both identity and expression recognition are key processes for interacting with others and changes to these types of facial information by Moko is certainly worth the potential wearer considering before embarking on a permanent transformation.

**Race**

Our ability to encode and remember faces can also be affected by the race of the face being encoded and remembered. Generally, it has been found that faces of one's own race are remembered better than faces of another race (e.g., Meissner, Brigham, & Butz, 2005; Sporer, 2001). This finding has been given a variety of terms including the *cross-race effect*, the *own-race effect,* and the *other-race effect*. So how the face of a wearer of Moko might be perceived partly depends on whether the race of the wearer and the viewer are the same or different. However, by changing the face so dramatically it is possible that Moko creates a new type of face equivalent to viewing a new race. To evaluate this supposition it is important to consider the different theories that have been proposed to account for the cross-race effect.

One perspective on the cross-race effect is that of interracial contact. Malpass (1981, 1990) suggested that the more interracial contact that takes place the less likely there was to be a cross-race effect as stereotypic responses would be reduced while

emphasis on looking for individuating information would increase (including a heightened motivation to do so). Moreover, Goldstein and Chance (1971) suggested that interracial contact reduces the perceived complexity of other-race faces. To support these contentions, Meisnner & Brigham (2001) conducted a meta-analytic study of such research and found that interracial contact accounted for 2% of the variance. Although this is a small portion of the variance it was significant, suggesting that interracial contact is a valid explanation of the cross-race effect, but that other factors also contribute.

Similarly, there is evidence that the distinctiveness effect interacts with contact with other races. Chiroro and Valentine (1995) demonstrated that distinctiveness effects for 'low-contact' individuals were confined to own-race faces, whereas 'high-contact' individuals demonstrated the effect regardless of race. This explanation also fits well with our understanding of familiarity and face perception; indicating that Moko wearers' faces would need to be encountered on a regular basis for memory of individual faces to become optimal.

Alternatively, cognitive disregard and categorization effects suggest that the cross-race effect stems not necessarily from poorer memory for other-race faces per se, but more from attentional factors that lead to an encoding bias (Levin, 1996, 2000; MacLin & Malpass, 2001; 2003). The suggestion is that there is an automatic inclination to categorize other-race faces, as if the race becomes a feature. If attention is focused on encoding the race of a face then those diverted cognitive resources are unable to be allocated to the encoding of individuating information. Likewise, encoding of faces with Moko may divert viewers' attention away from the individuating features of the face and more toward the encoding of "a face with tattoo" as a feature. Again this jeopardizes the possibility of someone unfamiliar with

the face recognising the individual on another occasion, and may lead to confusion between a number of faces that all bear Moko.

Considering the importance of configural information in perceiving both identity (familiarity) and expression information in facial stimuli, it is perhaps not surprising that configural processing explanations have also been offered to account for the cross-race effect. Rhodes, Brake, Taylor, and Tan (1989) reported that own-race faces were significantly more susceptible to the inversion effect than other-race faces, arguing that the greater experience with own-race faces would lead to a greater reliance on configural information that in turn would lead to greater disruption when the faces were inverted. However, other researchers have been unsuccessful in finding this relationship (e.g. Buckhout & Regan, 1988). Moreover, Meissner, Brigham, and Butz (2005) failed to find support for a configural account in their studies involving face rating (distinctiveness, likability, attractiveness, memorability, and familiarity) and recognition.

Of further interest is that Meissner et al.'s (2005) study also failed to find support for the role of racial stereotyping. Instead they argue that the cross-race effect is due to efficient encoding-based processing of own-race faces. Emphasis in this regard is placed on the greater qualitative selection of facial information and the allocation of sufficient attentional and cognitive resources to successfully store and recall own-race faces in comparison to other-race faces. In considering people's reactions to seeing a face with Moko, the research literature regarding race effects on face perception (and as suggested by familiarity and expression evidence) suggests it is clearly important to emphasize that their reactions, such as staring, may be based more on their difficulty in encoding the face than it is necessarily on a prejudiced or stereotyped reaction.

**Perception of gender and speech**

As well as communicating information on identity, familiarity, emotional expression, and racial category, faces assist in judging the gender of an individual and in interpreting speech. Even with obvious external details removed (e.g. hairstyle, make-up etc.) people are extremely good at correctly judging the gender of a face. For example, Burton, Bruce, and Dench (1993) demonstrated that people could classify the gender of faces (94% correct) using only a combination of sixteen local features and complex three dimensional details. Although Moko may have some effect on gender judgments (if worn fully by both males and females) the fact that traditionally women only have the chin and lips tattooed limits the impact on this aspect of face recognition.

Similarly, interpretation of facial speech is likely to be only marginally affected by Moko, given that visual speech perception relies on just the lips, teeth, tongue, and jaw movement (Bruce & Young, 1998). Nevertheless, evidence that categorizing race can divert attention may also mean that a 'Moko' category face may have attention diverted to the pattern and away from information regarding gender or speech recognition.

## Discussion

Given the serious decision to have a permanent tattoo engraved on the face in the form of Moko, it is important that someone who wishes to identify their ancestry and/or Maori pride in such a way be prepared for the transformation that is to take place: this includes the new appearance, their place in the world, and the assumptions, expectations, reactions, and consequences that arise from others (Rua, Nikora, & Te Awekotuku, 2004). Hence, coping strategies are needed for the potential wearer of newly acquired Moko and this includes seeking information (Rua, et al., 2004). In

particular, it is of immense benefit for wearers to have an understanding of the history and culture of Moko. This creates a sense of responsibility for the wearer and encourages them to enter into educational dialogue with those who are curious about Moko. However, Rua et al (2004) also highlight the 'dangerous' aspect of adapting to the "new face" through the discourse of a Moko wearer, who explains: "For the first 2 or 3 months – that is the most dangerous time for when you actually get one. For your own self. It's not so much about the people, or their first reaction. It's you." This need for the wearer to become accustomed to their own face indicates that alongside knowledge of history and culture it would be beneficial to inform wearers of how their face recognition processes will have to adapt to their new appearance.

Considering the extensive literature on face recognition regarding familiarity, expression, race, gender, and speech it has been possible to suggest ways in which face recognition may be affected by encountering a face with newly acquired Moko. In particular, it has been posited that configural information may be disrupted by the addition of extra spiral patterns and features. Given that configural processing appears to be the key to our ability to efficiently process faces, this disruption to configural processing may account for perceptual problems in adjusting to faces with Moko. Specifically, this may affect either identity/familiarity processing and/or emotional expression processing, depending on whether first- or second-order relations are disrupted. It is also likely that the attention given to the new pattern will distract from processing of the usual face cues and lead viewers to take longer to encode the face and hence they may find themselves staring.

If potential wearers of Moko understood these implications it might make the transition period more understandable and help with their coping strategies. While this article offers theoretical speculation concerning the effects of Moko on face

processing, it would be interesting to test them in an experimental setting. However, researchers are becoming increasingly concerned that people are misappropriating Moko, and suggest that there is "a need for more information in the wider community about Moko, both here [New Zealand] and overseas" (Ta Moko org.nz, 2006). Hence, any experimental work regarding Moko would have to be respectful of the cultural heritage of Moko and either seek permission to use traditional patterns, or create modern imitations of such stimuli with Maori consultation involved. This research could help potential wearers of Moko understand the perceptual adjustment that will have to be made in accepting their "new face" and more broadly it will help educate the wider community about Ta Moko.

## Endnotes

[1]Some 21st century celebrities are wearing pseudo-Moko, which shares some similarities with Moko (e.g. black pigmented lines) either through imitation or coincidence, but are not truly representative of traditional Moko. For example, the boxer Mike Tyson has a partial face tattoo consisting of black geometrical lines. However, traditional Moko is curvilinear in style.

[2]The Treaty of Waitangi is a highly significant document within New Zealand. The Treaty agreement (relating to land settlement) was signed between Maori leaders and the British crown in 1840 and is still referred to in legal issues relating to land, including the Waitangi tribunal, which attempts to resolve land claims.

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