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Face piercing (body art): choosing pleasure vs. possible pain and posture instability

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Piercings (body art, i.e., with jewelry) are more and more widespread. They can induce various complications such as infections, allergies, headaches, and various skin, cartilage, or dental problems, and represent a public health problem. We draw attention to possible side effects resulting from face piercing complications observed on four young adults such as eye misalignment, decreased postural control efficiency, and non-specific chronic back pain with associated comorbidity. We found that the origin was pierced jewelry on the face. Removing the jewelry restored eye alignment, improved postural control, and alleviated back pain in a lasting way. We suggest that pierced facial jewelry can disturb somaesthetic signals driven by the trigeminal nerve, and thus interfere with central integration processes, notably in the cerebellum and the vestibular nucleus involved in postural control and eye alignment. Facial piercings could induce sensory–motor conflict, exacerbate, or precipitate a pre-existing undetermined conflict, which leads pain and complaints. These findings are significant for health; further investigations would be of interest.

Keywords: piercing, back pain, trigeminal path, vertical heterophoria, postural instability

INTRODUCTION

Piercings (body art) are more and more widespread, and can induce various complications such as infections, allergies, headaches, various skin, cartilage, or dental problems which will lead to economic effects on health-care systems (e.g., Mayers et al., 2002; Stirn, 2003; Bone et al., 2008).

To maintain the center of body mass in equilibrium while standing, the central nervous system performs coordinated transformations of visual, vestibular and somaesthetic inputs (see Ivanenko et al., 1999), and permanently generates muscular response adapted as corrective torque through the action of a feedback control system (Peterka, 2002; Todorov, 2004).

Vertical heterophoria (VH) and vertical orthophoria are respectively the presence or the absence of a relative deviation of the vertical visual axes when the retinal images are dissociated, i.e., each eye views a different image (see Amos and Rutstein, 1987). VH can be induced by eye refraction problems (Amos and Rutstein, 1987), but without refraction problems, VH of small size (<1 dpt, i.e., 0.57°) could exist indicating a perturbation of the somatosensory loops involved in postural control (Matheron and Kapoula, 2008, 2011). In subjects with VH in this normal range, postural stability was impaired relative to subjects with vertical orthophoria; the cancelation of the VH with an appropriate vertical prism improved postural stability (Matheron and Kapoula, 2008, 2011). The influence of VH was explained by among other possibilities: the colliculus superior, the brainstem nuclei, and the cerebellum receiving visual, extraocular muscles and somatosensory inputs, implied to the vestibulooocular, the vestibulospinal and the reticulospinal systems required in phoria adjustment, vertical binocular alignment, and postural control while standing (see Büttner-Ennever, 2006; Matheron and Kapoula, 2008).

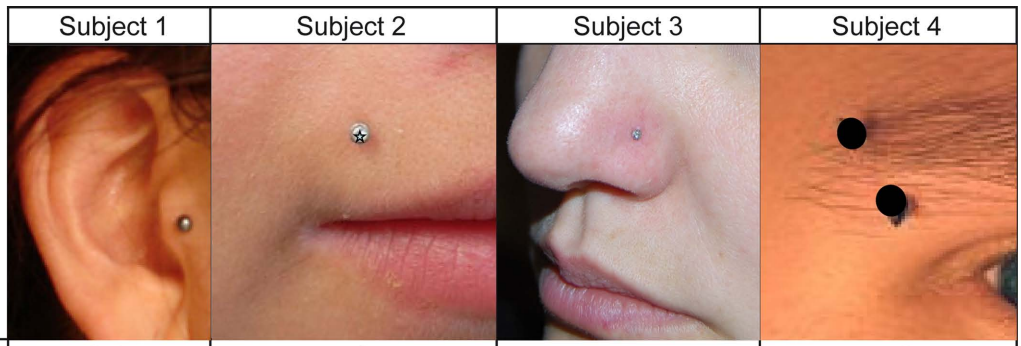
We hypothesized that pierced facial jewelry disturbed somaesthetic signals driven by the trigeminal nerve, and might be related to interference in central integration processes leading to various complaints. Here, we draw attention to the possible side effects resulting from facial piercing (with jewelry) complications such as eye misalignment, decreased postural stability, and non-specific chronic back pain.

MATERIALS AND METHODS

Four subjects wearing facial jewelry pierced in eyebrow, tragus, upper lip, and nose (**Figure 1**) retained our attention; they suffered from non-specific chronic back pain with an additional comorbidity such as dizziness, headache, or eyestrain known in non-specific chronic back pain (Von Korff et al., 2003; Hagen et al., 2006), associated with a VH (Matheron and Kapoula, 2011). They did not wear glasses, so there were no prismatic effects and thus no induced vertical eye deviation. Vision was normal with no history of strabismus, double vision, nor any other manifest ocular disease. Medical consultation and complementary examination (e.g., radiographic imaging, magnetic resonance imaging, or blood analysis) did not report any findings (anatomical, neuropathy, or rheumatism).

Pain was evaluated using a subjective visual analogical scale of 10 cm (0–10, "0" as no pain and "10" as the extreme of pain; Huskisson, 1974) validated for chronic pain (Price et al., 1983). See **Figure 1**.

Vertical heterophoria was detected, and measured for all the subjects as less than 0.57° with the Maddox Rod Test, combined



	Subject 1	Subject 2	Subject 3	Subject 4
a	6.1	5.2	5.5	4.8
b	0.0	2.4	0.0	0.3

FIGURE 1 | Pierced jewelry on the face of each subject. Pain score evaluated with a subjective analogical scale on the first day before the jewelry was removed **(A)**, and when each subject was checked on average 3 weeks later without the jewelry **(B)**.

with an appropriate prism value, which is one of the most appropriate tests (Wong et al., 2002).

Postural performance during quiet standing was investigated through the center of pressure (CoP) displacements recorded using a force platform (principle of strain gage) consisting of two dynamometric clogs (TechnoConcept, Céreste, France). The excursions of the CoP were measured over a period of 25.6 s while the subjects looked at a target, a letter "x" (angular size = 1°), 200 cm away at eye level; the equipment contained an Analog–Digital converter of 16 bits and the sampling frequency of the CoP was 40 Hz. The subjects wore a special spectacle into which one could easily insert or not a vertical prism, and were placed barefoot on the force platform. They stood in a quiet upright and standardized position (feet placed side by side, forming a 30° angle with heels separated 4 cm). They were asked to look at the "x" target in the straight ahead position.

The conditions were: (1) with jewelry: eyes open, eyes open with a prism to cancel the VH, and eyes closed; (2) jewelry removed: eyes open and eyes closed. A check was done on average 3 weeks later, the conditions were eyes open and eyes closed. Each testing condition over the period of 25.6 s was done twice and was counterbalanced, and data averaged.

The investigation adhered to the tenets of the Declaration of Helsinki and was approved by the Institutional human experimentation committee, the "Comité de Protection des Personnes" Ile de France, in Paris. Written informed consent was obtained from all subjects after the nature of the procedure had been explained.

RESULTS

Here, we presented the body sway area (mm^2), the parameter known for reporting on postural stability (e.g., Tagaki et al., 1985; Vuillerme et al., 2008). See **Figure 2**. For all cases, postural stability (**Figure 2A**) was strongly lower when eyes were closed, indicating a strong visual dependency for body stabilization. Yet the values with eyes open were still higher than corresponding values of healthy subjects with eyes open. When an appropriate prism canceled the VH, postural stability increased further approaching normal values (Matheron and Kapoula, 2008). More surprising, removal of jewelry immediately improved postural stability and restored eye alignment. The difference between eyes open and eyes closed conditions became smaller. Subjects were advised to remove the jewelry permanently. Three weeks later, back pain had either diminished or ceased entirely (**Figure 1**). Postural stability tended toward normal. Interestingly, one subject then agreed to put the jewelry back in temporarily (**Figure 2B**). Five minutes later, VH was found, postural stability decreased. When the jewelry was removed again, postural stability improved.

DISCUSSION

The results of four cases are of course not sufficient to generalize, but suggest that piercings could thus create more complications than those currently described in literature; we found binocular misalignment, reduced postural control efficiency, and non-specific chronic back pain. To our knowledge, aside from our conference abstract (Matheron and Kapoula, 2009), and that of Zanchetta et al. (2009) reporting on the influence of lingual piercing on postural control, the lack of studies on such from piercings in literature is surprising. Indeed, jewelry in body piercings is widespread, psychological, sociological, or culturally dependent, for instance nasal piercing is very frequent in India (for review, see Stirn, 2003). Maybe because body pierced jewelry is so common and the link to numerous side effects (beyond immediate pain, local infection, or other skin modifications as necrosis) has not yet sufficiently been established, its detrimental role remains underestimated.

For face pierced jewelry, it is important to emphasize that trigeminal primary afferent neurons and their sensory receptors provide information for the perception of the orofacial region, and contribute to various types of sensorimotor integration (Capra and Dessem, 1992; Shankland, 2000) such as postural control while quiet standing (Gangloff et al., 2000; Gangloff and Perrin, 2002). These afferences project to the cerebellum, the reticular formation, and the vestibular nucleus (see Capra and Dessem, 1992) which are located at the base of the spinal motor neurons and oculomotor efferents (see Büttner-Ennever, 2006). Previous studies reported that VH could indicate a conflict between somaesthetic signals,

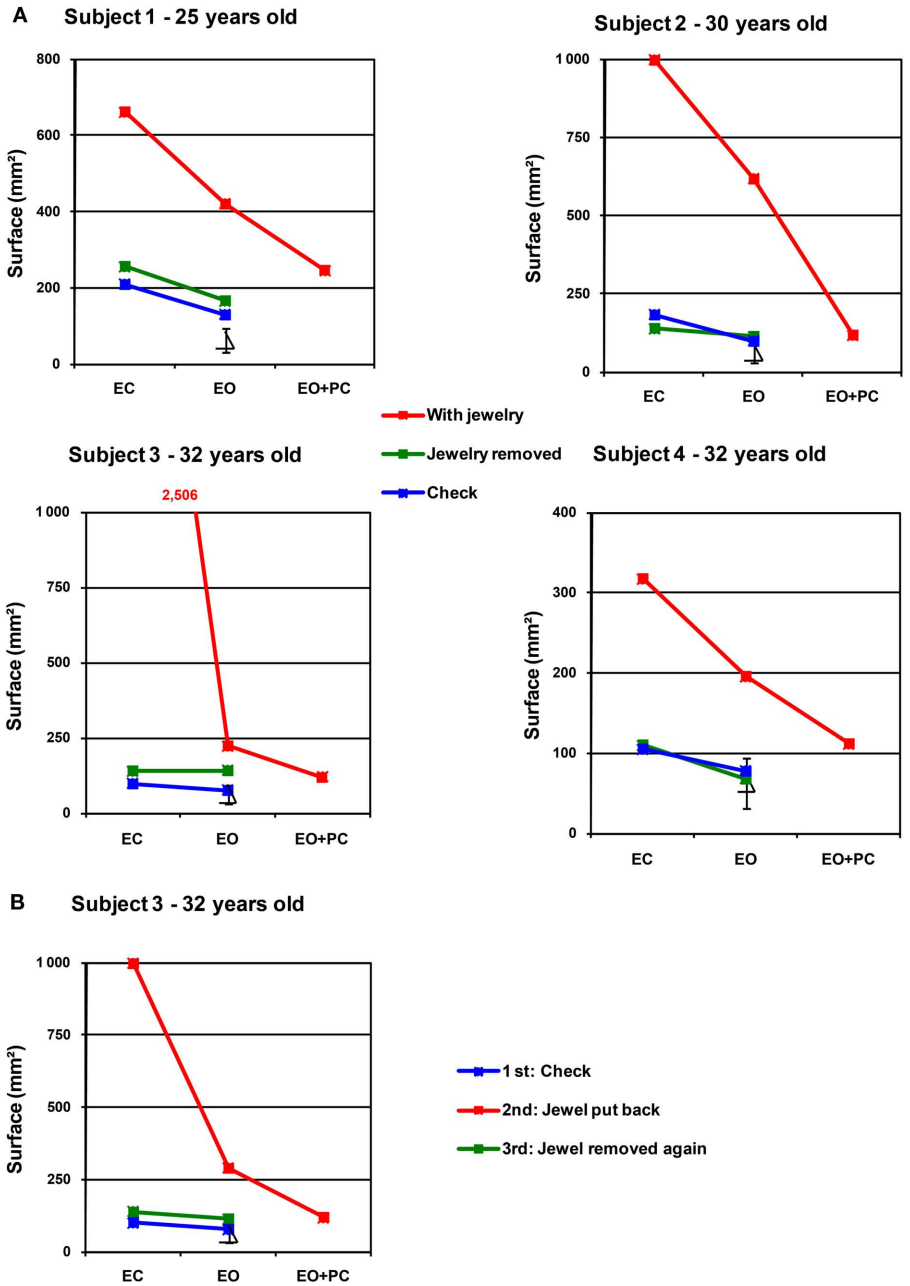


FIGURE 2 | (A) Reporting on postural stability, means of the surface area of the center of pressure excursions (mm^2) for each subject for each condition with jewelry, when jewelry is removed and when on average 3 weeks later the check is done. Eyes open (EO), eyes closed (EC), and EO with a prism to cancel the vertical heterophoria (EO + PC). Triangle symbols indicate EO control data from the study of Matheron and Kapoula (2008) of healthy subjects with vertical orthophoria, and with no jewelry or back pain. **(B)** Results for Subject 3 who agreed to put the jewelry back on temporarily during the second session.

here produced by jewelry in the trigeminal territory, involved in sensorimotor loops required in postural control (Matheron and Kapoula, 2008, 2011). Persistent conflict between vision and somaesthetic cues could lead to non-specific chronic back pain (McCabe et al., 2005; Matheron and Kapoula, 2011), modify perception, or even induce pain and unpleasant sensations in healthy subjects (McCabe et al., 2005, 2007). This novel observation can be understood in this context. The next step is to investigate the influence of piercings on the face, and other body parts in a larger number of cases. For instance, experimental studies of postural control in quiet stance are needed before and after body pierced jewelry. Postural control is also the basis for body stability during movements and gait (Gurfinkel et al., 1995). Furthermore, postural control is involved in the control of body segment orientation

and body stabilization, which is a prerequisite for perception and action (Amblard et al., 1985). Investigations on movement performance, eye–hand or eye–foot coordination would be of interest, as well as studies with eye movement recordings and visual stereoscopic tests, because small VH can alter vergence eye movements, stereopsis depth perception, and distance evaluation (see Saladin, 1995, 2005). We hope that this preliminary study will stimulate research in these fields.

As mentioned, recent studies (Stirn, 2003; Laumann and Derick, 2006) have reported that body piercing as body art, i.e., with jewelry, has a high incidence of medical complications. Here we report central complications possibly related to induced sensory–motor conflicts. As previously proposed, prolonged sensory–motor conflict could exacerbate pain and other symptoms, or could act after an undetermined precipitating event on a pre-existing conflict, or as a precipitating event in the trigeminal territory (Matheron and Kapoula, 2011). Health professionals and researchers should be aware of the possible side effects of piercings, i.e., impaired motor control, body pain, and additional comorbidity – known in chronic back pain (Von Korff et al., 2003; Hagen et al., 2006) including postural disorders (Gagey et al., 1980; Da Cunha, 1987), and the presence of VH (Amos and Rutstein, 1987; Scheiman and Wick, 1994), and heterophoria. Epidemiological and longitudinal studies of such side effects would be of interest.

CONCLUSION

Body piercings with jewelry, at least on the face, could more or less rapidly induce other complaints than the medical complications described in the relevant literature; we report here body pain, impaired postural control, and vertical eye misalignment (heterophoria). If these side effects were confirmed in a larger population, health professionals need to deal with them taking into account sociological and psychological aspects as recommended by Stirn (2003). We hope this study of a few cases could stimulate further experimental and clinical research to complete the investigation on risk factors linked to body piercing, and lead to public health recommendations and prevention. More knowledgeable clinicians could thus better inform patients thus helping to reduce possible future complaints.

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