

Injury Reporting Rates and Injury Concealment Patterns Differ Between High-school Cirque Performers and Basketball Players

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Objective: The performing arts style of cirque has grown in popularity, with high-school participants increasingly practicing this style. Still, little research has examined the injury reporting rates and patterns in this population. Our study aimed to compare injury reporting rates and injury concealment patterns between high-school cirque performers and a peer-group of basketball players. **Methods:** Fifty participants (30 cirque, 20 basketball) completed a 12-item injury history and concealment instrument with chi-squared analyses and Fisher's exact tests comparing groups ($p = 0.05$). **Results:** While no group differences ($p = 0.36$) existed in injuries reported, basketball players were more likely ($p = 0.01$) to miss participation due to injury than cirque performers. No significant difference existed between participants regarding which healthcare provider they reported to first ($p = 0.27$), but basketball players reported their injuries to the athletic trainer at higher rates (50%) than cirque performers (20%). A nonsignificant trend ($p = 0.08$) was noted in promptness to report injury, with more cirque performers (13%) concealing their injuries than basketball players (5%). Several reasons were noted for concealment of injury, with the most common being the belief that the injury would "go away" on its own. Knee injuries were most common in basketball players (23.7%) and back and knee injuries (10.5% each) in cirque performers. **Conclusions:** Despite similar injury rates, cirque participants concealed injuries more than peer-basketball players. Reasons may include losing performance roles, unfamiliarity and low trust with healthcare providers, ignorance about initially minor-looking injuries, and higher pain tolerance thresholds. Education and communication are essential to allow performing artists to seek healthcare support. Research is needed to appropriately understand and meet the needs of this underserved performing artist population. *Medical Problems of Performing Artists* 2011; 26(4):200–205.

The performance style of circus arts (cirque) is a unique form that incorporates a variety of skills such as trapeze and stilt-walking with activities like juggling, dance, and music in a theatrical setting. The cirque performance style has become increasingly popular over the last two decades, with over 500 performing arts companies across at least 19 countries worldwide practicing these circus arts.¹

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One of the most prominent companies that practice this style, the *Cirque du Soleil* is so popular that in 2008, its productions were performed in 271 cities across 32 countries and with an estimated audience of 11 million.² The company has over 900 artists performing in 17 different shows annually,^{3,4} with the number of performers/show ranging from 50 to 80 artists.² Professional *Cirque du Soleil* artists often perform 9 to 10 shows/week for up to 3 months at a time and over 450 shows per year.³ Financially, *Cirque du Soleil* is big business with a 20% stake sold for \$600 million in 2008 and estimated total revenue earnings of \$810 million (USD) in 2009.² With the increase in the popularity of cirque, it is now appearing as an after-school activity for students in the high-school setting. There are schools that train individuals in acrobatics, flying, trapeze, hand-balancing, contortion, juggling, teeterboard, wire-walking, and clowning.⁵

Although cirque performances are aesthetically pleasing, they put the performers at high risk for injury. This is because cirque performers often execute specialized tricks, contort, sprint, catapult, swing, dive, and launch partners to various locations on stage.³ All these performance skills require strength, agility, grace, and extreme precision,³ increasing the risk for injury (Figure 1).^{3,4,6,7}

Researchers have investigated injury rates in dancers and theatrical performers.^{8–11} Dancing is accepted as a high injury risk activity, with a 50 to 85% injury rate in a single season.^{12,13} However, limited research has examined cirque injuries. To the best of our knowledge, only one published study has examined injuries in cirque.⁴ Specifically, the researchers examined injuries over a 5-year period across all the cirque shows and reported that 1,376 artists sustained a total of the 18,336 show- or training-related injuries.⁴ While serious injury rates were lower than those of several National Collegiate Athletic Association (NCAA) sports, they were similar to rates for men's basketball.⁴ Still, the over 18,000 injuries to approximately 1,400 performers is a substantial number of injuries suffered by this performing arts population.

Due to the high numbers of cirque performers, performances, injuries, and associated high financial stakes, dedicated medical support is available for the professional *Cirque du Soleil* performers. Typically, the medical team for each *Cirque Du Soleil* production has two to three physical therapists and/or athletic therapists/trainers, with part-time massage therapists and Pilates or yoga instructors as needed.³ However, no research exists detailing injuries to or the med-



FIGURE 1. Example of a physically demanding technique performed by a high-school cirque performer. (Photo courtesy of Tammi Nowack.)

ical support for high-school-level cirque participants. This population thus remains underserved and is understudied despite the fact that these students are often the largest feeder system for professional cirque-style companies.

Despite the lack of published evidence, authors have suggested that performing artists may not be taking their injuries seriously.^{6,7,15} In an investigation of professional-level modern and ballet dancers, only one third of performers stopped dancing and rested as a result of injury.⁶ This pattern is consistent with prior observations of performing artists referring to their body as just “instruments of artistic expression.”¹⁰ Further, while more experienced performing artists are more likely to report an injury, overall, performing artists continue to participate through pain and injury, ignoring the potential for further injury or long-term negative effects.¹⁵ Some performing artists have an obsessive mentality that can prevent them from obtaining adequate treatment.⁷ Performing artists may not also consider a chronic, low-grade pain that does not completely inhibit the ability to perform as an “injury.”¹⁵

Although some research suggests that the percentage of dancers seeking professional help when injured has improved from 37% in 1993 to 60% in 2002,¹⁶ there are no comparative statistics for cirque performers available in the literature. Similarly, research has shown that 60.3% of athletes require “very little” or “a moderate amount” of pain in order to seek treatment from an athletic trainer or physician.¹⁷ If a performing artist chooses to conceal an injury, the injury can increase in severity if not treated promptly and appropriately

and can place the performer, and possibly other colleagues, at risk for further injury.

The frequency of the phenomenon of health-undermining behaviors, specifically injury concealment (i.e., the intentional action of withholding information from a healthcare provider), is examined in a dance population⁷ but relatively unknown in cirque. Health-undermining behaviors can include poor information-seeking, lack of consultation with a health professional, and ignoring injury-related pain with intentional hiding.⁷ This pattern of injury concealment may be unlike athletics, where athletes are aware that medical support is available to them and are prompt in seeking medical attention for injuries. Overall, it still remains unknown whether differences exist in injury reporting and concealment patterns between cirque performers and athletes.

Purpose

Thus the purpose of this study was to compare the injury reporting rate and injury concealment patterns between high-school cirque performers and a peer group of high-school basketball players.

METHODS

Participants

Fifty participants, consisting of cirque ($n = 30$; mean age 16.6 yrs, age range 14 to 18 yrs) and basketball athletes ($n = 20$; mean age 16.3 yrs, age range 14 to 18 yrs), at a private boarding school in the United States participated in the study. We chose basketball players as the comparative peer athletic group based on the similar competitive seasons and rate of injury.⁴

Since the school did not allow students to participate in more than one after-school activity per season, we were able to ensure that there was no cross-pollination between the basketball players and cirque performers. Both the cirque and basketball after-school activities were available for the high-school students. Cirque performers began individual practice and training sessions in late September. Auditions for the late February performance of cirque began in late November. Basketball training and practice began early November. Both cirque and basketball seasons ended in late February.

The school is a residential campus with a campus nurse and athletic trainer present onsite to provide healthcare to the students. Typically, if an injury or illness occurred during school time (i.e., before 3:00 pm), students would be referred to the campus nurse. If an injury or illness occurred after 3:00 pm during after-school activities, students were directed to the resident athletic trainer who provided medical support. The expected injury reporting protocol for after-school activities was reporting first to the athletic trainer and then receiving outside assistance from another healthcare provider.

The local Institutional Review Board at Western Carolina University and the school administration approved all study procedures. As the participants were minors, all potential participants' parents or legal guardians were asked to grant

TABLE 1. Injury History and Concealment Questionnaire

What activity did you compete in this winter season?	If you participate in another sport, do you typically report the injuries sustained in that sport as soon as possible?	
a. Basketball	a. Yes	
b. Cirque	b. No	
Please select your gender.	Did you have an injury that kept you from participating for at least 1 day this season?	
a. Male	a. Yes	
b. Female	b. No	
How many injuries did you have this season?	How many of your injuries kept you from participating in your activity for 2 days or less?	
a. 0	d. 3	
b. 1	e. 4	
c. 2	f. 5 or more	
Were your injuries reported to the athletic trainer or school nurse as soon as possible?	How many of your injuries kept you from participating in your activity for 3 days to 3 weeks?	
a. I reported all injuries as soon as possible.	a. 0	d. 3
b. I reported all injuries, but not right away (more than 1 day after).	b. 1	e. 4
c. I only reported some of my injuries, but when I did it as soon as possible.	c. 2	f. 5 or more
d. I only reported some of my injuries, but when I did it was a day or more after it happened.		
e. I did not report any injury even though I had an injury.		
f. I did not have any injuries this season.		
If you had an injury this season, which healthcare provider did you first report the injury to?	How many of your injuries kept you from participating in your activity for more than 3 weeks?	
a. The athletic trainer	a. 0	d. 3
b. The school nurse	b. 1	e. 4
c. Another healthcare provider outside the school, such as a physical therapist or your doctor	c. 2	f. 5 or more
d. Did not report to a medical person		
Why did you not report your injuries?	Do you participate in a sport during another season?	
a. Fear of losing playing/practice time	a. Yes	
b. Fear of letting my team/cast down	b. No	
c. Did not want my coach/director to know I was injured		
d. Did not feel the injury was serious or needed evaluation by a healthcare provider	To which part of your body did you suffer an injury?	
e. Thought the injury would heal or "go away" on its own	a. Foot	i. Head
f. Did not want to lose my spot on the team or role in the show	b. Ankle	j. Face
g. Felt that the program might be jeopardized	c. Shin	k. Shoulder
h. Other _____	d. Knee	l. Elbow
	e. Hip	m. Forearm
	f. Thigh	n. Wrist
	g. Back	o. Hand
	h. Neck	

permission for their minor to participate in the study. Only those participants whose parents or legal guardians agreed were allowed to participate in the study. To allow for timely communication with the several international parents of the participants, we used electronic mail as the preferred method of correspondence. Parents were allowed 1 month to respond before participants were eliminated from the pool. Thereafter, all minors who had permission to participate in the study were explained the purpose for the study and instructions for participation. Participants then completed a written assent form before study participation.

Injury History and Concealment Instrument

A 12-item injury history and concealment instrument (Table 1) was developed for the study. An injury was

defined as an incident that resulted in time lost from activity.^{18,19} The item answers were in a multiple-choice format. Instrument face validity was established by having three expert reviewers with combined 50 years of healthcare provision experience review the items and the instrument. This allowed us to optimize the instrument for content and clarity of the instrument items.

Data Collection

Participants completed the instrument simultaneously in an electronic format in the computer laboratory at the end of their respective seasons of cirque or basketball. An unbiased third-party individual proctored the survey to ensure anonymity and avoid any potential investigator bias. Participants were informed that their participation in the study was

TABLE 2. Injury Frequency, Time Loss, Healthcare Provider Choice, Injury Reporting, and Participation between Cirque Performers and Basketball Players

Question	Cirque	Basketball
No. of injuries reported during the season		
0	17	7
1	7	9
2	6	4
3 or more	3	1
Loss of at least 1 day of participation due to injury		
Yes	4	9
No	26	11
Healthcare provider athlete sought care from first		
Suffered no injuries	17	7
Athletic trainer	6	10
School nurse	2	2
Outside practitioner (PT, MD)	1	0
Did not report my injury	4	1
Promptness of injury reporting		
Reported promptly	15	7
Delayed or did not report	11	13
Suffered no injury	4	0
Athletes performing in another sport during another season		
Yes	14	19
No	16	1

optional and their responses were anonymous with no identifying data linked to the participants.

Statistical Analyses

Survey responses to questions that involved nominal data were analyzed descriptively through frequency counts and percentages. When appropriate, chi-squared analyses and Fisher's exact tests were used to examine differences in injury or concealment patterns between groups. Fisher's exact test was used when the expected count of five was not achieved in >20% of cells.²⁰ Means and standard deviations are reported on items that resulted in ratio data (i.e., number of injuries reported). Tests of assumptions of normality were conducted on these items per group, and nonparametric statistics were utilized if necessary. An alpha level of 0.05 was used for all tests. All data were analyzed using SPSS version 17.0 (SPSS Inc, Chicago, IL).

RESULTS

No differences existed between activity groups when looking at the number of injuries reported ($p = 0.36$) using the Fisher's exact test^{20,21} (Table 2). However, basketball players were more likely to miss at least 1 day of participation per injury than cirque performers ($\chi^2_4 = 6.25, p = 0.01$) (Table 2). No significant group difference ($p = 0.27$) was noted regarding the healthcare provider to whom participants reported

TABLE 3. Reasons for Participants Not Reporting (Concealing) Injuries

Reasons	Cirque	Basketball
Fear of losing playing/practice time	42.9% (3)	20.0% (4)
Fear of letting my team/cast down	10.0% (3)	15.0% (3)
Did not want my coach/director to know I was injured	13.3% (4)	33.3% (2)
Did not feel the injury was serious or needed evaluation by a healthcare provider	16.7% (5)	15.0% (3)
Thought the injury would heal or "go away" on its own	16.7% (5)	20.0% (4)
Did not want to lose my spot on the team or role in the show	3.3% (1)	0 (0%)
Felt that the program might be jeopardized	6.7% (2)	0 (0%)
Other	0 (0%)	5.0% (1)

Data shown as % (n).

first. However, 50% of the basketball athletes reported to the athletic trainer first, as compared to 20% of cirque performers (Table 2).

A nonsignificant trend ($p = 0.08$), was revealed in the participants' promptness in reporting an injury. Further, when asked about reporting injuries, besides reporting an injury to the athletic trainer, cirque performers would otherwise choose to conceal their injury rather than consult another healthcare professional (Table 2). Basketball players were also more likely ($\chi^2_1 = 12.493, p < 0.001$) to play a different sport in another season than cirque performers: 95% of basketball athletes reported playing another sport during another season vs 46.7% of cirque performers (Table 2).

The reasons for concealing or not reporting an injury are shown in Table 3. In basketball players, the most frequent reasons were "fear of losing playing/practice time" and believing the injury would "go away" on its own. In cirque performers, the most frequent reasons were "not feeling the injury was serious enough to warrant evaluation" or believing that "the injury would heal or 'go away' on its own" (Table 3).

Table 4 presents injury reporting patterns noted in both groups. The highest injury rate was in the lower extremity (65.8% of total injuries), with the knee being the most frequently injured part of the body. Basketball athletes reported the highest rates of injury in the knee, while cirque performers reported the highest rates of injury in the knee and back.

DISCUSSION

Primary Findings

Our study is the first to investigate both the understudied high-school level cirque performers and concealment of injuries patterns in this population as compared to athletes in traditional sports (i.e., basketball). Both basketball players and cirque performers reported similar numbers of injuries during the season, in agreement to previous reports of injury rates in cirque performers being similar to those for NCAA

men's basketball.⁴ However, our basketball participants were more likely to miss participation than cirque performers. Since both groups reported similar injury rates, but basketball players were more likely to miss participation, it raises the question of why cirque performers were not missing the same amount of participation times?

One possible reason for this observation finding may be that several of the injuries that occurred in the cirque participants were minor, in agreement with previous reports.⁴ Thus, as previously suggested,^{6,15} the Cirque performers did not believe that these so-called "minor" injuries warranted missing participation time if the injuries did not make it impossible for them to perform. In contrast, basketball players did report their injuries to the athletic trainer and sought medical attention. As can be seen in Table 3, possible reasons for the cirque performers' lower rates of seeking healthcare may include losing roles in performance, unfamiliarity and low trust with healthcare providers, ignorance about initially minor-looking injuries that may worsen and negatively impact performance, and higher thresholds for pain tolerance.

Preferred Health Care Provider

Our finding that more basketball players were likely to report their injuries to the athletic trainer first than the cirque performers is partially understandable given the differing patterns of likelihood of participation in another sport noted between the groups. Specifically, basketball players were more likely to play another sport in another season than the cirque performers were. Thus, the basketball players were likely to have previously received medical care from the athletic trainer and established a familiarity and a good working relationship with the athletic trainer. This prior familiarity with medical support and the exposure to other sports may have heightened the basketball players' awareness to injury signs and symptoms. The basketball players would then have an improved understanding of the importance of appropriate care and the role of rest (time off) to allow for proper healing and subsequent full return to activity.

In contrast, fewer numbers of cirque performers participated in other sports. The cirque performers therefore may not have had multiple opportunities to interact with the athletic trainer and may have been unaware of the athletic trainer's role in medical support. Overall, this would have resulted in the cirque performers not choosing to visit the athletic trainer as their first choice when injured. Further support for this explanation comes from the observation that the basketball players reported missing more days of participation than the cirque performing artists. Since cirque performers probably did not have had prior experience in working with medical professionals, they may have chosen to work through their injuries.

Injury Concealment Patterns

Of concern is the trend, although not statistically significant, that cirque performers reported concealing an injury in its

TABLE 4. Injuries Reported by Participants by Body Part

Body Part	Cirque	Basketball	Overall
Foot	7.9% (3)	7.9% (3)	6 (15.8%)
Ankle	5.3% (2)	15.8% (6)	6 (15.8%)
Shin	0	0	0
Knee	10.5% (4)	23.7% (9)	34.2% (13)
Hip	0	0	0
Thigh	0	0	0
Back	10.5% (4)	0	10.5% (4)
Neck	5.3% (2)	0	5.3% (2)
Head	0	0	0
Face	0	0	0
Shoulder	2.6% (1)	2.6% (1)	2.6% (1)
Elbow	2.6% (1)	2.6% (1)	2.6% (1)
Forearm	0	0	0
Wrist	2.6% (1)	2.6% (1)	5.3% (2)
Hand	0	2.6% (1)	2.6% (1)
Total	47.3% (18)	57.9% (22)	100% (38)

Data shown as % (n).

entirety more often than basketball players. Specifically, when asked if participants had an injury and to which healthcare provider they first reported the injury, more cirque performers ($n = 4$) answered "I did not report any injury even though I had an injury" as compared to only one basketball player. Although not statistically significant, this response should be carefully noted by healthcare providers, as it highlights the pattern of concealment of injury in cirque performers. Cirque performers were noted have several reasons for not reporting an injury that need to be further examined as detailed in Table 3.

Adolescents and Injury Risk

It is also important to note that adolescents are at an increased risk of injury when performing due to skeletal and social development.²³ It is estimated that within 100 high schools throughout the United States alone, almost 1.5 million injuries occurred during the 2005-06 school year.³ Injury in adolescents has been attributed to growth spurts, decreased physical strength, and slower onset of bone mineralization.¹⁶ Additionally, increased risk-taking by adolescents may translate into increased injury incidence. The combination of anatomical-physiological injury risk factors, inherently risky nature of the cirque style of performance, and adolescent desire to take risks may lead to increased injury rates in high-school cirque performers.

Limitations and Future Recommendations

With our study being cross-sectional in design, we acknowledge the limitation of not being able to calculate injury exposure rates prospectively. As we wanted to investigate for the first time the injury reporting and injury concealment in high-school level cirque performers, we were not excessively concerned about exposure rates in this specific study. Still,

we understand that prospective investigations of injury incidence in high-school cirque performers-dancers are needed, and we are currently planning a prospective longitudinal investigation of injury incidence in this population as a function of injury exposure rates.

The injury reports and injury concealment data were also self-reported. While researchers^{24,25} have enumerated limitations of using self-recall of injury status, Gabbe et al.²⁴ note that 80% of individuals are able to recall accurately the general body region injured during a 12-month recall of injury. Since our data collection was immediately at the end of the cirque and basketball seasons, we are reasonably confident that our participants correctly recalled the injuries they suffered over the season (only 3 to 5 months prior to data collection). Still, additional research is needed comparing the numbers, severity, and types of self-reported injuries with actual injury reports documented by healthcare providers to confirm the accuracy of self-recall in this population.

Additionally, the survey instrument was not validated. Attempts will be made to compare the reported injury rate with medical records of the subjects.

Another recommendation to strengthen our findings is to investigate injury and concealment patterns over multiple years at multiple schools. Researchers should also examine whether an educational interventional program that teaches cirque performers about injuries before the season successfully attenuates concealment of injury patterns and increases injury-reporting rates in this population. Further investigation is also needed into quantifying the physical stresses imposed during cirque activities and reveal differences in the mechanisms of injury and subsequent injury patterns in cirque performers. Finally, although we attempted to reassure participants to be truthful when completing the instrument and assured their anonymity, we recognize that some participants, as in all participant response-oriented studies, may still have not been completely forthcoming when completing the instrument.

CONCLUSIONS

The performing arts style of cirque is an emerging practice subspecialty for performing arts medicine practitioners. The increased popularity of cirque and increased numbers of cirque performers highlight the need to provide appropriate medical care for this population. Our preliminary findings suggest that while high-school-level cirque performers have similar injury rates as high-school-level basketball players (traditional athletes), they appear to conceal these injuries at an increased rate. Open communication with all performing artists and athletes regarding injury and seeking proper healthcare should be emphasized, particularly with an adolescent population because of their propensity for injury and

increased risk-taking behavior. Helping adolescents understand injuries and the significance of these injuries could lend itself to an appropriate increase in injury reporting rates. Further research is needed regarding injury rates in cirque participants to understand and appropriately meet the needs of this underserved population.

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