Abstract

Safety is paramount to nurture artists' creative growth and performance. In several contemporary circus arts disciplines, the consequences of accidents may involve severe injuries or death. In this paper, we explored perceived risks, personality, experiences of sensation, emotion regulation, and agency in relation to accidents and near misses in contemporary circus arts (N = 248). A pathway analysis revealed that perceived risk, personality and emotion regulation co-vary, and together affect the likelihood of accidents and near misses in contemporary circus arts. A MANOVA showed that contemporary circus arts consist of a heterogeneous group of discipline categories. Floor acrobats experienced significantly more accidents than aerial acrobats and object manipulators, and aerial acrobats experienced significantly more emotion regulation and agency than object manipulators. Further, aerial acrobats scored significantly higher on the personality traits conscientiousness and agreeableness than object manipulators. Our study reinforces the centrality of emotion regulation to safe performance in contemporary circus arts. Practitioners in performance arts, and circus in particular, are recommended to tailor safety interventions to the circus category and the artists' personality specific needs.

Keywords: emotion regulation, personality, risk, performance art, safety

Not just clowning around: psychological mechanisms underlying accidents in a heterogenous group of contemporary circus artists

Contemporary circus is a performance art form wherein artists use circus skills to tell a story and play a character, with the aim to captivate spectators (Leroux, 2014; van Rens & Filho, in press). Similar to other performance art forms (e.g., dance), there is an inherent dualism present in contemporary circus between the artists ability to engage in artistic expressiveness and their ability to execute complex circus skills (see Filho, Aubertin, & Petiot, 2016; Ménard & Hallé, 2014; Spohn & Spickard Prettyman, 2012). The performance of these circus skills is physically demanding, as it requires artists to produce and sustain high levels of muscle strength at extreme ranges of movement (Wolfenden, Angioi, & Orlando, 2017). Contemporary circus consists of a range of disciplines, which are grouped into categories (see Barlati, 2018). These categories include aerial acrobatics (performance of acrobatic skills on an apparatus that is suspended in the air, such as aerial silks), floor acrobatics (performance of acrobatic skills on the ground, or from an apparatus that is positioned on the ground, such as contortion), object manipulation (performance which involves moving an object's location, such as juggling), equilibrium (performance of balancing skills on the ground or an apparatus, such as tightwire), clowning (comic acting, mime, or farce performance with the aim of making audiences laugh), and animal acts (acts involving animals).

The perceived risk and danger inherent in contemporary circus arts is deemed a draw to spectators, who expect to be dazzled and amazed by 'death-defying' acts (Tait, 2016). Indeed, accidents in aerial acrobatics, floor acrobatics, and equilibrium may cause severe injuries or even death (van Rens & Filho, in press). Consequently, these circus categories can be considered 'high-risk' activities (see Barlow et al., 2015). Systematic research in contemporary circus is limited (Ross & Shapiro, 2017), and accordingly little is known about

the risks associated with contemporary circus disciplines. Given the potential life-threatening consequences of involvement in accidents, it is important to better understand the psychological mechanisms underlying incidences of accidents in contemporary circus arts.

Sensation, emotion regulation, and agency in high-risk activities

Participation in high-risk activities was traditionally seen as an expression of sensation seeking behaviour, which refers to a willingness to take risks for the reward of experiencing sensations such as a thrill or an adrenaline rush (Zuckerman, 1994). Consistent with this view, research has suggested that athletes in high-risk sports score significantly higher on the personality trait sensation seeking than athletes who participate in lower-risk sports (Jack & Ronan, 1998; Zuckerman, 1983). Furthermore, high scores on the trait sensation seeking have been correlated with increased risk-taking in high-risk sports (Castanier, Le Scanff, & Woodman, 2010a) and incidences of accidents and near misses in driving (Iversen & Rundmo, 2002; Trimpop & Kirkcaldy, 1996). As such, sensation seeking may also be an important factor contributing to participation in high-risk circus disciplines, as well as incidences of accidents and near misses.

Yet, exploratory research amongst flying trapeze artists indicates that aerial performers mainly seek mastery and control rather than sensation (Hofsess, 1986). Indeed, a growing body of evidence has suggested that participants in high-risk activities should not be seen as a homogenous group of sensation seekers (Barlow, Woodman, & Hardy, 2013). Rather, some may be motivated to engage in high-risk activities for sensation rewards, whilst others may (also) be motivated by the prospect of experiencing emotion regulation and agency (Barlow et al., 2015; Woodman, Hardy, Barlow, & Le Scanff, 2010). Emotion regulation refers to the processes that influence which emotions people experience when, and how these emotions are expressed (Gross, 1998). It is well established that participation in artistic activities elicits experiences of emotion regulation (Fancourt, Garnett, Spiro, West, &

Müllensiefen, 2019). Similarly, participation in high-risk activities provides a means for experiencing emotion regulation (Barlow et al., 2013; Woodman et al., 2010). Experiences of emotion regulation in turn lead to a myriad of physical and mental health benefits (Gross, 2015). Some people may thus engage in (high-risk) circus disciplines to benefit from a fulfilled need for emotion regulation (Barlow et al., 2013; Woodman, Cazenave, & Le Scanff 2008).

Agency refers individuals' perceptions that they can influence their life, and assume responsibility for their behaviour (Bandura, 2001). Having a sense of agency involves the belief that people are active contributors to their life circumstances (Bandura, 2006). Within the human motivational system, feelings of agency have been associated with increased levels of life satisfaction (Welzel & Inglehart, 2010). Athletes who participate in high-risk sports experience more agency compared to those in low-risk sports (Barlow et al., 2013). Consequently, experiences of agency could also be considered a motive to participate in high-risk circus disciplines.

The extent to which participation in contemporary circus disciplines evokes experiences of sensation, emotion regulation, and agency is currently unknown. Individuals who engage in contemporary circus arts with the aim to experience sensation, emotion regulation, and agency may take more risks during participation in their circus discipline. Those who take more risks while participating in high-risk activities are more likely to experience accidents and near misses (Castanier, Le Scanff, & Woodman, 2010b; Merritt & Tharp, 2013). To understand the psychological mechanisms underlying incidences of accidents and near misses in contemporary circus, it is thus important to consider artists' experiences of sensation, emotion regulation, and agency. However, certain personality traits have also been associated with risk-taking in high-risk activities.

Personal and activity characteristics in relation to accidents.

Individuals' general personalities are commonly described using the 'Big Five' personality traits, consisting of openness, conscientiousness, extraversion, agreeableness, and emotional stability (Costa & McCrae, 1992). Little is known about the personality traits of circus artists (Ross & Shapiro, 2017). Artists in general have been characterized as scoring comparatively high on openness, and low on conscientiousness (Feist, 1998). However, Barlow et al. (2013) suggested that there are personality differences among athletes who participate in high- and low-risk sports. Specifically, athletes in high-risk sports have been found to score higher on conscientiousness and emotional stability compared to controls (Barlow et al., 2013). As such, it is possible that circus artists in high-risk circus disciplines may score untypically high on conscientiousness and emotional stability compared to other artists.

Personality traits have been associated with the amount of risk people take while participating in high-risk activities. Conscientiousness has consistently been negatively associated with risk-taking behaviour in a range of high-risk sports (Castanier et al., 2010b; Merrit & Tharp, 2013), and several studies have found positive associations between neuroticism and risk-taking behaviour (see Bonnet, Bréjard, & Pedinielli, 2017; Merrit & Tharp 2013). The typical low scores of artists on conscientiousness could thus potentially predispose circus artists to risk-taking behaviour. Research findings concerning the association between extraversion and risk-taking behaviour conflict, some researchers found a positive association between extraversion and risk-taking (Bonnet et al., 2017; Castanier et al., 2010b) whilst others did not (Merrit & Tharp, 2013). Agreeableness and openness are not associated with risk-taking behaviour (Merrit & Tharp, 2013).

Unique factors inherent to high-risk activities are also thought to differentiate the extent to which sensation, emotion regulation, and agency are experienced during participation. Notably, Barlow et al. (2013) showed that skydivers experience significantly

more sensation while participating in their sport than mountaineers or participants in low-risk sports (Barlow et al., 2013). Barlow et al. (2013) argue that this may be due to sports such as mountaineering requiring careful planning and preparation to avoid experiences of 'thrills', as thrills are typically associated with a loss of control in mountaineering, which may cause injury or death (Barlow et al., 2013). In sports such as skydiving, the experience of a thrill is an inherent part of the activity, and not actively avoided. Exploratory evidence (Hofsess, 1986) suggests that contemporary circus disciplines may bear more resemblance to mountaineering that to skydiving. Yet, to truly understand the experiences of sensation, emotion regulation, and agency in contemporary circus arts it seems of importance to differentiate between circus disciplines.

Moreover, the amount of risk that a person perceives to be associated with participation in a high-risk activity is reported to affect risk-taking behaviour (Kontos, 2004). Specifically, individuals who perceive an activity to be low-risk may engage in more risk-taking behaviours during participation, consequently exposing themselves to a greater likelihood to experience accidents and near misses (Kontos, 2004). To date, little is known about the personality traits of circus artists, or how different circus categories are experienced (Ross & Shapiro, 2017). To better understand incidences of accidents in contemporary circus, it is thus important to explore the artists' personality relative to their circus discipline.

The Present Research

In summary, to better understand incidences of accidents and near misses in contemporary circus arts, it is important to consider the artists' circus disciple, their perception of risk associated with participation in this discipline, their personality, and experiences of sensation, emotion regulation and agency. In this context, the first aim of this study is to explore associations among these factors, with the purpose to identify those that predict accidents and near misses in contemporary circus arts. Based on the literature

described, we expect that the risk associated with the circus discipline, experiences of sensation, emotion regulation, and agency, as well as the personality traits conscientiousness and neuroticism would predict accidents.

The second aim of this study was to compare the perceived risks, experiences of sensation, emotion regulation, and agency, and circus artists' personality in various contemporary circus disciplines. In particular, we compared three circus categories: aerial acrobatics, floor acrobatics, and object manipulation. We expected that aerial acrobatics would be perceived the most high-risk circus category, followed by floor acrobatics, and that object manipulation would be perceived as low-risk. Increased experiences of emotion regulation and agency were expected among the high-risk circus disciplines. Due to prolonged training circus artists endure, we expected no significant differences in terms of experiences of sensation. Finally, circus artists participating in the most high-risk circus disciplines were expected to score higher on conscientiousness and emotional stability than artists in lower-risk circus disciplines.

Method

Participants

We recruited circus artists who participated in a diverse range of circus disciplines. The final sample consisted of 248 circus artists (188 female, 54 male, 6 other/prefer not to say), ranging from 18 to 65 years of age (M = 30.7, SD = 8.4). On average, the participants had 7.3 years of circus experience (SD = 6.7), and trained 1 to 40 hours per week (M = 8.7, SD = 7.7). The group of participants included 150 amateur circus artists, 70 professional circus artists, 16 full-time students at national circus schools, and 12 retired professional circus artists who still train their circus skills. The participants listed 28 distinct circus disciplines as their primary circus discipline (see Table 1). These disciplines were categorised as aerial acrobatics (n = 181), object manipulation (n = 38), floor acrobatics (n = 21),

equilibrium (n = 5), and clowning (n = 3). Due to the low sample size, clowning and equilibrium were not represented as distinct categories in our analyses.

Table 1

Participants' Circus Category and Corresponding Primary Circus Discipline

Circus category	Circus discipline	N
Aerial acrobatics		**181**
	Aerial silks	59
	Lyra	41
	Flying trapeze	25
	Static trapeze	22
	Aerial acrobatics (unspecified)	17
	Dance trapeze	4
	Rope	3
	Duo trapeze	2
	Swinging trapeze	2
	Straps	2
	Hammock	2
	Aerial pole	1
	Cloudswing	1
Object manipulation		**38**
	Juggling	24
	Poi	6
	Hula hoop	4
	Diabolo	2
	Object manipulation (unspecified)	2
Floor acrobatics		**21**
	Partner/group acrobatics	7
	Acrobatics	5
	Contortion	4
	Pole	4
	Adagio	1
Equilibrium*		**5**
	Handbalance	2
	German wheel	1
	Walking globe	1
	Tightwire	1
Clowning*		**3**
	Clowning	3
	Total	**248**

*Due to the small sample size in this circus category, it was not used as a distinct category in the analyses

Measures

The Sensation seeking, Emotion regulation, and Agency Scale (SEAS; Barlow et al., 2013). The SEAS consists of three separate inventories assessing motives for experiences of sensation, emotion regulation and agency before, while, and after participation in a high risk activity. In the current study, only the 'while participating' inventory was used. The SEAS-'while participating' consists of 18 items distributed evenly over three subscales which assess experiences of sensation (example item: 'I enjoy getting a physical thrill'), emotion regulation (example item: 'My emotions are sometimes very intense') and agency (example item: 'I am in charge'). Responses are collected on a 7-point Likert scale ranging from 1 (*completely disagree*) to 7 (*completely agree*). We conducted a confirmatory factor analysis in the current sample using IBM SPSS AMOS 24. Cut-off values close to the following values were deemed indicators of good model fit: CFI > .95, RMSEA < .06 and SRMR < .08 (Hu & Bentler, 1998). An adequate model fit was found (χ^2 (114) = 259.5, CFI=.92, RMSEA = .07, SRMR =.07). The internal reliability alpha coefficients for sensation, emotion regulation, and agency in the current sample were .85, .88, and .69 respectively.

The Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). The TIPI is a ten-item instrument that assesses the Big-Five personality dimensions (McCrae & Costa, 1987) openness to experiences, conscientiousness, extraversion, agreeableness, and emotional stability, were assessed using the TIPI (Gosling et al., 2003). It contains two items per personality dimension and is designed for optimal convergent validity, discriminant validity, and test-retest reliability compared to longer personality inventories (Gosling et al., 2003). Responses are provided on a seven-point Likert scale ranging from 1 (*disagree strongly*) to 7 (*agree strongly*). Example items are 'I see myself as sympathetic, warm' and 'I see myself as conventional, uncreative'.

Accidents and Close Calls in Sport Inventory (ACCSI; Barlow et al., 2015). The ACCSI consists of six items, equally distributed over two subscales which measure close calls and accidents in sport. For the purpose of the current study, the words 'my sport' in the questionnaire have been replaced by 'my main circus discipline'. Example items include 'During participation in my main circus discipline, I narrowly avoid accidents', and 'My decisions in my main circus discipline lead to accidents'. Responses are measured on a 7-point Likert scale ranging from 1 (*never*) to 7 (*always*). A confirmatory factor analysis conducted in the current sample also indicated a good model fit (χ^2 (7) = 8.2, CFI= 1.0, RMSEA = .07, SRMR =.03). The internal reliability alpha coefficients for accidents and close calls were .78 and .84 respectively.

Perceived Risk. As an indicator of the perceived risk associated with their main contemporary circus disciplines, participants were asked: 'How would you rate the risks associated with your main circus discipline?'. The question was followed by a description in which the concept 'risk' was explained to the participants: "An activity in which the consequences of something going wrong do not impact your safety or wellbeing is considered a 'no risk' activity. An activity in which the consequences of something going wrong could lead to severe injuries or death is considered an 'extremely high risk' activity". Participants were asked to rate the risks associated with their main circus discipline on a scale from 1 to 5 (1 = *no risk at all*, 2 = *slight risk*, 3 = *moderate risk*, 4 = *high risk*, 5 = *extremely high risk*).

Procedure

Ethical approval for this study was obtained from the relevant institution's human research ethics committee. The authors recruited participants to complete an online questionnaire using the networking platform 'Facebook'. On Facebook, the lead author shared a so-called 'post' containing information about the study with her personal network within the circus community (e.g., circus artists, coaches, and training centres). Snowballing

techniques (e.g., circus artists sharing the post) were used to bring the research under the attention of other circus artists, coaches, and training centres. Additionally, an invitation to the online questionnaire was distributed in a newsletter to all students of a national circus school.

Participants were invited to follow a link to an online questionnaire created using the Qualtrics survey platform. The first page of the questionnaire provided additional information about the study, and included an informed consent statement. Following this, the participants were asked to provide demographic data, information about their circus experience, and to complete the TIPI, SEAS-'while participating', and ACCSI. To increase data quality, we followed guidelines by Meade and Craig (2012) aimed at preventing careless participant responses in anonymous online surveys. Specifically, we (a) increased respondent interest by clearly stating why the study is important for circus artists, (b) limited the length of our questionnaire to a maximum of 57 items, and (c) tailored our communication to the target population of circus artists by mentioning that the lead author is a circus artist.

In total, 304 circus artists consented to participation in our online questionnaire. Of this group, 248 participants completed the entire questionnaire (completion rate: 81.6%). Only full completions were included in the analyses, and no missing data-points were present in our sample. We used the participants' ip-adresses as an indicator of unique responses. No duplications were found, indicating a low likelihood that a participant completed the questionnaire multiple times. Further, all responses to the open-ended question regarding the participants' main circus disciplines detailed true circus disciplines, indicating a high likelihood that all participants were circus artists.

Results

To identify associations between perceived risk, sensation, emotion regulation, and agency, personality, life satisfaction, and near misses, exploratory correlational analyses were

conducted in IBM SPSS Statistics 24 (Table 2). Further, a path-analysis model was conducted in Mplus version 7.4 calculating MLR chi-square statistics (Figure 1). A MANOVA was conducted in IBM SPSS Statistics 24 to assess differences between circus categories (Table 3), eta squared was calculated as an estimate of effect size. Bonferroni post-hoc tests were conducted to identify significant differences between circus categories, and Cohen's *d* was calculated as an estimate of effect size.

Associations among perceived risk, sensation, emotion regulation, agency, personality, near misses, and accidents

Correlational analyses were conducted to explore associations among risk perceptions, the five personality traits, experiences of sensation, emotion regulation, agency, close calls, and accidents (see Table 2). Significant, small to medium (Cohen, 1988), positive, relationships between perceived risk and sensation, emotion regulation, and agency were found (r = .24, r = .32, and r = .23 respectively), indicating that those who perceived the risk associated with their circus discipline to be higher, reported experiencing more sensation, emotion regulation, and agency during participation. Significant, small, positive associations were identified among several personality traits and perceived risk, experiences of sensation, emotion regulation, and agency (see Table 2), which indicates that personality plays a role in how participation in contemporary circus arts is experienced. Those who experienced more emotion regulation during participation in their circus discipline were more likely to report experiencing near misses while participating in circus (r = .25). Circus artists who perceived higher risks associated with their circus discipline reported experiencing more accidents (r = .18), and a significant, small, positive, relationship between experiences of emotion regulation and accidents was found (r = .18). A small, negative, relationship between conscientiousness and accidents was found (r = -.16), indicating that those scoring higher on the personality trait conscientiousness were less likely to experience accidents while

participating in their circus discipline. Finally, a large, positive, relationship between accidents and near misses was found (r = .51).

To expand on the correlational analyses, we ran a path analytical model, which differs from multiple regression because it allows for researchers to examine unique standardized effects of multiple predictors on multiple outcomes (Kline, 2016). In our model, the outcome variables were *accidents* and *near misses*, and the predictors were *perceived risk*, *emotion regulation*, and *conscientiousness*. We thus modelled the previously observed statistically significant correlations among the independent variables and the outcome variables (see Table 2). Noteworthy, the tested model reflects Barlow and colleagues' framework on risk taking behaviour in high-risk sports (2013; 2015), and bears resemblance to the established notion that personality traits (e.g., conscientiousness), coping resources (e.g., emotion regulation) and cognitive appraisals (e.g., perceived risk) affect the likelihood of injury in sport settings (see Andersen & Williams, 1988). The standardized results for the final model are depicted in Figure 1. The model yielded good fit to the data ($\chi^2(2) = 3.31$, p = .19, CFI = .98, RMSEA = .05, SRMR = .04), and confirmed the overall pattern of relationships observed in the univariate correlational analysis. Specifically, the set of predictors explained 7.8% (p < .05) and 6.2% (p < .05) of the total variance of *accidents* and *near misses* respectively. More specifically, *accidents* (a) co-varied with *near misses* (r = .49, $p \leq .01$) and (b) was predicted by *perceived risk* (β = .15, p = .01), *emotion regulation* (β = .18, p = .02), and *conscientiousness* (β = -.15, $p \leq .01$). Furthermore, *near misses* was predicted by *emotion regulation* (β = .25, p = .01), which in turn co-varied with *conscientiousness* (r = 20, $p \leq .01$) and *perceived risk* (r = .32, $p \leq .01$). *Conscientiousness* was found to be correlated with *perceived ris*k (r = .12, p = .01).

Table 2

Correlations among Perceived Risk, Sensation, Emotion Regulation, Agency, Personality, Near Misses, and Accidents (n = 248)

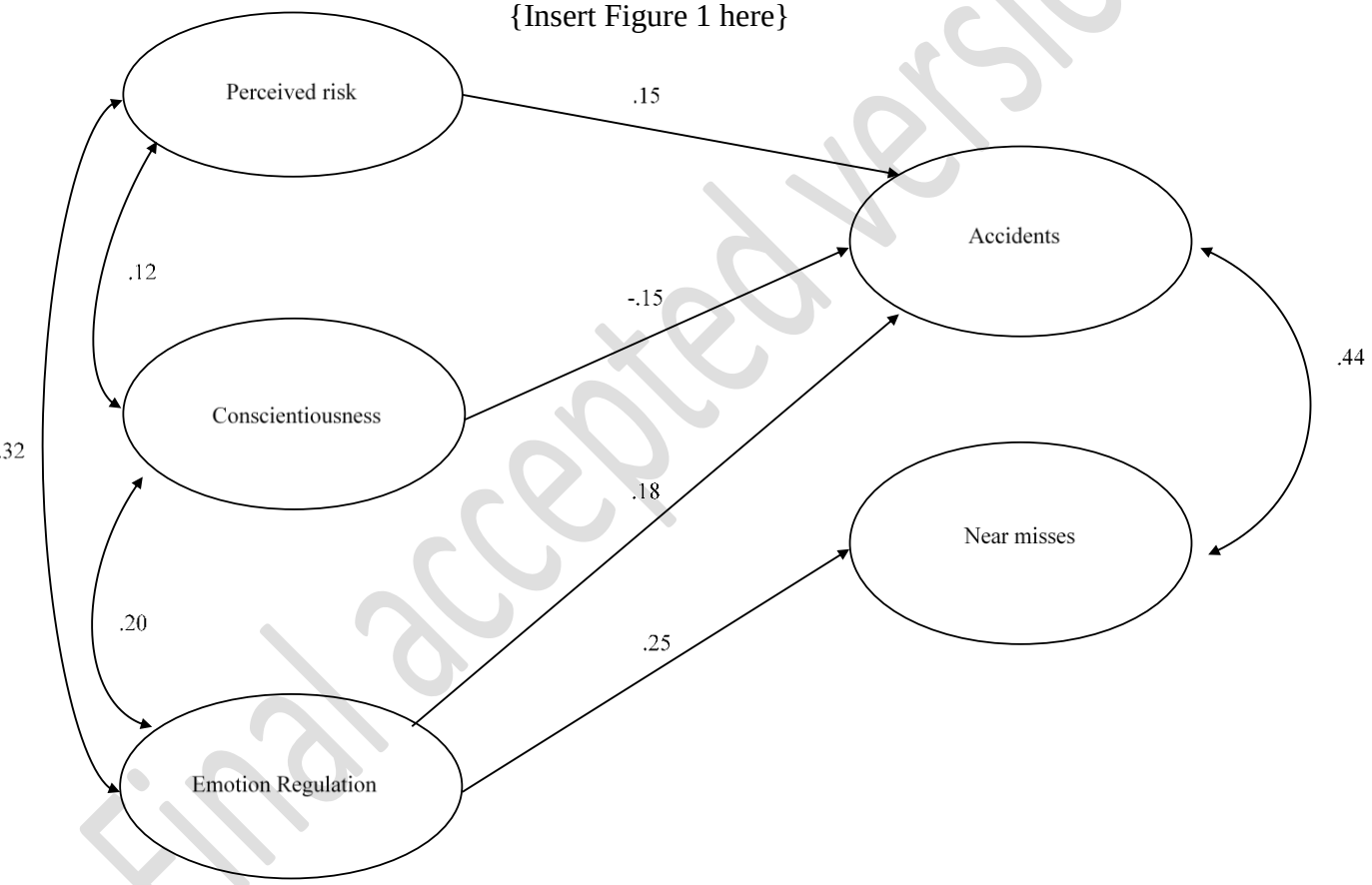
	Perceived risk	**Sensation**	**Emotion regulation**	**Agency**	**Openness**	**Conscientiousness**	**Extraversion**	**Agreeableness**	**Emotional stability**	**Near misses**	**Accidents**
Perceived risk	1	.24**	.32**	.23**	.04	.12	.05	.18**	.03	.06	.18**
Sensation		1	.36**	.29**	.06	.02	.26**	.14*	.07	.11	.12
Emotion regulation			1	.19**	.10	.20**	.01	.15*	.03	.25**	.19**
Agency				1	.10	.21**	.15*	.21**	.20**	-.11	-.08
Openness					1	.15*	.19**	.13*	.06	.02	-.03
Conscientiousness						1	-.04	.20**	.23**	-.08	-.16*
Extraversion							1	-.03	.12	.12	.10
Agreeableness								1	.28**	-.12	-.10
Emotional stability									1	.03	-.04
Near misses										1	.51**
Accidents											1

* $p < 0.05$ two-tailed
** $p < 0.01$ two-tailed

Finally, given the importance of testing for alternative models (Kline, 2011), we ran a more complex model including interaction terms among all exogenous variables (perceived risk x conscientiousness; perceived risk x emotion regulation; conscientiousness and emotion regulation. These alternative models yielded a poor fit ($\chi^2(41) = 92.56$, $p < .01$, CFI = .62, RMSEA = .07, SRMR = .09). Thus, the model depicted in Figure 1 was considered the final model.

Figure 1. A path analytical model predicting accidents and near misses in contemporary circus arts.

{Insert Figure 1 here}



Differences between circus categories

Results of the MANOVA showed that there were significant differences between circus disciplines F (12, 226) = 6.76, p <.001, Λ = .54, partial η^2 = .26. For an overview of the results, please refer to Table 3.

Perceived risk. Results of analyses of variance indicated significant differences between aerial acrobatics, floor acrobatics, and object manipulation. The perceived risk associated with object manipulation was deemed significantly lower compared to aerial acrobatics ($p < .01$, Cohen's $d = 1.79$) and floor acrobatics ($p < .01$, Cohen's $d = 1.76$).

Sensation, emotion regulation, and agency. No significant differences between circus categories were found regarding experiences of sensation. Compared to object manipulators, aerial acrobats experienced significant more emotion regulation ($p < .01$, Cohen's $d = .64$), and agency ($p < .01$, Cohen's $d = .71$). Ground acrobatics was not found to differ significantly from aerial acrobatics or object manipulation.

Personality. Differences in personality were found between aerial acrobats and object manipulators; specifically, aerial acrobats scored significantly higher on conscientiousness ($p < .01$, Cohen's $d = .57$) and agreeableness ($p < .05$, Cohen's $d = .54$).

Accidents and near misses. Floor acrobats reported significantly more experiences of near misses than aerialists ($p < .05$, Cohen's $d = .74$), and floor acrobats experienced more accidents than both aerialists ($p < .01$, Cohen's $d = 1.05$) and object manipulators ($p < .01$, Cohen's $d = 1.18$).

Table 3

Differences Between Circus Categories for Perceived Risk, Sensation, Emotion Regulation, Agency, Personality, Near Misses, and Accidents.

	Aerial acrobatics (n = 181)	**Floor acrobatics** (n = 21)	**Object manipulation** (n = 38)	**Total** (n = 240)	**Between group difference** *F* (2, 237)	**Post-hoc** ($p < 0.05$)
Perceived risk	3.58 (.93)	3.48 (.87)	1.95 (.89)	3.31 (1.09)	49.67, $p < .01$, $\eta^2 = .30$	AA > OM; FA > OM
Sensation	5.79 (.94)	5.73 (.87)	5.42 (.93)	5.72 (.94)	2.56, $p = .08$, $\eta^2 = .02$	
Emotion regulation	5.09 (1.19)	4.79 (1.20)	4.21 (1.53)	4.93 (1.29)	7.97, $p < .01$, $\eta^2 = .06$	AA > OM
Agency	5.98 (.67)	5.73 (.87)	5.45 (.81)	5.73 (.94)	10.56, $p < .01$, $\eta^2 = .08$	AA > OM
Openness	5.83 (1.19)	5.86 (.78)	6.03 (.88)	5.87 (.93)	.66, $p = .52$, $\eta^2 = .01$	
Conscientiousness	5.70 (1.11)	5.64 (1.03)	5.03 (1.24)	5.59 (1.15)	5.59, $p < 0.05$, $\eta^2 = .05$	AA > OM
Extraversion	4.19 (1.64)	4.45 (1.64)	4.46 (1.35)	4.26 (1.60)	.62, $p = .54$, $\eta^2 = .01$	
Agreeableness	5.18 (1.20)	4.60 (1.15)	4.54 (1.17)	5.03 (1.21)	6.21, $p < 0.01$, $\eta^2 = .05$	AA > OM
Emotional Stability	4.73 (1.11)	4.74 (1.78)	4.26 (1.46)	4.66 (1.43)	1.73, $p = .18$, $\eta^2 = .01$	
Near misses	2.64 (.99)	3.38 (1.02)	2.90 (1.57)	2.75 (1.11)	4.74, $p < .05$, $\eta^2 = .04$	FA > AA
Accidents	2.02 (.83)	3.00 (1.03)	1.91 (.81)	2.09 (.89)	13.55, $p < .01$, $\eta^2 = .10$	FA > AA; FA > OM

Note: Data shown for aerial acrobatics, floor acrobatics and object manipulation are means and standard deviations (in parentheses). AA = aerial acrobatics; FA = floor acrobatics; OM = object manipulation.

Discussion

In this study, we explored the relationships among perceived risk, personality, experiences of sensation, emotion regulation and agency, and near misses and accidents in contemporary circus arts. The findings of our model suggest a multivariate iterative relationship among individuals' perception of risk, conscientiousness, experiences of emotion regulation, and near misses and accidents in contemporary circus arts. Although the explained variance for accidents might seem small, the iterative effects among the aforementioned set of predictors are important as it might constitute the difference between a safe landing and a life-threatening injury.

Predictors of accidents and near misses in contemporary circus.

Contrary to our hypothesis, experiences of sensation were not associated with an increased likelihood of accidents and near misses in circus. Instead, our findings point to the centrality of emotion regulation to safe performance in contemporary circus, as this factor co-varied with all variables included in the model. As such, our findings build on work by Barlow et al. (2013) by emphasizing the importance of understanding experiences of emotion regulation of those who participate in high-risk activities. We recommend future research to consider the effects of difficulties with emotion regulation (e.g., alexithymia; see Woodman et al., 2008) to better understand accidents and near misses in performance artforms such as circus and dance.

Consistent with previous research concerning personality traits and risk-taking behaviour (Castanier et al., 2010b; Merrit & Tharp, 2013), our findings suggest that conscientiousness also plays a role in safe performance in contemporary circus, as this factor co-varied with most variables included in the model. Contrary to our expectations, no significant associations among neuroticism and accidents or near misses were found.

The moderate association found between near misses and accidents indicates that near miss situations should be scrutinized to allow for the development of risk prevention and assessment strategies to minimize potentially life-threatening accidents in circus. Previous research in applied psychology highlights the importance of developing contingency plans in these high-risk circus activities (Filho & Rettig, 2019).

Differences between contemporary circus categories.

In this study, we also compared floor acrobats, aerialists and object manipulators on their perceptions of risk, experiences of sensation, emotion regulation and agency, personality traits, and accidents and near misses. Similar to Barlow et al. (2013), our findings indicated that circus artists should not be seen as a homogenous group of performance artists. Rather several differences between circus categories were revealed. As expected, aerial and floor acrobatics were perceived as higher risk circus disciplines than object manipulation. More importantly, our findings revealed that floor acrobats are the most at-risk group in circus. Floor acrobats namely reported significantly more experiences of near misses than aerialists, and experienced more accidents than both aerialists and object manipulators. This finding corresponds with the high accident risk associated with the performance of jumps and leaps by dancers (Wanke et al., 2014). Indeed, like dancers, floor acrobats must rely primarily on their own skills and partners or spotters to avoid accidents in their circus disciplines, whereas aerialists may have more opportunities to engage in precautionary behaviours by utilizing safety nets and harnesses to prevent major accidents (Filho & Rettig, 2019; Woodman et al., 2013). In-depth qualitative studies are recommended to identify the specific needs of this group and inform the development of evidence-based interventions to increase the safety of floor acrobats. Within this, it would be interesting to compare risk-factors associated with aerial acrobatics, floor acrobatics, dance, and gymnastics.

Consistent with Barlow et al. (2013), artists in the highest-risk circus category (i.e., aerial acrobatics) experienced more emotion regulation and agency compared to those in the lowest-risk circus category (i.e., object manipulation), and no differences between circus categories were found in terms of experiences of sensation. These findings thus challenge the traditional view of engagement in high-risk activities for sensation rewards (see Zuckerman, 1994), and support the notion that emotion regulation and agency rewards may be key in the motivation to participate in high-risk activities (Barlow et al., 2013; Hofsess, 1986).

Contrary to other artists (Feist, 1998; Gosling, 2003), circus artist scored relatively high on the personality trait conscientiousness. Congruent with Barlow et al. (2013), artists in high-risk circus disciplines (e.g., aerial acrobatics) scored higher on this personality trait compared to artists on low-risk circus disciplines (i.e., object manipulation). Tait (2016) explains that circus artists in high-risk disciplines perform with the aim to innovatively create an illusion of risk and danger to captivate the audience, while simultaneously reducing actual risks of accidents by being conscientious about the risks they take (e.g., equipment check, performing relatively easy tricks, etc.). Further, aerial acrobats scored significantly higher than object manipulators on the personality trait agreeableness. This finding was unexpected, and may represent the interdependency required in some aerial acrobatics disciplines (van Rens & Filho, in press). Combined, these findings thus likely reflect the notion that individuals with certain personality traits are attracted to specific activities (gravitational hypothesis of personality; Wilk, Desmaris, & Sackett, 1995), while partaking in a given activity may also shapes someone's personality (developmental hypothesis; Caspi, Roberts, & Shiner, 2005). As expected, no differences were found among circus categories in terms of the personality traits openness and extraversion. These personality traits have been consistently associated with high levels of creativity (see Batey & Furnham, 2006). Therefore, we speculate that these personality traits are not discriminant of performance in

different circus arts disciplines. Contrary to Barlow et al (2013) our findings did not indicate higher levels of emotional stability in participants in higher-risk circus disciplines compared to lower risk-circus disciplines. Practitioners are encouraged to consider personality factors and discipline specific factors when designing intervention programs aimed at minimising accidents in contemporary circus.

Limitations and directions for future research

Despite the strengths of this research in terms of the variability of the sample within one performance art domain (i.e., circus), this research carries several limitations. First, the use of the ACCSI to assess accidents and near misses could be perceived as a limitation of this study. The ACCSI is a self-report measure, consequently participant responses may have been affected by self-deception and impression management bias (Gravetter & Forzano, 2012). However, we believe that this limitation is mitigated by anonymity associated with the use of internet-based surveys (Maede & Craig, 2012). Alternatively, participants could have been asked to recall the accidents and close calls they experienced, however, these methods are not always very accurate and shares similar limitations to the use of a self-reported questionnaire (Gabbe et al., 2003). Notwithstanding, future research is encouraged to use accident reports as opposed to self-reported scales to investigate the mechanisms underlying accidents in contemporary circus arts.

Second, the present study utilized a retrospective data collection method. We preferred this retrospective approach as it allowed for an evaluation of the individual's overall experiences during participation in their main circus discipline. These overall experiences were deemed more relevant to participants overall experiences of near misses and accidents than a single assessment during a circus training session. However, we acknowledge that a prospective research design - in which the participants complete the SEAS-before measure, and their experiences of accidents and close calls are recorded for a

set time-frame - could provide valuable insight into the predictors of accidents and near misses in contemporary circus arts.

Third, research has shown that exogenous factors such as partner work, the floor surface, costumes and props are major contributors to accidents in dance (Wanke, et al., 2013; 2014). Additionally, other endogenous factors such as health status, performance pressure, and anatomical-physiological features such as hypermobility are thought to affect injuries and accidents in dancers (Wanke et al., 2013; 2014). Given the similarities between dance and some circus disciplines (e.g., floor acrobatics), we therefore recommend researchers to investigate the effect of these exogenous and endogenous factors on accidents and injuries in circus arts. This research could also consider differences in experiences of sensation, emotion regulation and agency between training and performance.

Furthermore, it is important to note that the convenience sample used in this study precludes us from generalizing our findings to the worldwide circus population. For example, cross-cultural studies between countries are warranted to establish whether personality differences ("I" factors; level-1) co-vary with cultural ("we" factors; level-2) characteristics. Additionally, future research is encouraged to consider a control group of individuals who partook in high-risk circus arts, but dropped out because they deemed the risk associated with their circus discipline to be too high.

Conclusions and Implications

In conclusion, this study presented novel insight into the relatively unexplored performance art domain; contemporary circus arts. A path analytical model was constructed which suggested that perceived risk, personality and emotion regulation co-vary and together influence the likelihood of accidents and near misses in contemporary circus arts. Congruent with Barlow et al. (2013), our findings indicate that experiences of sensation are not central in understanding safety in contemporary circus arts. Rather our research findings point

towards the importance of emotion regulation in understanding the mechanisms underlying accidents and near misses in contemporary circus arts. Safety is paramount to nurture artists' creative growth, and performance (Filho et al., 2016; Mace & Ward, 2002). Lacking perceived safety, artists are unable to fully experiment with aesthetic and expressive properties of their performance (Mace & Ward, 2002). Consequently, it is important to investigate the role of emotion regulation amongst other populations of performance artists who may be prone to experiencing accidents, such as dancers.

Further, we identified that contemporary circus consists of a heterogeneous group of categories, wherein artists in high-risk disciplines distinguish themselves from other artists based on their high scores on conscientiousness and agreeableness. Notably, most accidents and near misses were reported in floor acrobatics. Consequently, researchers in the circus arts domain are encouraged to differentiate between circus disciplines. Practitioners in performance arts, and circus in particular, are recommended to tailor interventions surrounding safety in circus arts to the circus discipline and personality specific needs.

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