

Article

Skin Health in Dance Focusing on Professional Dance and Latin American Formation Dance during Periods of Different Training Loads

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Abstract: Up to the present, there has been a lack of studies on the skin health of professional and recreational dancers. Dancers are at risk of skin diseases due to contact with allergenic or irritating substances and working in humid environments. The aim of the present study was, therefore, to examine skin health in two different dance styles and training periods. **Methods:** Physical dermatological examination of professional dancers (PD; $n = 35$) and Latin American formation dancers (LD; $n = 79$) after a 4-week period of recovery (T0) and a period of high training or work load (T1). **Results:** PD are significantly more frequently affected by skin dermatoses than LD (T0, $p = 0.004$) (frontal traction alopecia, hair loss, facial seborrhoea, xerosis cutis of the trunk and extremities, and facial folliculitis). The following significant differences between the sexes were observed in the LD: more folliculitis of the trunk in male subjects (T0 and T1, $p = 0.009$), more frequent xerosis cutis of the extremities ($p < 0.001$) and perioral dermatitis in female subjects (T1, $p = 0.043$). Subjects with skin lesions trained more frequently, performed more times per year, and had longer dance experience. **Discussion:** Based on the findings, preventive measures for skin protection (especially informing dancers about skin health) are necessary. At the same time, further studies on this topic are important.

Keywords: skin diseases; sport; dance; professional dance; stress period; rest period



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1. Introduction

Over the centuries, a multitude of different dance styles have developed, which can be pursued professionally for livelihood (employee or freelance) or as a hobby. There are numerous reasons for increased skin stress and the development of skin diseases or disorders that exist regardless of the dance style. These include a warm and humid microclimate due to sweating, the aesthetics of clothing, strict hair styling, frequent showering, exposure to potential allergens or toxic substances (preservatives, fragrances, adhesives, and dyes) [1–3], exposure to pathogens in community settings and through frequent physical contact, and high levels of psychological stress (e.g., competitive pressure) [3–5].

So far, there is a lack of representative studies on skin health in dance. Results from studies in sports show that the causes for skin problems are numerous [6–8]. In some cases, prevalences of 30% for diseases caused by bacteria, 20% for diseases caused by fungi, and 20% for diseases caused by herpes viruses were found [9]. Among athletes at one college, as many as 47% were affected by diseases caused by herpes viruses [9] and inflammations of the hair follicle (folliculitis) occurring frequently in water sports [10]. While these described results point to a need for action regarding infectious and non-infectious skin diseases in sports, Liebich et al. [11] describe competitive sports as a protective factor in skin health.

The aim of the present study was, therefore, to assess skin health taking into account different times and dance styles in the sense of a pilot study. In order to take into account the large number of different dance styles, two cohorts with very different demands were selected for this study as representative of all dancers (Table 1). These were professional dancers on the one hand and ambitious amateur Latin American formation dancers on the other [12,13].

Table 1. Comparison of characteristic features of professional dance and Latin American formation dance.

	Professional Dance	Dance Sport
Classification	Revue, single, group, pas de deux	Latin American Formation dance, couple dance in Latin
Status	Professional dancer/employed	Amateurs/athletes
Training frequency	Including rehearsal and performances: 40 h/week	Up to 25 h/week during competition season
Dance styles	Various, classical dance, neo-classical dance, contemporary, tap dance, revue dance	Latin American dances (rumba, samba, pasodoble, jive, and cha cha cha)
Number of dancers per ensemble/team	Variable, here: 65	16–20 (including substitute dancers)
Evaluation of the dancer performance	Audience and critics' satisfaction; occasional competitions to establish young talent	Competitions in the league system with standardised assessment through a points system
Number of performances or competition days per year	Up to >260 per year, partly several times a day	5 to max. 9 competition days per year, plus evening show performances on weekends
Season length	Over 10 months per year; breaks are subject to statutory regulation	2 months per year, possibly participation in other championships in the individual field
Physical strain due to performances/competitions	Daily; at least 1–2 performances of 2–3 h each	Maximum three rounds of 6 min per competition day

Professional dancers are artists, elite athletes, and employees at the same time. Health problems that occur due to work-related activities are therefore of particular relevance, as they entail measures in behavioural and environmental prevention for which the employer is responsible (also preventive care). Formation dancing, on the other hand, is practised as a hobby with a high degree of dance taking place during leisure time (up to 25 h per week in competition times). The aim is that each of the eight couples looks the same. To achieve this, measures are taken that may be harmful to the skin (e.g., glue, shoe polish for the hair) [14].

2. Methods

2.1. Study Design

The primarily descriptive study design allowed data collection within the two cohorts of professional dancers and Latin American formation dancers as a cross-sectional and longitudinal study. The study included a dermatological examination twice. Both groups were examined at the same time of the year. During the first dermatological examination, the actual condition of the skin was first assessed during a rest phase or a phase of reduced stress (outside the competition period, directly after an approx. 4-week recovery period) (T0). A second examination of the skin took place during a phase of increased training, performance, or competition (T1).

A professional dance company was recruited for voluntary participation. For the participation of Latin American formation dancers, an appeal was made to coaches with information about the study who were either (a) regionally easily accessible or (b) danced in the 1st national league (highest performance class). Seven teams were recruited.

The participation was voluntary and it was possible to drop out of the study at any time. Of the initial total $n = 138$ subjects, $n = 114$ were examined. In the course of the study, there was a drop-out rate of 42.8%, which was due to the lack of participation in the second examination.

2.2. Inclusion and Exclusion Criteria

The following inclusion criteria applied:

- Signed written declaration of consent;
- At least 18 years old;
- At time T0, training time of at least 4 weeks and actively dancing member of the formation or employed professional dancer;
- At time T1, regular participation in dance training and competitions, rehearsals, performances.

2.3. Diagnostic Procedures

The data collection was carried out by means of a dermatological examination and sociodemographic medical history twice with documentation in an examination form, which was developed in cooperation with the Haut- & Laserzentrum Berlin-Potsdam on the basis of already existing and partly evaluated examination forms [15]. The medical history included the following questions:

- Sociodemographic data such as gender and age;
- The height and weight of the body;
- Occupational stresses such as dance experience, training intensity, and competition frequency;
- Known skin problems;
- Application of “self-tanners” (especially in Latin American formation dance).

2.4. Dermatological Examination

The dermatological examination consisted of an inspection of the entire integument, including nails and hair, excluding the intimate area. All examinations were done by one dermatological expert to guarantee identical and standardised examinations. For every abnormal finding, an image documentation was made. The study also included findings on the hands and feet, but these are not part of the content of this paper. The subjects were instructed not to use soap or other skin care or decorative cosmetics for 24 h before the start of the examinations. The dermatological examination was based on a definition of skin lesions commonly used in dermatology. Since the skin is an organ accessible to the inspecting eye, it is common in dermatological practice to describe the morphology of a skin abnormality. This is usually done according to the so-called efflorescence theory for the documentation of skin findings [16]. A distinction is made between primary and secondary efflorescences, which arise from the former [17]. In general, the first evaluation distinguished between subjects without any skin changes and those with one or more skin changes.

The findings were documented in the examination form. This was developed by medical doctors of the Haut- & Laserzentrum Berlin-Potsdam on the basis of the documentation form used in the practice and adapted to the dance. The first section of the examination form served to roughly document the localisation of conspicuous findings. In the second section, conspicuous findings could be described for the respective localisations of scalp and hair, face and neck, trunk and extremities, and hands and feet. In the case of conspicuous skin findings during the dermatological examination, a symptom-related medical history—supplementary to the general anamnesis survey in the questionnaire—was carried out. In the third section of the examination form, the possibility was given to document the skin type according to Fitzpatrick (classification of skin types, according to

Fitzpatrick, Wolff (pp. 3–21)) [15] and Fritsch (pp. 20–25) [17]. Finally, the last section of the examination form was used to record possible diagnostic or therapeutic consequences.

2.5. Course of Study

Before conducting the actual study, a pre-test was conducted with adult ballet school teachers ($n = 8$). There were neither comments nor a need for discussion.

The first examination round took place immediately after the average four-week, training-free recovery period (T0). The subjects were first informed in detail about the study, who was responsible for it, the voluntary nature of participation, and the pseudonymisation of their data. After the written declaration of consent, the dermatological examination took place in appropriately prepared rooms provided for this purpose. The test persons were examined individually and parallel to the ongoing training or ongoing work process. Following the respective examination, the first diagnostic and therapeutic consequences of the skin findings were discussed with the test persons.

2.6. Data Preparation and Evaluation

The data were processed, statistically analysed, and graphically presented using the programme Microsoft Excel for Mac 2011 and IBM SPSS Statistics 21. Frequencies (absolute and relative) were determined for the nominal data and analysed inferentially using the chi-square test and adjusted depending on the application requirements (e.g., Fisher's exact test). The metric data were presented via mean values and standard deviations and examined for group differences using *t*-test procedures. The significance level was set at 5% and all comparisons were made under two-tailed testing; *p*-values between 5% and 10% were registered as statistical trends.

A positive ethics vote had been obtained on the topic from the Charité-Universitätsmedizin Berlin before the start of the study (No. EA4/120/14).

3. Results

3.1. Cohort Characteristics

Within the framework of the study, $n = 114$ dancers could be examined. Of these, $n = 35$ were professional dancers (m: $n = 9$; w: $n = 26$) aged 19 to 39 years and $n = 79$ were Latin American formation dancers (m: $n = 43$; w: $n = 36$) aged 19 to 37 years. Table 2 presents important cohort characteristics.

With regard to the training intensity of the dancers, the following results could be found: Subjects with skin changes at T0 ($n = 93$) had already been dancing for 13.3 ± 6.5 years (MV \pm SD), while those with a normal examination finding ($n = 21$) had been dancing for 9.5 ± 4 years (MV \pm SD). This mean difference of 3.8 years of dance experience between the dancers with and without skin changes is statistically significant ($p = 0.001$).

Those subjects with abnormal examination findings at T0 danced an average of 16.6 ± 11.4 h per week (MV \pm SD), while those without dermatological abnormalities ($n = 21$) trained 12.8 ± 5.5 h per week (MV \pm SD). Again, the observed mean difference of 3.79 h per week is statistically significant ($p = 0.027$). Subjects who had a larger weekly training volume showed skin changes more frequently.

Overall, 50% of the professional dancers ($n = 34$) and 43% of the Latin American formation dancers ($n = 79$) did other sports besides dancing. Subjects who did another sport were significantly more often affected by skin lesions ($p = 0.03$).

Subjects with skin lesions at T0 ($n = 93$) had an average of 94.4 ± 127.3 performances per year (MV \pm SD), while the group not affected by skin lesions ($n = 21$) had 18.2 ± 55.5 performances (MV \pm SD). Again, the mean difference of 76.1 performances is statistically significant ($p < 0.001$).

Table 2. Characteristics of $n = 35$ professional stage dancers (PD) and $n = 79$ Latin American formation dancers (LD) in $MW \pm SD$ and frequencies in %.

Features	PD	LD	<i>n</i>	<i>p</i> -Value
Age (years)	25.5 ± 4.1	25.5 ± 4.1	113	0.982
Female sex (%)	74.3	45.6	114	<0.01 *
Size (cm)	178.3 ± 6.1	174.6 ± 9.6	111	0.016 *
Weight (kg)	64.3 ± 10.2	66.6 ± 13.5	109	0.327
BMI (kg/m ²)	20.1 ± 1.9	22 ± 2.4	108	<0.01 *
Age at start of dance (years)	7.7 ± 3.8	14.6 ± 3.6	112	<0.01 *
Dance experience (years)	18 ± 5	10.9 ± 5.1	111	<0.01 *
Training effort (h/week)	24.7 ± 14.9	12.6 ± 4.7	112	<0.01 *
Presentation frequency (number per year)	269.8 ± 41.4	6.7 ± 2.7	110	<0.01 *
Sleep duration (h/d)	7 ± 0.9	6.8 ± 0.9	111	0.14
Smokers (%)	25	16.7	110	0.27
Alcohol consumers (%)	71.4	84.8	114	0.09
Allergy sufferers (%)	25.7	45.6	114	0.045 *
Additional other sporting activity (%)	50	43	113	0.38

*: $p < 0.05$.

3.2. Examinations at T0

At T0, 97.1% of professional dancers and 74.7% of Latin American formation dancers had skin abnormalities in the dermatological examination with significant difference in prevalence ($p = 0.004$). In contrast, the distribution of skin types was not significant between the cohorts studied: 80% of professional dancers and 81% of Latin American formation dancers had skin types 2 or 3. Folliculitis on the trunk and face and hair loss were among the most common abnormalities in both cohorts.

3.3. Scalp and Hair

A total of 28.6% of professional dancers and 7.6% of Latin American formation dancers had hair loss ($p = 0.006$). A similar result was found for the frequencies of frontal traction alopecia ($p = 0.037$) (LFD: 1.3%; PD: 8.6%). No significant differences were found in the analysis of erythema, scaling, and itching of the scalp.

3.4. Face and Neck

Facial seborrhoea was significantly more common in professional dancers (25.7%) than in Latin American formation dancers (3.8%) ($p = 0.001$). Facial folliculitis tended to be found more frequently in professional dancers (31.4%) than in Latin American formation dancers (17.7%) in both dance styles studied ($p = 0.1$). Xerosis cutis of the facial skin ($p = 0.665$) and perioral dermatitis ($p = 1$) each showed no significant differences between the two cohorts.

3.5. Trunk and Extremities

The frequency of xerosis cutis of the trunk showed a significant difference between the professional (25.7%) and the Latin American formation dancers (1.3%) ($p < 0.001$). A similar difference was found for xerosis cutis of the extremities (PD: 22.9%; LFT: 6.3%) ($p < 0.021$). Folliculitis of the trunk tended to occur more frequently in professional dancers (37.1%, LFT: 21.5%) ($p = 0.081$). The comparisons of prevalence of keratosis pilaris of the extremities (PD: 14.3%; LD: 6.3%; $p = 0.279$) and suspected pityriasis versicolor (PD: 8.6%; LD: 5.1%; $p = 0.674$) did not reveal any significant differences between the cohorts at T0.

3.6. Use of Self-Tanning Products

Cosmetics for tanning the skin with the active ingredient dihydroxyacetone were used regularly by 64.9% of the subjects. Of the users, 95.6% were Latin American formation dancers. Overall, 89.9% of Latin American formation dancers used this method for skin tanning. In the dermatological examinations, the tanning was persistently visible on elbows, knee joints, and other mechanically stressed areas due to a thicker horny layer localised in those areas (Figure 1). A total of 60.2% of the subjects with skin changes in the rest examination ($n = 93$) regularly used dihydroxyacetone, while 85.7% of the subjects without skin changes ($n = 21$) used the active substance ($p = 0.027$). In the stress test, however, this difference was no longer detectable ($p = 0.157$).



Figure 1. Discolouration of the skin after application of dihydroxyacetone for skin tanning in Latin American formation dancers.

3.7. Examination at T1

While at T0 the professional dancers were significantly more often affected by skin changes than the Latin American formation dancers, this difference was only observed as a statistical tendency at time T1 (Table 3). There were still significant distribution differences in the three diagnoses of hair loss, facial seborrhoea, and xerosis cutis of the trunk. A difference between the two cohorts regarding xerosis cutis of the extremities was no longer detectable at T1. Xerosis cutis of the facial skin and perioral dermatitis tended to be observed more frequently in the Latin American formation dancers than in the professional dancers at T1.

Table 3. Skin changes at time T1 in professional dancers (PD) and Latin American formation dancers (LD); $n = 114$.

Type of Skin Lesions	Affected PD in % ($n = 35$)	Affected LD in % ($n = 79$)	p -Value
Overall conspicuous examination findings	100	88.6	0.055
Hair loss *	25.7	7.6	0.014 *
Frontal traction alopecia	8.6	1.3	0.085
Facial folliculitis	31.4	26.6	0.595
Facial seborrhoea *	25.7	3.8	0.001*
Xerosis cutis of the facial skin	2.9	16.5	0.061
Perioral dermatitis	0	8.9	0.098
Folliculitis on the trunk	34.3	25.3	0.326
Xerosis cutis of the trunk *	28.6	2.5	<0.001 *
Xerosis cutis of the extremities	25.7	16.5	0.248
V.a. pityriasis versicolor on the trunk	8.6	5.1	0.674

*: $p < 0.05$.

3.8. Differences between T0 and T1 Period

In professional dancers, there were no significant differences of the results between the two periods. However, skin changes were found significantly more frequently in the Latin American formation dancers at T1 (88.6%) than in T0 (74.6%, $p = 0.024$). The same applies to xerosis cutis of the face (T0: 6.3%, T1: 16.5%; $p = 0.045$) and xerosis cutis of the extremities (T0: 6.3%, T1: 16.5%; $p = 0.045$). At T1, perioral dermatitis tended to be observed more frequently in the Latin American formation dancers than in T0 (T0: 2.5%; T1: 8.9%; $p = 0.086$).

3.9. Gender Differences

No gender-specific skin changes were found among the professional dancers. It should be noted that with $n = 9$, the number of male professional dancers was small, which prevented a statistically reliable statement. In the Latin American formation dancers, gender-specific differences were found: folliculitis on the trunk affected males (37.2%) significantly more often than females (11.1%) at both T0 ($p = 0.009$) and T1 ($p = 0.008$). Perioral dermatitis was more frequently observed in female subjects (f: 16.7%, m: 2.3%) at time point T1 ($p = 0.043$) but not at time point T0 ($p = 0.204$). The same applies to xerosis cutis of the extremities, which was seen significantly more frequently in the female subjects (f: 33.3%, m: 2.3%) at T1 ($p < 0.001$). This difference was not found at T0 ($p = 0.172$) (Figure 2).

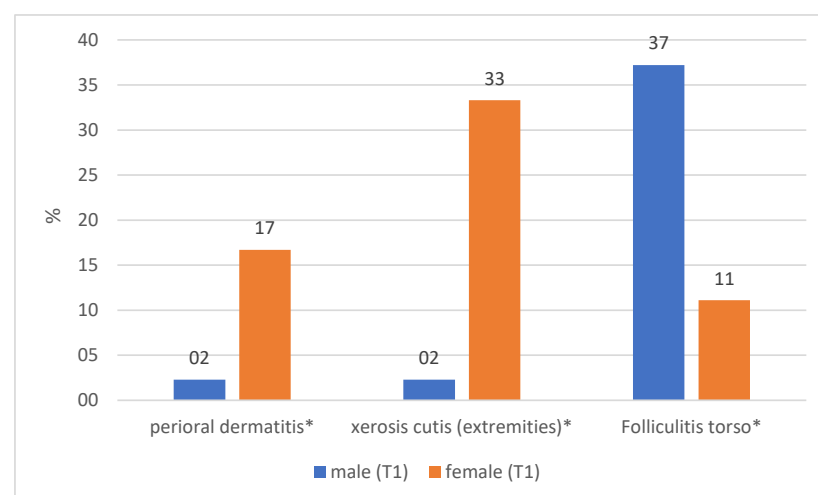


Figure 2. Gender-specific examination findings of Latin American formation dancers (LD) at time T1; $n = 79$. *: $p < 0.05$.

4. Discussion

The aim of this study was to assess skin health in different dance styles and training periods using the example of professional dance and Latin American formation dance. With an insufficient data situation in this respect so far, the investigations were carried out with regard to occupational dermatologically relevant aspects of legally anchored preventive measures. The comparability of dancers with other occupational groups is severely limited due to the specificity of the profession. In addition, the majority of general occupational skin diseases are hand eczema, which were not considered in the present work. For these reasons, an attempt was made not only to classify the study results within occupational and sports dermatology, but also to compare them with data from the normal population.

4.1. Examinations at T0

At T0, the professional dancers showed skin changes significantly more often than the Latin American formation dancers in the examination, which we interpret as a consequence of the overall permanently high stress on the skin. This result is consistent with other occupations in which high skin stress has been described [18]. The present sample size of $n = 35$ employed professional dancers is too small to carry out a more extensive statistical analysis and should at most be seen as a first step for further investigations. However, there are at least important indications that especially indicate that the permanent strain on the skin in professional dance has visible consequences compared with Latin American formation dancing.

Strict hairstyling techniques involve an increased risk of frontal and also occipital traction alopecia. These include hairstyles that exert mechanical traction and cause pain such as fixed ponytails, chignon, braided hairstyles, or the wearing of wigs [19]. However, these fixed hairstyles are part of the characteristic appearance of classical ballet and are furthermore necessary in order to be able to perform the required movement parts without danger (e.g., several pirouettes in a row). Frontal traction alopecia have therefore already been observed and described in the literature in connection with the performance of classical ballet and could represent a profession-specific characteristic [20].

It is striking that facial seborrhoea was found significantly more often in professional dancers than in Latin American formation dancers. Oily skin provides a good growth base for bacteria and fungi [21]. Seborrhoea thus predisposes to seborrhoeic eczema, rosacea, pyoderma, folliculitis, and acne vulgaris [22]. This circumstance can also lead to the aforementioned inflammatory diseases in athletes [6]. One explanation for the present result may be the change in the acid mantle as a result of increased sweating during sporting activities [23]. However, this does not explain why PDs are more frequently affected. Acne vulgaris is one of the most common dermatological diseases, which affects almost everyone during puberty, but usually subsides in early adulthood [22]. The subjects of the present study were all older than 18 years and were in early adulthood. In this respect, the high prevalence of folliculitis and acne vulgaris is striking. Possibly this is related to the oil-based body make-up or to hygienic aspects (use of a sponge for application by several dancers, possibly after a shave or the reaction from heavy sweating and make-up. In the case of folliculitis, too, the altered acid mantle during regular vigorous physical activity could ultimately contribute to the development of inflammatory diseases [24]. This may also play a role in the fact that professional dancers, who were more exposed to training, tended to be affected more often by folliculitis. Furthermore, most of the dance training took place in well-heated rooms to prevent injuries. The humidity increased rapidly during a training session. Interestingly, folliculitis is also found more frequently in tropical, warm, and humid climates than in temperate or cold climates, which represents a further explanatory approach [25]. In addition, there is a mechanically caused form of inflammation of the hair follicle. Folliculitis can also occur in athletes in the form caused by friction, pressure, and occlusion (acne mechanica) [26–29]. This cause is also conceivable for dancers. Dancers' clothing is usually tight fitting and elastic so there is friction due to close body contact. Occlusion is also conceivable due to reduced or absent moisture transport via the clothing

material. It cannot be excluded that the choice of clothing can also influence the prevalence in dance.

Compared with Latin American formation dancers, the professional dancers showed a significantly higher incidence of pronounced dryness of the skin in the trunk and extremity region. Dry skin can have a variety of causes and is often multifactorial. A familial tendency to dry skin in the context of a skin barrier disorder such as atopic dermatitis should be emphasised [30]. Atopic diathesis can lead to increased susceptibility to occupational skin diseases [4] and should therefore be diagnosed as early as possible [31,32].

Pityriasis versicolor is classified as a cosmetic problem [33]. Prevalences of 1 to 4% have been described for the normal population [34]. Subjects living in tropical regions showed prevalences of up to 21% [35]. Pityriasis is caused, for example, by a humid and warm microclimate, which occurs particularly in sports [36]. Endogenous causes of pityriasis versicolor may include malnutrition, hyperhidrosis (=increased sweating), seborrhoea, the use of oral contraception, and immune suppression (also iatrogenically caused, for example, by corticosteroids) [37]. The prevalences of 5.1% of Latin American formation dancers and 8.6% of professional dancers in the study were not relevantly elevated compared with the normal population.

Another skin change that can be classified as a cosmetic problem is keratosis with a prevalence of almost 50% in the normal population [38]. The results of the study showed significantly lower prevalences.

4.2. Use of “Self-Tanners” (Dihydroxyacetone)

Skin tanning is an important issue in Latin American formation dance. A total of 89.9% of this cohort regularly used “self-tanners” with the active ingredient dihydroxyacetone. This is a monosaccharide that reacts with amino acids of the horny layer, for example arginine [39]. As early as 1960, Goldman et al. described a tanning of the skin by this active substance [40]. Dihydroxyacetone is also used for medical–cosmetic reasons. This is done, for example, in patients with vitiligo in an active substance concentration of 5% [41]. In 1979, Pham et al. suspected a mutagenicity of the so-called “self-tanners” with the active ingredient dihydroxyacetone [42]. This could not be confirmed in various in vitro and in vivo experiments [43], not even under UV irradiation (so-called photomutagens) [44]. However, dihydroxyacetone itself does not offer UV protection and further protective measures against UV light must therefore be taken despite tanning [45,46]. The subjects of the study who regularly used the active ingredient dihydroxyacetone surprisingly showed skin changes less frequently. One assumption is that the products also contained skin-care substances and thus, in addition to the tanning, a side effect resulted from the skin care [47]. The cleansing efforts should be critically questioned, as they can in turn damage the skin barrier and cause skin changes. “Self-tanners” could therefore also have a secondary influence on skin health via intensive cleansing attempts.

4.3. Examination during the Stress Period

While at time T0 significantly more professional dancers than Latin American formation dancers showed a noticeable finding, this correlation was only observed as a statistical tendency at time T1. The difference between the two cohorts was thus less than after a training and performance break at time T0. This could indicate that the skin of the Latin American formation dancers experiences an acute deterioration in the course of the competition phase, while the skin of the professional dancers is already in a highly stressed state in the rest examination and the changes at T1 can only be minor.

In summary, there is much to be said for acute stress on the skin of the Latin American formation dancers in the competition season and a chronic high stress in the professional dancers, which reduces the differences observed at T0 between the two groups and even partly balances them out.

In particular, the facial skin of the Latin American formation dancers showed conspicuous changes at T1. This skin change, which is also called “cosmetic acne”, is usually caused

by over-care of the skin with cosmetic products [48,49]. It is worth noting that patients with perioral dermatitis often also have allergies [50], which is also relevant in dance sport as it could possibly be the result of the use of allergenic substances (glue, shoe polish in the hair), compared with PD. Allergy testing (e.g., epicutaneous testing) in dancers may provide important results in the future and should be considered if necessary.

The frequent occurrence of perioral dermatitis among Latin American formation dancers suggests that the excessive use of cosmetic products damages the skin during the competition phase.

4.4. Gender Specificity

No gender-specific study results could be found among the professional dancers. It should be noted that in this group only $n = 9$ male subjects could be included in the study. Therefore, no reliable statement can be made about gender-specific differences in the skin health of professional dancers. Significant differences between the sexes could be observed in the Latin American formation dancers. It has already been described that women react more sensitively to stress on the skin [51]. Thus, the data of the present study also showed that Latin American female formation dancers had perioral dermatitis or xerosis cutis of the extremities more frequently than their male dance partners. It is conceivable that women use more decorative cosmetics and care products than their male dance partners or use cosmetics excessively and inadequately [48,49].

Endogenous causes are also to be discussed, for example, a generally higher sensitivity of women to irritants [52,53]. However, in a study, no gender-specific differences in the reaction to certain irritating substances (including soap) could be found in test persons with or without hand eczema [54]. Similarly, no differences were found between males and females in exposure to sodium lauryl sulphate, a detergent for cleaning and emulsifier in cosmetic products, which can have an allergenic effect [55,56].

The male Latin American formation dancers showed folliculitis of the trunk significantly more often than the female Latin American formation dancers. The higher prevalence of truncal acne amongst males could partly explain this [57]. In addition, hair removal for aesthetic reasons for competitions in combination with contaminated sponges and oil-based make-up can be causative (see Figure 1). Here, too, the unwritten “rules of aesthetics” in dance must be critically questioned.

4.5. Training Habits

The longer and more intensively the test persons danced, the more frequently they were affected by skin changes observed in the study. Thus, the intensity of the sporting activity seems to have an influence on the occurrence of skin changes, also described in sports dermatology [6,8].

A successful prevention programme for skin diseases [58,59] should also include psychological support and training. This has been more effective for skin diseases such as atopic dermatitis than purely technical dermatological information programmes [60]. This could include learning and performing relaxation exercises or behavioural therapy. These measures contribute to the health of dancers’ skin.

4.6. Limitations

Up to the present, data on skin health in dancers was completely lacking. Therefore, a study design was chosen that generates a lot of data through a cross-sectional and longitudinal survey. With the choice of the two dance styles, a relevant and large spectrum of dance was covered. Although a total of $n = 114$ test persons is not representative for all dance styles, it is a sufficient number to suggest a certain transferability to other dance styles. Thus, the results can serve as a first rough orientation regarding skin problems. The examinations took place parallel to the ongoing training. In principle, this was a good method to examine as many dancers as possible in a short period of time. At the same time, more dancers could be motivated to participate in the study. Simultaneously, the varying

load intensity during the training made the dermatological examination slightly more difficult (e.g., to assess seborrhoea and erythema caused by redness and sweat production). Furthermore, the results could be biased by the timing of the study during the year, as certain skin conditions are more prevalent during certain times of the year because of the weather. Furthermore, there has been no second control examination to confirm the findings, as this is also not usual in physician consultations. Theoretically, this includes the possibility of misjudgements.

Inflammatory skin diseases such as acne vulgaris were counted as folliculitides in this study. This served to provide a better overview, but should also be critically questioned, as numerous different clinical pictures are now subsumed into one entity under the term folliculitis.

In order to be able to assess the extent of skin changes, further questions on quality of life and skin care behaviour could be a valuable addition to the present questionnaire. For this purpose, there are standardised questionnaires developed especially for dermatology, for example the DLQI (Dermatology Quality of Life Index) frequently used in studies [61]. A detailed analysis of the cosmetic products used and their ingredients would also be helpful. Despite the aforementioned limitations, the present study offers new, already extensively discussed findings in a relevant but hitherto little-considered field of research.

5. Conclusions

Medically relevant skin changes can be observed in both professional dancers and Latin American formation dancers depending on the exposure and gender, from which concrete measures can be derived. These include, among other things, a skin protection and hygiene plan adapted to the needs, preventive information seminars, and early detection measures, as well as education of those affected by skin diseases. Furthermore, further studies with a larger number of subjects are necessary to substantiate the present results.

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