Health Risks Associated with Tattoos and Body Piercing

Susannah Grimm Poe, EdD, BCBA-D, and Anne Cronin, PhD, OTR/L

ABSTRACT

• **Objective:** To review the health risks associated with tattoos and body piercing.
• **Methods:** Review of the literature.
• **Results:** Tattooing and piercing have become increasingly popular practices in the United States. There are important physical and behavioral risks associated with these forms of body modification. The most common complications from tattooing include skin infections and allergic reactions. Minor complications such as infection and bleeding occur frequently with piercings, but major complications have also been reported. Tattoos and piercings appear to be a marker for risk-taking behavior.
• **Conclusion:** Clinicians should understand the potential complications of these procedures and be able to counsel patients on how to reduce their health risks.

Tattoos and piercings are ancient practices of body modification that have gained widespread acceptance in modern society, particularly among young adults. Tattoos involve the insertion of colored pigment into the dermal layer of the skin with the goal of creating a permanent marking. They are commonly applied using an electrically powered handheld tattoo machine that moves a needle up and down to inject ink through the epidermis and deposit a drop of ink into the dermis [1]. The cells of the dermis are more stable compared with those of the epidermis, so the ink will mostly stay in place for a person’s lifetime [2].

Body piercing is defined as the insertion of a needle or specially designed piercing gun to create a fistula-like opening into either cartilage or skin for the introduction of decorative ornaments [3]. These ornaments can include jewelry, plastic or wood plugs, beads, or pearls. Body piercing has been part of ritualistic or cultural practices for centuries but is rapidly becoming a worldwide mainstream fashion trend, especially among young women aged 17 to 25 years [4]. Ear piercing has become so well accepted that most studies of body piercing do not include earlobe piercing [5].

There are important physical and behavioral risks associated with body modification. In this paper, we review the epidemiology, potential complications, and behavioral factors associated with tattoos and piercings.

**EPIDEMIOLOGY**

Tattoos are increasingly popular, with a 2012 Harris poll indicating that 1 in 5 adults has at least 1 tattoo [6], up from 14% in 2008 [7]. In the 2012 poll, adults aged 30 to 39 are most likely to have a tattoo (38%) compared to both those younger (30% of those 25–29 and 22% of those 18–24) and older (27% of those 40–49, 11% of those 50–64 and just 5% of those 65 and older). Women are slightly more likely than men, for the first time since this question was first asked, to have a tattoo (23% versus 19% in men). Current US body piercing rates are approximately 36% [3]. Body piercing is more popular among women than in men [8]. Among adolescents, body piercing is performed considerably earlier than tattooing [9]. The head area is the favored location for piercing, while the most common location for a tattoo is the limb [10].

**ASSOCIATED HEALTH RISKS**

**Tattoos**

The most common complications that result from tattooing are skin infections and allergic reactions to the tattoo ink. Extensive skin puncturing can result in bleeding and prolonged leaking of serosanguinous fluid. Pyodermal infections can include temporary inflammation at the site of needle puncture, superficial infections such as impetigo and ecthyma, and deeper infections such as cellulitis, erysipelas, and furunculosis [11]. Unsterile equipment and needles can transmit infectious diseases.
such as hepatitis [2]. Human immunodeficiency virus is theoretically transmissible this way, but no cases of HIV infection caused by tattooing have been documented [12].

Skin reactions to tattooing include aseptic inflammation and acquired sensitivity to tattoo ink, especially red ink, but also to chromium in green ink, cadmium in yellow ink, and cobalt in blue ink [13]. The reaction can manifest as either allergic contact dermatitis or photoallergic dermatitis. Cutaneous conditions that localize in tattooed areas include vaccinia, verruca vulgaris, herpes simplex, herpes zoster, psoriasis, lichen planus, keratoacanthoma. Other possible but less common conditions include keloid, sarcoidal granuloma, erythema multiforme, localized scleroderma, and lymphadenopathy [12].

A recent outbreak of nontuberculous mycobacterial infection was linked to contaminated tattoo inks [14]. Contamination can occur during the manufacturing process due to use of contaminated ingredients or when inks are diluted with nonsterile water by tattoo artists [15]. Investigations of 22 cases of tattoo-associated NTM skin infections in 4 states that occurred during 2011–2012 found that ink was contaminated with NTM before use [16]. M. chelonae, one of several disease-causing NTM species, can cause lung disease, joint infection, eye problems and other organ infections. These infections can be difficult to diagnose and can require treatment lasting 6 months or more [15].

Tattoo laws and regulations vary by state. The inks and ink colorings (pigments) used for tattoos are subject to regulation by the US Food and Drug Administration as cosmetics and color additives. However, the FDA has not traditionally enforced its authority over tattoo inks. The FDA encourages reporting of tattoo-associated complications to its MedWatch program (www.fda.gov/Safety/MedWatch/).

Malignancies reported to develop within tattoos include squamous cell carcinoma, basal cell carcinoma, malignant melanoma, leiomyosarcoma, and dermatofibrosarcoma protubersans [17,18]. These malignancies may be coincidental, but carcinogenicity of the tattoo is as yet unknown. Another concern is that a malignancy within a tattoo is more difficult to identify on skin examination [11,17].

Rarely, tattoos or permanent makeup might cause swelling or burning in the affected areas during magnetic resonance imaging (MRI) exams. The metallic ferric acid pigments used in tattoos can conduct heat on the skin during MRI, resulting in traumatic burns [19]. This has also been reported to occur with tattoos with nonferrous pigments. In some cases, tattoo pigments can interfere with the quality of the image, such as when a person with permanent eyeliner has an MRI of the eye [19].

Patients may self-administer tattoos using sewing needles, forks, paper clips, or pens, and colorants may include charcoal, soot, mascara, or ink. The use of unprofessional tattooists and piercers, who often have limited knowledge of health and hygiene precautions, is more likely to lead to complications [10].

Piercings

While most body piercings are not problematic, the potential for localized infections as well as associated systemic disease is present as long as the piercing site remains open [20]. Bacterial skin infections at or near the site are the most commonly reported complication of body piercings, with causative organisms primarily consisting of Staphylococcus, group A beta-hemolytic Streptococcus, and Pseudomonas [21]. Contributing to the health risks of piercing is the reluctance of patients to seek qualified medical intervention when initial site irritation, pain, or oozing occurs [21].

Systemic infections have been reported. More than 25 infective endocarditis cases in the past decade have come from tongue, navel, carlobe, lower lip, and nipple piercings [21]. Infective endocarditis should be considered in individuals with a new piercing (ie, up to 4 months), with or without a history of congenital heart disease, who present with unexplained fever, night chills, weakness, myalgia, arthralgia, lethargy, or malaise [22]. General complications include allergic contact dermatitis (eg, from nickel or latex), bleeding, scarring and keloid formation, nerve damage, and interference with medical procedures such as intubation and blood/organ donation [20].

Oral piercings may lead to difficulty speaking and eating, excessive salivaition, and dental problems. Oral and nasal piercings may be aspirated or become embedded, requiring surgical removal. Tongue piercing, usually performed without anesthesia, may cause damage to teeth and gums, including dental fractures [23] and changes in chewing and speech. Because of the tongue’s vascular nature, prolonged bleeding can result if vessels are punctured during the piercing procedure. In addition, the technique for inserting tongue jewelry
may abrade or fracture anterior dentition, and digital manipulation of the jewelry can significantly increase the potential for infection [24]. In fact, complications arising from oral piercing are so numerous—and in some cases life-threatening—that the American Dental Association has issued a formal statement opposing the practice [24].

Other site-specific complications have been reported (Table 1). Piercing tracts in the ear, nipple, and navel are prone to tearing [20]. Galactorrhea may be caused by stimulation from a nipple piercing. Genital piercings may lead to infertility secondary to infection, and obstruction of the urethra secondary to scar formation. In men, priapism and fistula formation may occur. Navel piercings account for 40% of complications arising from body piercing and are commonly associated with infection and scarring. The peri-umbilical area is a popular site for self-piercing and a modern fashion statement, but friction from clothing in this area may account for higher infection rates, longer healing time and increased scarring [25].

**BEHAVIORAL RISK**

While the presence of tattoos or piercings is not necessarily indicative of any aberrant patterns of behavior, clinicians should consider not only medical but also behavioral risks when tattoo or piercing is evident in patients, especially if that body modification is extreme. Koch et al [26] report stark differences in the levels of deviant behavior among college students with just 1 tattoo versus those with 4 or more (Table 2), and among those with just 1 to 3 piercing versus those with 7 or more. Respondents with intimate piercings reported deviance levels similar to the heavily tattooed [26].

Several studies have found that those with body modifications engaged in earlier or more frequent sexual activity and had a greater number of sexual partners [26–28]. A study by Deschesnes and colleagues [29] reported that certain “externalized” risk behaviors were more commonly associated with tattooed and pierced youth than with their unmodified counterparts, including the use of drugs, gang affiliation, school truancy, and problem gambling. Other studies of high school youth have found that tattooing was significantly and independently associated with other high-risk behaviors, including sexual intercourse, binge drinking, smoking, marijuana use, gang membership, truancy, and school failure [30]. However, a survey of college students found that, compared to individuals with no body art, individuals with 1 tattoo and less than 4 piercings had no greater likelihood to engage in high-risk behaviors [31].

Conversely, some researchers have attempted to show a positive association for body modification. In a study of women with eating disorders, the authors suggested that body piercing could be seen as reflecting a positive attitude towards the body, an expression of self-care [32]. In addition, people with piercings are more likely to give attention to their physical appearance and are less likely to be overweight than people without piercings [33].
Stirn and Hinz [34] concluded that most people who partake in body modification clearly do not do it because they have any psychological problems. However, for a few, modifications may be utilized as a convenient means to either realize psychopathological inclinations, such as self-injury, or to overcome psychological traumas. The prevalence of self-injury is unknown, though it is believed to be a growing problem. While self-injury is believed to be a low-lethality behavior, teens who hurt themselves are at increased risk for suicide related to their underlying anxiety or depression. Moreover, self-harmers report that they often had their skin tattooed or body pierced to help overcome a negative experience, or simply to experience physical pain. Another clue that self-harm and piercing/tattooing might in some cases be linked derives from the fact that many of the self-harmers said they had ceased cutting themselves after obtaining their first piercing or tattoo [35]. The increasing incidence makes deliberate self-harm a problem that all health care providers dealing with adolescents are likely to encounter.

Given the link between body modification and “externalized risk behaviors” in young people, tattooing and body piercing may serve as clinical markers for health care professionals, potentially identifying those who may be involved in activities that hinder their health and development [29]. For example, closer examination of teens who wear long sleeves or clothing inappropriate for weather could reveal cuts, burns, carvings, or bruises that are self-inflicted.

Patients are more likely to discuss the issue of body art if the clinician does not speak or act judgmentally [1]. Practitioners who are concerned that their tattooed patient might be self-injuring or engaging in other risky behaviors should invite a discussion with the patient, perhaps using general terms, such as “Sometimes people may get involved in self-injury and don’t know where to turn for help. I will try to help you if you are ever worried about that.” As always, if the clinician suspects a patient is engaged in self-harming activities, an immediate referral should be made for mental health evaluation and any necessary intervention.

Table 2. Tattoos and Deviance: Comparative Percentages and Chi-Square Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>No Tattoos</th>
<th>1 Tattoo</th>
<th>2–3 Tattoos</th>
<th>4+ Tattoos</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheat on college work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once/year or less</td>
<td>81.6 (n = 1217)</td>
<td>82.0 (n = 123)</td>
<td>83.1 (n = 59)</td>
<td>76.5 (n = 13)</td>
<td></td>
</tr>
<tr>
<td>Once/semester or more</td>
<td>18.4 (n = 275)</td>
<td>18.0 (n = 27)</td>
<td>16.9 (n = 12)</td>
<td>23.5 (n = 4)</td>
<td>NS</td>
</tr>
<tr>
<td>Sex partners in past year</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2 or less</td>
<td>79.9 (n = 620)</td>
<td>69.4 (n = 86)</td>
<td>64.6 (n = 42)</td>
<td>64.3 (n = 9)</td>
<td></td>
</tr>
<tr>
<td>3 or more</td>
<td>20.1 (n = 156)</td>
<td>30.6 (n = 38)</td>
<td>35.4 (n = 23)</td>
<td>35.7 (n = 5)</td>
<td>P &lt; 0.01</td>
</tr>
<tr>
<td>8 or less</td>
<td>91.2 (n = 705)</td>
<td>80.8 (n = 101)</td>
<td>69.2 (n = 45)</td>
<td>57.1 (n = 8)</td>
<td></td>
</tr>
<tr>
<td>9 or more</td>
<td>8.8 (n = 68)</td>
<td>19.2 (n = 24)</td>
<td>30.8 (n = 20)</td>
<td>42.9 (n = 6)</td>
<td>P &lt; 0.001</td>
</tr>
<tr>
<td>Binge drinking in last week</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>No</td>
<td>63.9 (n = 925)</td>
<td>52.4 (n = 76)</td>
<td>55.1 (n = 38)</td>
<td>71.4 (n = 10)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>36.1 (n = 522)</td>
<td>47.6 (n = 69)</td>
<td>44.9 (n = 31)</td>
<td>28.6 (n = 4)</td>
<td>P &lt; 0.01</td>
</tr>
<tr>
<td>Monthly marijuana use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>87.3 (n = 1308)</td>
<td>70.7 (n = 106)</td>
<td>66.2 (n = 47)</td>
<td>75.0 (n = 12)</td>
<td></td>
</tr>
<tr>
<td>Once or more</td>
<td>12.7 (n = 190)</td>
<td>29.3 (n = 44)</td>
<td>33.8 (n = 24)</td>
<td>25.0 (n = 4)</td>
<td>P &lt; 0.001</td>
</tr>
<tr>
<td>Other illegal drug use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>95.6 (n = 1428)</td>
<td>90.7 (n = 136)</td>
<td>91.5 (n = 65)</td>
<td>93.3 (n = 14)</td>
<td></td>
</tr>
<tr>
<td>Once or more</td>
<td>4.4 (n = 65)</td>
<td>9.3 (n = 14)</td>
<td>8.5 (n = 6)</td>
<td>6.7 (n = 1)</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>Arrest other than traffic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>91.5 (n = 1373)</td>
<td>81.3 (n = 122)</td>
<td>87.3 (n = 62)</td>
<td>29.4 (n = 5)</td>
<td></td>
</tr>
<tr>
<td>Once or more</td>
<td>8.5 (n = 127)</td>
<td>18.7 (n = 28)</td>
<td>12.7 (n = 9)</td>
<td>70.6 (n = 12)</td>
<td>P &lt; 0.001</td>
</tr>
</tbody>
</table>

Preventatively, clinicians should provide targeted and repeated education to transmit the message of effective decision-making and evaluation of risks to children in the early elementary grades, since some students start to obtain body art as early as fifth grade.

REGRET AND REMOVAL

Over time, many individuals regret getting tattoos and wish to have them removed [35]. In some cases, delayed complications, like the development of allergic, hypersensitivity, or granulomatous reactions, require tattoo removal. On average, tattoo regret occurs 14 years after tattooing and by the age of 40 years.

Removal is more painful and laborious than the tattooing itself, and complete removal, with no scarring, is often not possible. The American Society for Dermatologic Surgery reports that in 2011, its doctors performed nearly 100,000 tattoo removal procedures, up from the 86,000 performed in 2010 [36]. Pulsed lasers have been used to remove tattoos for more than 20 years. With this procedure, pulses of high-intensity laser energy pass through the epidermis and are selectively absorbed by the tattoo pigment. The laser breaks the pigment into smaller particles, which may be metabolized or excreted by the body, or transported to and stored in lymph nodes or other tissues [37].

Other removal techniques include dermabrasion and surgical excision. Do-it-yourself tattoo removal ointments and creams can be purchased online, but they have not been approved by the FDA and there is no clinical evidence that they work. Furthermore, tattoo removal ointments and creams may cause unexpected reactions, such as rashes, burning, scarring, or changes in skin pigmentation [37].

CLINICIAN’S ROLE

Body art provides a window into an individual’s uniqueness, and acknowledging body modifications can help build trust and develop the physician/patient relationship. The health professional armed with knowledge about body modifications can forge more functional relationships, obtain critical historical information, and provide better treatment and referral for this population [5].

Having a clinician who is a trusted, nonjudgmental source of information and intervention for patients who choose body art will reduce the health risk of complications associated with tattooing and piercing [1].

Unfortunately, only 14% of the population identify health care professionals as a common resource for information on body modification. Instead, young adults endorsed friends (82%), body piercing shops (61%), and tattoo shops (51%) as their top information sources. Clinicians should help patients make informed decisions about body art and counsel them about the importance of universal precautions [35].

Corresponding author: Susannah Grimm Poe, EdD, 176 Gilboa Rd., Fairmont, WV 26554, spoe@hsc.wvu.edu.

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REFERENCES

Health Risks of Body Art


