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The Relationships Among Three Components of Perceived Risk of Injury, Previous Injuries and Gender in Contact Sport Athletes

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ABSTRACT

This study examined the relationships among three components of perceived risk of injury: (a) probability of injury, (b) worry/concern of being injured, and (c) confidence in avoiding injury. Participants were 434 athletes from 3 contact sports (hockey, soccer, and football). Correlations between the components showed a positive relationship between worry/concern and probability of injury, and negative relationships between worry/concern and confidence in avoiding injury as well as probability of injury and confidence in avoiding injury. Results also indicated that those athletes who had been previously injured perceived the highest probability of re-injury, demonstrated the greatest worry/concern of re-injury, and had the least amount of confidence in their ability to avoid re-injury. Additional gender differences and type of sport differences were found for certain subscales. When football was excluded from the analyses, a 2 (sport) by 2 (gender) by 2 (injury status) ANOVA demonstrated sport by gender interactions, a gender by injury interaction, and a sport by gender by injury interaction for certain subscales. Findings are discussed in light of self-efficacy and risk taking theory, and the potential effects of socialization on gender differences in perceived risk of injury.

Introduction

There is little doubt that injuries have a significant impact on individual and team performance (Doyle, Gleeson, & Rees, 1998; Dunn, 1999; Evans, Hardy, & Fleming, 2000; Kolt, 2000; Synder, 1990; Wischnia, 1980). Research shows that the relationship between injury and performance tends to be more negative than positive; meaning that if an athlete is injured, their performance will suffer. From a physical standpoint, the primary reason for the negative relationship is that athletes tend to not attain their pre-injury status upon return from an injury. However, the decrease in performance associated with injury has been attributed to psychological factors more so than physical factors (Doyle et al., 1998; Dunn, 1999; Evans et al., 2000; Synder, 1990; Wischnia, 1980). Heil (1993) stated that injury exerts a direct impact on an athlete's psychological well-being, which in turn, directly influences health, performance, and the risk of further physical injury. Even injuries that are small or less severe that allow an athlete to still compete may limit preparation and subsequent performance in competition (Kolt, 2000).

Although there have been a number of psychological factors associated with injuries in sport, Williams and Andersen (1998) suggested that researchers expand the number of psychological variables currently being studied. One potentially debilitative psychological factor affecting performance concerns an athlete's *fear* or perceived risk of injury. Fear has been defined as an "apprehensive feeling towards anything regarded as a source of danger, or towards a person regarded as able to inflict injury or punishment" (Simpson & Weiner, 1989). We have defined the *fear of injury in sport* as the unpleasant feeling of apprehension or distress caused by the anticipation of physical damage to the body or a part of the body.

Intuitively, most of us would agree that fear of injury has a negative effect on performance. However, researchers have difficulties documenting this relationship. The primary reason for this has to do with the word "fear" itself. Many negative connotations have been associated with the word "fear." The names "suck" and "sissy" have been used to refer to people who are afraid or who show anxiety (Kidd, 1990). Snyder (1990) conducted a study where gymnasts were labeled according to their risk or non-risk taking behaviors. Gymnasts who were viewed as risk takers were labeled by fellow gymnasts as "kamikazes, gutsy, and animals" while those who were non-risk takers were labeled "wimps, chickens, or balkers." Research also shows that athletes may attempt to hide their fear because they feel coaches view fear as a weakness or they are afraid of looking foolish. Many athletes feel that they have to be tough and "macho" in order to participate in sports, and thus self-reports of fear of injury may not be as reflective of actual perceptions as they are of socially accepted (e.g., gender stereotyped behaviors) norms. For these reasons, we advocate using the term perceived risk of injury, as suggested by Kontos (2000).

Our review of the recent literature on perceived risk of injury shows that this construct has been conceptualized in three ways. First, it has been linked to self-efficacy theory with the emphasis being on one's confidence in his/her ability to avoid injury. Second, perceived risk of injury has been likened to feelings of competitive anxiety,

relating to one's worry or concern about being injured in sport. Finally, it has been looked at as a perceived probability of being injured. Each of these areas is now briefly reviewed.

Perceived Risk of Injury as a Lack of Confidence in Avoiding Injury

Self-efficacy theory has received considerable attention with respect to its relationship with fear of injury. Magyar and Chase (1996) stated that fear of injury exists when an athlete lacks confidence in the ability to perform successfully in a threatening or taxing situation. Injured athletes have expressed low self-efficacy in their perceived ability to perform skills and movements required by their specific sport without re-injuring themselves (Doyle et al., 1998, Evans et al., 2000). For example, a rugby player who had sustained a shoulder injury had low self-efficacy upon his return to competition to take on tackles with the previously injured shoulder even though he had fully recovered (Evans et al., 2000). This lowered confidence in his ability to adequately use his shoulder caused him to use his other shoulder more often, not only decreasing his performance, but also placing him in vulnerable situations to experience another injury.

Bandura (1997) hypothesized that an athlete with low self-efficacy would also be fearful of the sport environment and consequently lack confidence in attaining a positive outcome (e.g., avoiding injury). Hence, athletes lacking confidence in avoiding injury would be more likely to be injured than those confident in avoiding injury. Another consequence of having low self-efficacy is that a high level performer may decide to participate in activities at a lower performance level to accommodate the injury (Doyle et al., 1998). The athlete may choose to participate only in low risk sporting events in order to avoid excessive stress on the injured body part. A worse case scenario would be an athlete whose self-efficacy is so low that they have an unwillingness to perform because of an injury or the thought of being injured (Synder, 1990).

Clearly, the return to play, after suffering an injury, is a major decision that should be made by a team consisting of physicians, coaches, athletic trainers, the athlete, and the sport psychologist. An athlete who is not fully efficacious upon returning to competition carries a greater risk of re-injury. It has been suggested that when athletes are given the green light to return to competition many of them are not psychologically ready to compete (Evans et al., 2000). There is ample evidence that shows unnecessary injuries occur and that recovery time is increased because of the failure to adequately address psychological factors (Cupal, 1998). If confidence in the athlete is not expressed by significant others (i.e., coach, teammates) prior to returning to play, the athlete's self-confidence may be further threatened leading to an increased fear of failure or re-injury (Heil, 1993).

Perceived Risk of Injury as Worry or Concern

Perceived risk of injury has also been included as a component of competitive worry. Most recently, Dunn (1999) included a subscale relating to an athlete's worries about potential injury of physical danger in his competitive worry measure. Similarly, in their

measure of anxiety, Endler, Edwards and Vitelli (1991) included a "physical danger A-trait" dimension in their anxiety measure. Physical danger A-trait was defined as a person's predisposition to experience anxiety in situations in which the potential for physical harm exists. Hackfort (1986) also included "physical harm/injury anxiety" as a dimension of competitive trait anxiety. Research has shown that the perceived risk of injury is a common source of worry and a possible reason for leaving competition among young gymnasts (Duda, 1995; Duda & Gano-Overway, 1986; Klint & Weiss, 1986; Weiss, Weise, & Klint, 1989).

Perceived Risk of Injury as a Probability

Kontos, Feltz, and Malina (2000) recognized the need for more research on fear of injury in sport. They developed a general scale for the measurement of perception of risk of injury as a probability or likelihood for use with contact team sports. The Risk of Injury in Sports Scale (RISSc) consists of 24 items representing 6 injury subscales (i.e., uncontrollable, controllable, overuse, upper body, surface-related, and re-injury).

Kontos et al. (2000) examined the relationship between the perceived probability of injury (using the RISSc) and gender. Females scored higher on all subscales except for the uncontrollable factor, where males were higher. The "uncontrollable" dimension represents injuries that are more common and involve factors (e.g., collisions) inherent in the team or contact/collision sports. Although they found gender differences, their interpeation of these findings was cautious, as sport type may have been a confounding factor. Kontos (in press) examined the perceived probability of injury (using the RISSc) and gender in soccer where both males and females participate under similar rules, and again found strong support for gender differences in perceived probability of injury. However, low perceptions of risk were predictive of injury regardless of gender, indicating that the gender differences in perceived risk may not translate into a difference in injury risk.

It was also suggested that that the presence of previous injuries might increase subsequent perceptions of risk of injury (Kontos, in press; Kontos et al., 2000). Results showed that males reported more previous injuries than females and that there were higher RISSc scores among athletes who had been injured in the past year compared to those who had not been injured. The type, location, severity, immediacy, and repetitiveness of an injury could influence perceived risk of injury. For instance, an athlete who has incurred multiple, severe ankle sprains may perceive more risk in playing sports than an athlete who has had only one such injury.

Our review shows that perceived risk of injury has been conceptualized in three ways: (a) as a lack of self-efficacy, (b) as a worry or concern component of competitive anxiety, and (c) as a probability of being injured. No single study has explored the inter-relationships among these three constructs. More research is needed to further define or pinpoint the specific psychological factors associated with perceived risk of injury so practical applications can be developed. This information can then be used by coaches

and sport psychologists to design and implement psychological skill training programs to cater to the specific needs of their athletes (Dunn, 1999).

The purpose of this study, therefore, was to examine the interrelationships among the three components of perceived risk of injury in male and female collegiate, team contact sport athletes. Additionally, this study was designed to assess the three components of perceived risk of injury in relation to gender, sport type, and previous injuries. Based on previous research the following hypotheses were made:

1. A positive relationship between worry/concern and probability of injury;
2. A negative relationship between confidence in avoiding injury and worry/concern of injury and between confidence in avoiding injury and probability of injury;
3. No differences in worry/concern, probability, and confidence in avoiding injury in sport type (i.e., soccer, hockey and football). All sports are similar being contact in nature;
4. Gender differences on all measures (worry/concern, probability and confidence) where females would perceive more worry/concern, more risk and have less confidence in their abilities to avoid injuries compared to males;
5. Differences in worry/concern, probability, and confidence in avoiding injuries related to previous injury status – i.e., if an athlete has been injured in the past, he/she would perceive more worry/concern, greater probability of injury, and less confidence compared to those athletes who weren't previously injured. In addition, there would be a positive relationship between the number of times an athlete has been injured and worry/concern, and risk of injury, and a negative relationship between the same variable and confidence in avoiding injury; and
6. A positive relationship between the severity of an athlete's previous injury to their perceived probability of injury and worry/concern about injury, and a negative relationship between injury severity and confidence in avoiding injury.

Method

Participants

Participants were 434 male and female athletes from 3 contact sports (ice hockey, soccer and football). For ice hockey, there were 76 females and 86 males. For soccer, there were 32 males and 32 females. All football players were male (n = 208). The mean age of the participants was 20.91 (SD = 3.97). The average length of time participants were involved in their sport ranged from less than one year to 25 years (M = 10.79, SD = 4.80). The majority of the sample (58%) indicated that they were a "starter" (i.e., that they played more than 50% of each game). Finally, most of the sample played at the Division 2 level (48.4%) followed by Division 1 (13.4%), Recreational (10.8%), Division 3 (8.8%), Club (8.3%), NAIA (5.5%), and Junior A (3.9%).

Measures

Demographics. A demographics questionnaire was used to obtain relevant personal information (e.g., age, sport type, starting status, competitive level, etc.), and previous injury information from each participant. An injury was defined as "any injury you had in your sport in the past 12 months that required treatment beyond icing and taping" (see Kontos et al., 2000). If the participant had been injured, (s)he was asked to indicate how many times (s)he had been injured and to describe their most serious and most recent injury. Both the most serious and most recent injuries were rated as mild ("an injury requiring treatment without interruption of training/practicing or playing in games"), moderate ("an injury more severe than a mild injury, that interferes with training/practicing or playing in games"), or major ("an injury more severe than mild or moderate that requires a long duration of downtime, often with surgery or hospitalization") (Heil, 1993, p. 114).

Risk of Injury in Sport Scale (RISSc; Kontos et al., 2000). The original RISSc contained 24-items designed to measure athletes' perceptions regarding the probability of being injured in team, contact sports. The RISSc consists of 6 subscales dealing with uncontrollable injuries, controllable injuries, overuse injuries, upper-body injuries, surface-related injuries and re-injuries. Previous research has shown adequate validity and reliability for the RISSc (Kontos, in press; Kontos et al., 2000). For the present study, the original RISSc was extended to include two additional hypothesized components of perceived risk of injury, namely, fear/worry and confidence in avoiding injury. The 24 items of the original RISSc remained the same (to maintain the integrity of the original 6 factors), however, the stems were changed to reflect the two new components (see descriptions below).

RISSc-Probability of Injury (RISSc-P). The RISSc-P consisted of the original 24 items of the RISSc. Each item uses the stem, "What do you think are the chances that you will…" Sample items from each of the factors are as follows: from the uncontrollable subscale: "injure yourself in a collision with an opponent;" from the controllable subscale: "be injured by not paying attention to what you are doing;" from the overuse subscale: "be injured from practicing too hard;" from the upper body subscale: "injure your arm or wrist;" from the surface-related subscale: "fall down and injure yourself;" and from the re-injury subscale: "re-injure an area you have recently injured." Participants responded using a Likert-type scale ranging from 1 (very unlikely) to 6 (very likely). Reliabilities for the subscales of the RISSc-P in this study were strong, ranging from .77 to .89.

RISSc-Worry/Concern about Injury (RISSc-W). The RISSc-W was used to assess how worried or concerned an athlete is about being injured in sport. The format was identical to the RISSc-P, except the stem was, "How worried or concerned are you that you will…" Respondents were instructed to respond using a Likert-type scale ranging from 1 (*not worried or concerned at all*) to 10 (*very worried or concerned*). The reliabilities for each of the 6 subscales ranged between .82 and .94.

RISSc-Confidence in Avoiding Injury (RISSc-C). The RISSc-C was used to assess how confident an athlete is in avoiding injury. The RISSc-C used the stem, "How confident are you in your ability to avoid…" To be more similar to other efficacy measures (cf. Moritz, Feltz, Fahrbach, & Mack, 2000), respondents were instructed to choose their answers using a scale that ranged from 0 (*not confident at all*) to 10 (*very confident*). Reliabilities for the subscales of the RISSc-C ranged between .84 and .96.

Procedure

Approval to conduct the study was granted by the Institutional Review Board. Data collection occurred during regular team meetings or practices. Participants took approximately 15-30 minutes to complete the measures.

Results

The results of this study are presented in 4 sections. The first section contains the descriptive statistics. The second section considers the relationship between the 3 primary dependent variables (probability, worry/concern, and confidence in avoiding injury). The third section includes analyses relating each outcome variable to athletes' previous injury status. Finally, analyses for gender by sport and injury status are included in the fourth section. All statistical analyses were performed using SPSS (Version 10.0.05).

Descriptive Statistics

Descriptive statistics for the three components of the RISSc according to sport and gender can be found in Table 1. For all subscales of the RISSc-P as well as the total RISSc-P scores, mean values ranged between 2.12 and 2.83. These values indicate that participants perceived low probabilities of being injured in sport. An Analysis of Variance (ANOVA) showed that there were significant gender differences for the perceived probability of re-injury (F (1, 432) = 7.56, $p < .05$), uncontrollable injuries (F (1, 432) = 27.54, $p < .01$), and total RISSc-P scores (F (1, 432) = 5.15, $p < .05$). In all cases, values were higher for females compared to males. With respect to type of sport, an ANOVA showed that there were significant differences between sport type on the probability of re-injury (F (2, 431) = 3.34, $p < .05$), surface injuries (F (2, 431) = 4.41, $p < .05$), overuse injuries (F (2, 431) = 4.48, $p < .05$), uncontrollable injuries (F (2, 431) = 11.20, $p < .01$), and on the total RISSc-P scores (F (2, 431) = 3.62, $p < .01$). Follow-up post hocs using Tukey's test showed that the soccer players perceived a higher probability of re-injury, surface and overuse injuries compared to football and hockey players. With respect to the uncontrollable injuries, football players perceived the lowest probability compared to the hockey players and soccer players. Finally, for the total perception of probability of injury score, soccer players had the highest means and they differed significantly from the football players.

Descriptive statistics for the RISSc-W according to sport and gender can be found in Table 2. For all subscales of the RISSc-W as well as the total RISSc-W, mean values ranged between 1.46 and 2.54. These values indicate that participants perceived a low level of worry/concern about being injured. An ANOVA showed that there were significant gender differences in worry/concern about uncontrollable injuries (F (1,432) = 8.68, $p < .01$), with females reporting higher scores than males. With respect to type of sport, an ANOVA showed that there were significant differences for worry/concern about uncontrollable injuries (F (2, 431) = 5.60, $p < .01$). The football players demonstrated the least amount of worry/concern about injury among the three sports.

Descriptive statistics for the RISSc-C according to sport and gender can be found in Table 3. For all RISSc-C subscales and the total RISSc-C score, mean values ranged between 6.96 and 7.60. These values indicated that participants were quite confident in their ability to avoid injury. An ANOVA revealed no significant gender differences in confidence in avoiding injuries. For sport type, an ANOVA showed that there were significant differences between sport types in confidence in avoiding injury for uncontrollable injuries (F (2, 431) = 3.83, $p < .05$), and confidence in avoiding upper body injuries (F (2, 431) = 3.25, $p < .05$). For confidence in avoiding uncontrollable injuries, differences were between hockey and football players; the football players reported higher levels of confidence in their ability to avoid uncontrollable injuries compared to hockey players. For confidence in avoiding upper body injuries, differences were between the soccer and hockey players, and the soccer and football players. The soccer players indicated more confidence compared to hockey and football players.

Relationships Among Probability of Injury, Worry/Concern about Injury, Confidence in Avoiding Injury

To examine the relationships among the three scales of the RISSc, Pearson product moment correlations were conducted on the three total RISSc subscale scores. Correlations between the measures indicated a positive relationship between worry/concern of injury and probability of injury ($r = .50$, $p < .01$), and negative relationships between worry/concern of injury and confidence in avoiding injury ($r = -.28$, $p < .01$), as well as between probability of injury and confidence in avoiding injury ($r = -.29$, $p < .01$).

Relationships Among Probability of Injury, Worry/Concern about Injury, Confidence in Avoiding Injury and Previous Injury Status

The background information sheet used in this study asked respondents to indicate if they had experienced an injury in the past 12 months. Two hundred and two athletes responded “yes,” while 213 did not (19 cases were missing). Descriptive statistics can be found in Table 4. An ANOVA showed that the two groups differed significantly in their perception of probability of re-injury (F (1,413) = 6.17, $p < .01$), in their worry/concern about re-injury (F (1,413) = 12.35, $p < .01$), and their confidence in avoiding re-injury (F (1,413) = 5.04, $p < .01$). If an athlete was previously injured, they reported more worry/concern, higher probability, and less confidence in their ability to avoid re-injury.

Table 1. RISSc-P Scores According to Sport and Gender.

Subscale	Football		Soccer						Hockey						Total					
	Males		Males		Females		Total		Males		Females		Total		Males		Females		Total	
	(*n* = 208)		(*n* = 32)		(*n* = 32)		(*n* = 64)		(*n* = 86)		(*n* = 76)		(*n* = 162)		(*n* = 326)		(*n* = 108)		(*n* = 434)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Re-injury	2.79	1.10	3.19	0.89	3.10	1.02	3.14	0.95	2.49	0.89	3.06	1.17	2.76	1.07	2.74	1.04	3.07	1.12	2.83	1.07
Surface	2.34	0.97	2.80	0.99	2.59	0.92	2.70	0.95	2.14	0.96	2.43	1.00	2.28	0.99	2.33	0.98	2.48	0.98	2.37	0.98
Upper body	2.63	1.08	2.90	0.98	2.16	1.07	2.53	1.08	2.33	0.91	2.80	1.16	2.55	1.06	2.58	1.04	2.61	1.17	2.59	1.07
Overuse	2.05	0.95	2.67	1.08	2.24	1.01	2.45	1.06	1.91	0.80	2.28	1.05	2.08	0.95	2.07	0.95	2.26	1.04	2.12	0.97
Controllable	2.04	0.93	2.63	0.99	1.99	0.84	2.31	0.96	2.03	0.90	2.28	0.98	2.14	0.94	2.10	0.94	2.19	0.94	2.12	0.94
Uncontrollable	2.48	1.01	3.22	0.96	3.09	1.14	3.15	1.05	2.51	0.94	3.17	1.19	2.82	1.11	2.56	1.01	3.15	1.17	2.71	1.08
Total scale	2.33	0.87	2.87	0.84	2.47	0.83	2.67	0.85	2.20	0.79	2.61	0.94	2.40	0.89	2.35	0.87	2.57	0.91	2.41	0.88

Table 2. RISSc - W Scores According to Sport and Gender.

Subscale	Football		Soccer						Hockey						Total					
	Males		Males		Females		Total		Males		Females		Total		Males		Females		Total	
	(*n* = 208)		(*n* = 32)		(*n* = 32)		(*n* = 64)		(*n* = 86)		(*n* = 76)		(*n* = 162)		(*n* = 326)		(*n* = 108)		(*n* = 434)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Re-injury	2.52	2.26	2.89	2.23	2.84	2.20	2.87	2.20	2.05	2.00	2.58	1.91	2.30	1.97	2.43	2.20	2.66	1.99	2.49	2.15
Surface	1.92	1.98	2.36	1.80	2.14	1.98	2.25	1.88	1.75	1.92	1.69	1.51	1.72	1.73	1.92	1.95	1.82	1.67	1.90	1.88
Upper body	2.61	2.36	2.85	2.25	1.31	1.66	2.08	2.11	2.45	2.31	2.81	2.27	2.62	2.29	2.59	2.33	2.37	2.21	2.54	2.30
Overuse	1.36	1.86	2.24	2.15	1.55	1.79	1.90	2.00	1.43	1.82	1.39	1.58	1.41	1.70	1.46	1.89	1.44	1.64	1.46	1.83
Controllable	1.36	1.85	2.34	2.06	1.21	1.53	1.77	1.89	1.50	1.86	1.41	1.50	1.46	1.70	1.50	1.89	1.35	1.50	1.46	1.80
Uncontrollable	1.84	1.92	2.83	1.97	2.49	2.13	2.66	2.04	2.08	1.97	2.74	2.23	2.39	2.12	2.00	1.96	2.66	2.19	2.17	2.04
Total scale	1.84	1.81	2.54	1.93	1.85	1.63	2.20	1.81	1.81	1.77	2.00	1.51	1.90	1.65	1.90	1.82	1.95	1.54	1.91	1.75

Table 3. RISSc - C Scores According to Sport and Gender.

Subscale	Football		Soccer						Hockey						Total					
	Males		Males		Females		Total		Males		Females		Total		Males		Females		Total	
	(*n* = 208)		(*n* = 32)		(*n* = 32)		(*n* = 64)		(*n* = 86)		(*n* = 76)		(*n* = 162)		(*n* = 326)		(*n* = 108)		(*n* = 434)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Re-injury	6.72	2.52	6.56	1.82	6.60	1.77	6.58	1.79	6.83	2.51	6.60	2.14	6.72	2.34	6.73	2.45	6.60	2.03	6.70	2.35
Surface	7.26	2.47	7.20	2.16	7.38	1.59	7.29	1.88	7.01	2.73	7.38	2.28	7.18	2.53	7.19	2.50	7.38	2.09	7.23	2.41
Upper body	6.90	2.61	7.18	2.03	8.28	1.44	7.73	1.83	7.11	2.53	6.58	2.43	6.86	2.49	6.98	2.54	7.08	2.31	7.01	2.48
Overuse	7.55	2.67	7.55	1.93	8.14	1.28	7.84	1.65	7.24	2.82	7.82	2.13	7.52	2.53	7.47	2.65	7.92	1.92	7.58	2.49
Controllable	7.56	2.67	7.57	1.86	8.44	1.09	8.01	1.58	7.25	2.64	7.77	2.24	7.50	2.47	7.48	2.59	7.97	1.99	7.60	2.46
Uncontrollable	7.27	2.45	6.83	1.81	7.10	1.77	6.97	1.78	6.75	2.61	6.36	2.51	6.57	2.56	7.09	2.45	6.58	2.33	6.96	2.43
Total scale	7.27	2.42	7.21	1.74	7.74	1.20	7.47	1.51	7.06	2.51	7.18	2.04	7.12	2.30	7.21	2.39	7.35	1.85	7.24	2.26

Table 4. Relationship Between RISSc Subscales and Previous Injury Status.				
Measure	**Injured (*n* = 202)**		**Non-Injured (*n* = 213)**	
	M	***SD***	***M***	***SD***
RISSc – P				
Re-injury	2.95	1.06	2.69	1.06
Surface	2.38	0.97	2.32	1.00
Upper body	2.61	1.09	2.54	1.06
Overuse	2.15	1.01	2.08	0.94
Controllable	2.05	0.92	2.15	0.96
Uncontrollable	2.70	1.12	2.69	1.04
Total Score	2.41	0.87	2.37	0.90
RISSc – C				
Re-injury	6.48	2.28	6.99	2.40
Surface	7.21	2.32	7.36	2.47
Upper body	6.93	2.43	7.17	2.52
Overuse	7.54	2.41	7.70	2.54
Controllable	7.69	2.38	7.63	2.50
Uncontrollable	7.00	2.36	7.07	2.44
Total Score	7.22	2.16	7.37	2.33
RISSc – W				
Re-injury	2.82	2.14	2.10	2.05
Surface	1.91	1.84	1.84	1.93
Upper body	2.56	2.30	2.47	2.32
Overuse	1.53	1.83	1.37	1.85
Controllable	1.45	1.72	1.44	1.89
Uncontrollable	2.18	2.01	2.01	2.05
Total Score	1.97	1.70	1.82	1.81

As a follow-up, we ran an ANOVA to determine if there was a relationship between the number of injuries an athlete reported having and the probability, worry/concern and confidence in avoiding re-injury. The 202 athletes who reported an injury were divided into two groups – those who had one injury in the last year (n = 123) and those who reported having more than one (n = 75) (4 participants had missing data). There were no statistically significant differences on any of the RISSc measures.

We also ran an ANOVA using injury severity as an independent variable. Of the 202 athletes who reported an injury, 32 stated their most serious injury was mild, 109 moderate and 58 severe (3 cases were missing). There were no statistically significant differences between these levels of severity and any of the RISSc measures.

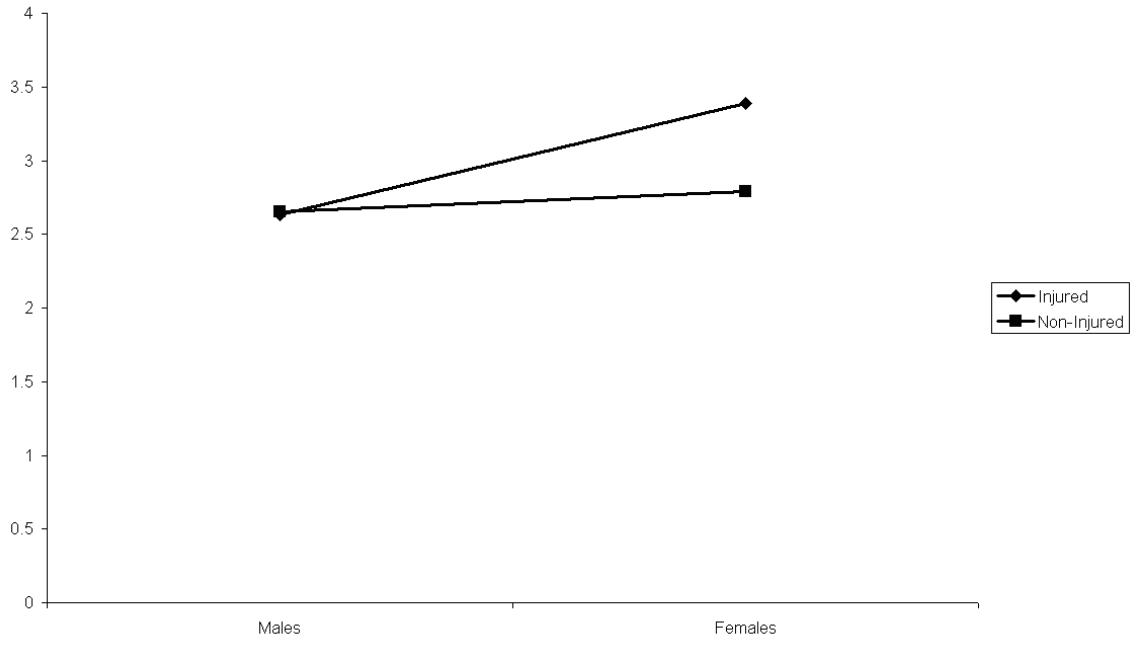
Additional analyses

Our final analyses examined the interaction between gender, type of sport and injury status. Given that there were no female football players in our study, football was excluded. A 2 (male, female) by 2 (soccer, hockey) by 2 (injured, not injured) MANOVA was done. Results revealed several main effects and interactions. Given that the interactions supersede the main effects, and that the main effects have been reported in the descriptive statistics section, only the interactions will be presented here.

First, there was a *sport by gender by injury* interaction for the surface-related injuries subscale of the RISSc-C (F (1, 203) = 5.46, $p < .05$). Male soccer players reported less confidence in avoiding injury compared to male hockey players when both groups were injured in the past (*ES* =.52). Male soccer players had more confidence in avoiding injury compared to male hockey players when they were not injured in the past (*ES* =.68). Regardless of sport, females had more confidence in avoiding injury if they were not previously injured, compared to females who had been injured (*ES* =.38).

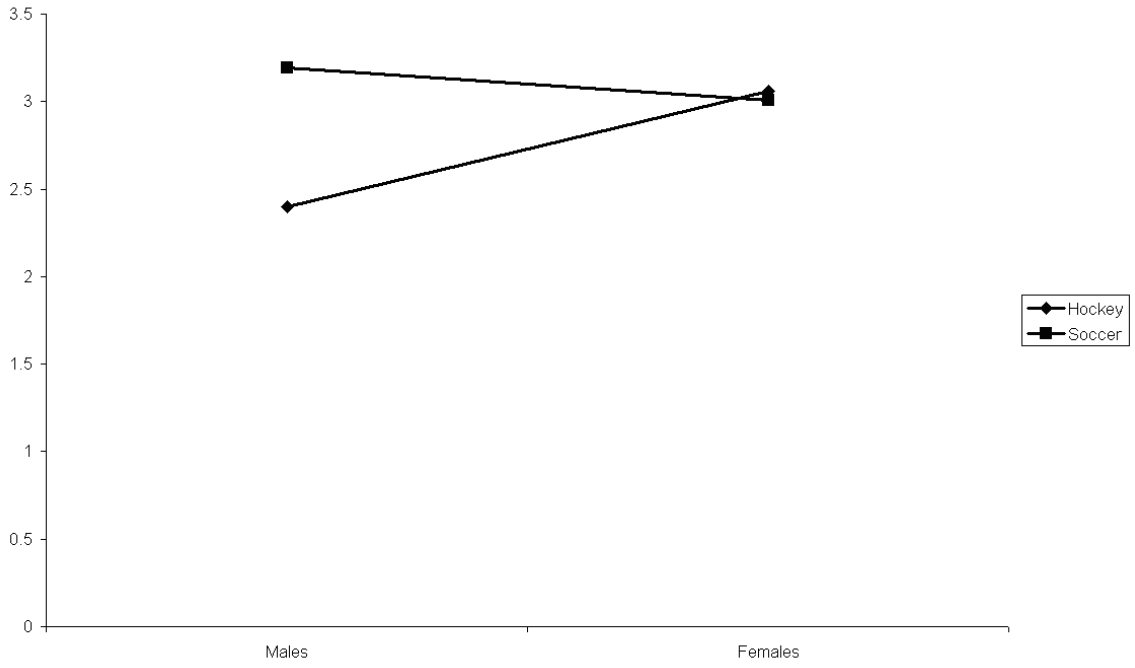
Second, there was a *gender by injury* interaction for the re-injury subscale of the RISSc-P (F (1, 203) = 6.22, $p < .05$). Females who had been injured perceived a higher probability of injury compared to males who had been previously injured (*ES* = .72). Perceived probabilities of injury for males and females were equal when they had not been previously injured (*ES* = .14) (See Figure 1).

Figure 1
Gender by injury status interaction for RISSc - P Reinjury



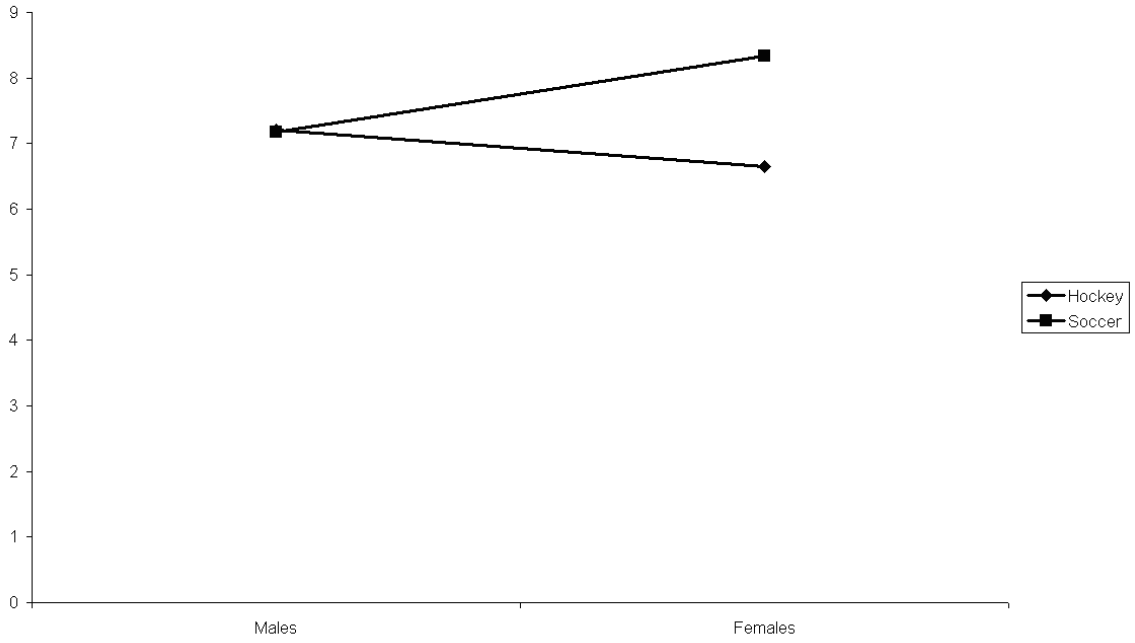
Finally, there were several *sport by gender* interactions. All of the interactions involving the RISSc-P subscales were statistically significant (All *F*'s > 5.33, significant at $p = .05$). In all cases, perceived probability of injury was higher in soccer compared to hockey for males (see Figure 2 for an example). For females, however, probability of injury seemed stable across sports.

Figure 2
Example of gender by sport interaction for RISSc - P subscales



The only *sport by gender* interaction for the RISSc-C was found for the upper body subscale (F (1, 203) = 6.96, $p < .01$). Confidence in avoiding injury was greater for female soccer players compared to female hockey players (*ES* = .86). For males, confidence in avoiding injury was stable across sports (see Figure 3).

Figure 3
Gender by sport interaction for RISSc - C Upper body



For the RISSc-W, there were 3 *sport by gender* interactions. For the upper body subscale (F (1, 203) = 12.05 $p < .01$), female hockey players perceived more worry/concern about injury than female soccer players (*ES* = .85). Male soccer players perceived slightly more worry/concern about injury than male hockey players (*ES* = .25) (see Figure 4). For the controllable subscale (F (1, 203) = 4.67, $p < .05$), male soccer players perceived more worry/concern about injury compared to male hockey players (*ES* = .50). Female hockey players perceived slightly more worry/concern about injury than female soccer players (*ES* = .17) (see Figure 5). Finally, there was a significant interaction for the total scores on the RISSc-W (F (1, 203) = 4.35, $p < .05$). Male soccer players perceived more worry/concern about injury compared to male hockey players (*ES* = .49). Female hockey players perceived slightly more worry/concern about injury than female soccer players (*ES* = .13) (see Figure 6).

Figure 4
Gender by sport interaction for
RISSc - W Upper body

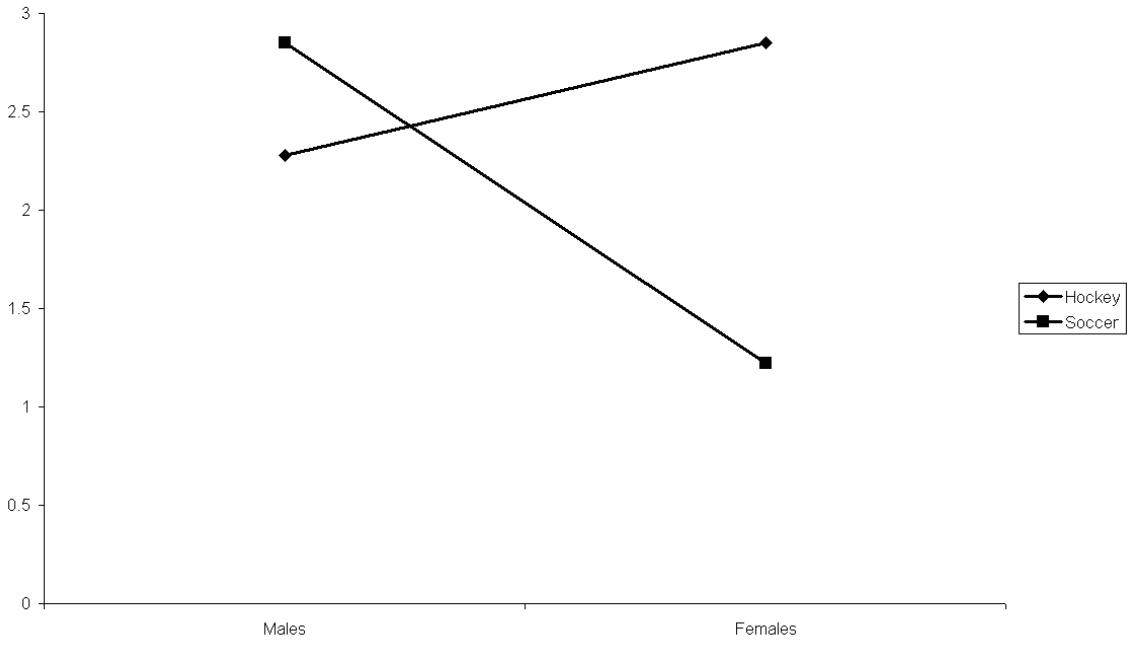


Figure 5
Gender by sport interaction for
RISSc - W Controllable

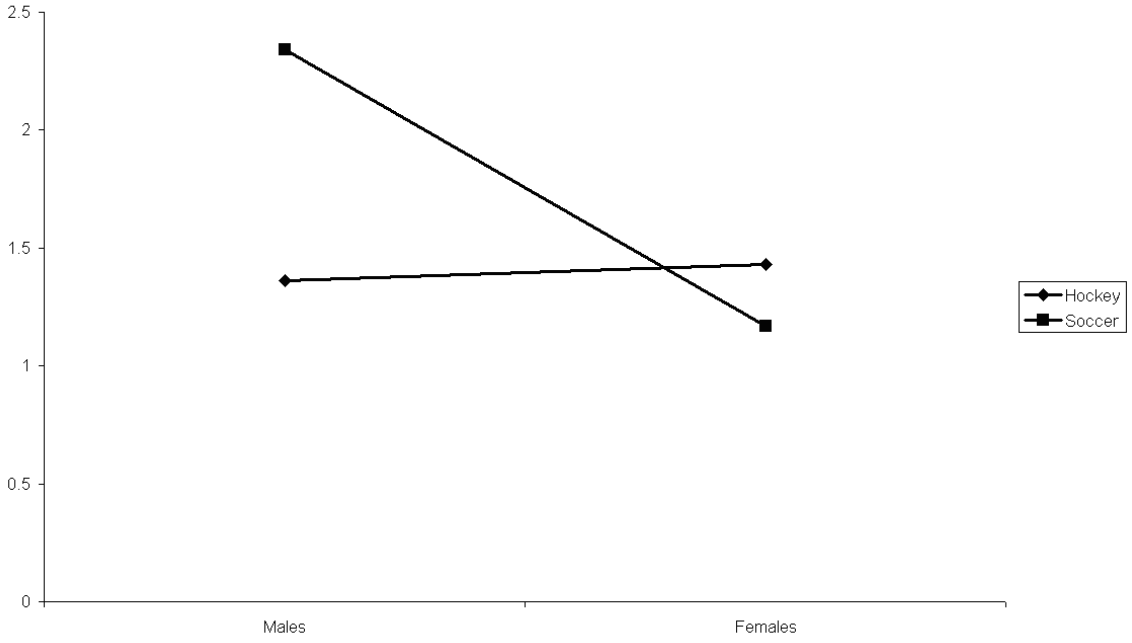
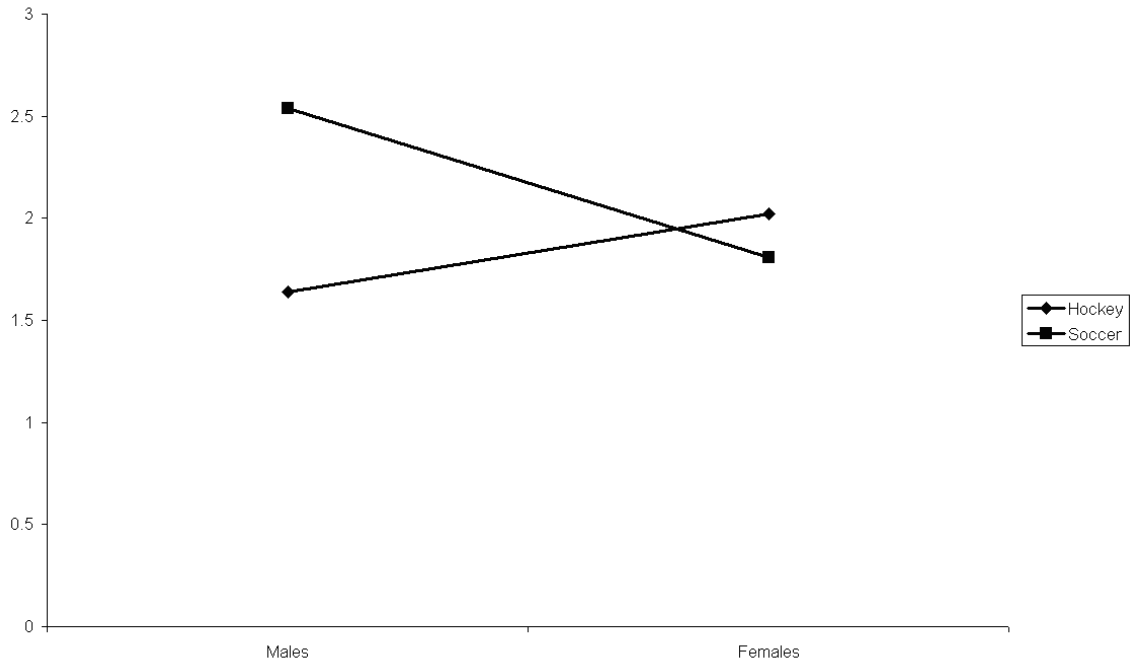


Figure 6
Gender by sport interaction for RISSc - W Total



Discussion

This study examined the interrelationships among three components of perceived risk of injury in sport: (a) probability of injury, (b) worry/concern about injury, and (c) confidence in avoiding injury; and determined the effects of previous injuries, gender, and sport type on participants' perceived risk of injury. The results demonstrated that the three components of perceived risk were related to each other in the hypothesized directions supporting hypotheses 1 and 2. Bernoullian risk taking theory (Bernoulli, 1954), which forms the basis for much of modern thought on perceived risk and risk taking, suggests that individuals who are overly concerned about a potentially adverse outcome (e.g., injury, death) are likely to overestimate the probability of the outcome occurring. For example, an individual who is worried about being electrocuted in a storm may erroneously believe that there is a relatively high probability of being struck by lightning when in fact, the probability is quite low (1:28,500 per exposed individual). Similarly, one can extend this logic to sport and postulate that athletes who perceive a high probability of injury are more concerned about the consequences of injury (e.g., pain, loss of playing time, disability). As such, it is reasonable for these athletes to then be worried/concerned about injury, as they are overly concerned about a potentially detrimental outcome (i.e., injury) that they view as probable. The results of the present study also revealed that higher levels of perceived probability of injury and worry/concern about injury were inversely related to confidence in avoiding injury. This is not surprising given that self-efficacy theory (Bandura, 1997) and research (Kontos, in press) supports an inverse relationship between self-efficacy (in this case, confidence in avoiding injury) and athletes' subsequent likelihood for injury.

The current study also provided support for relationships among previous injuries, gender, and sport type; and perceived risk of injury. Previous injuries were found to be positively related to probability of injury and worry/concern about injury, but were inversely related to confidence in avoiding injury (partially supporting hypothesis 5, not supporting hypothesis 6). These findings are in line with the suggestion put forth by researchers indicating that previous injuries have a negative effect on athletes' subsequent perceptions or cognitive appraisal of injury (Heil, 1993; Kontos, in press; Williams & Andersen, 1998). However, one caveat in examining the relationship between previous injuries and subsequent perceptions of risk is that previous injuries may only affect perceptions involving the previous injured area (Williams & Andersen, 1998). The current study did not examine specific injury types to ascertain whether the changes in perceived risk of injury were specific to the previous injury or more general in nature.

Surprisingly, the effect of previous injuries on perceived risk may be influenced by gender. In the current study, a gender by previous injuries interaction, wherein previously injured females perceived more risk of re-injury than did previously injured males, was found to be significant. This finding may be reflective of females paying more attention to previous injuries in relation to future injury outcomes than males, or it may be an indication of males' socialization (i.e., the "pain norm") to ignore injuries and "play with pain" as reported in the literature (Coakley, 2001). In contrast, the socialization of female athletes may be different, and not involve a "play with pain" ethos. Regardless of gender differences in the effect of previous injuries on perceived risk of injury, these findings highlight a timely juncture in the injury process for the services of a sport psychologist. As previous injuries affect subsequent perceptions of risk of injury, and potentially future performance levels (because thoughts are focused on being injured or avoiding injury, rather than on performing), interventions from a sport psychologist to ameliorate the effects of previous injuries on an athlete's perceptions may be beneficial. These interventions may involve cognitive restructuring, self-talk, imagery, and in more serious cases, systematic desensitization.

With regard to gender differences in the three components of the RISSc, males were more confident in their ability to avoid injury than females, while females perceived higher probabilities and reported greater worry/concern about injury than did males (see hypothesis 4). These results provide additional support for the consistently reported gender differences in fear of injury (Ollendick & King, 1994) and perceived risk of injury (Kontos, in press; Kontos et al., 2000; Morrongiello & Rennie, 1998). To our surprise, sport type, however, may influence gender differences. We did not expect to find sport type differences (see hypothesis 3). In this study, female hockey players reported more worry/concern about injury than did female soccer players, where as, male hockey players reported less worry/concern about injury than did male soccer players. These differences in perceived risk may be indicative of different mental and physical approaches or attitudes to the same sport taken by males and females. Male hockey players may also be conforming to the expected norm for hockey, which involves a greater acceptance of injury as just "part of the game," thus, reducing the likelihood that they would report worry/concern about being injured. Male soccer and hockey players may also differ in their perceptions about what an injury is, with hockey players

considering only the more serious injuries in their responses to the RISSc. Female soccer and hockey players, on the other hand, may have worry/concern about injury that is more reflective of the actual probabilities of injury associated with their respective sports. Again, the socialization of males and females mentioned earlier may influence this relationship.

An alternate explanation of the gender by sport interaction may lie in the different ways in which the same sport is structured for males and females. This is evidenced in different applications of rules for males and females competing in the same sport. In women's hockey, for example, checking, fighting and other similarly aggressive acts are restricted by the rules; whereas for males, these acts are neither restricted nor enforced to the same degree as in the women's game.

A lack of experience with previous injuries, however, may negate the effects of gender on perceived risk. In the present study, differences in perceived risk of injury among previously uninjured males and females were negligible. Athletes who have not experienced an injury are likely to lack familiarity with the probabilities of injury in their sport and consequently perceive their sport environment to be relatively risk-free. Their perceptions of risk of injury, in the absence of personal experience, may be based (much like self-efficacy is) on vicarious experiences with other injured athletes, comments regarding injury from coaches and significant others, or on imaginal experiences involving injury. These risk-free perceptions of the sport environment, in turn, may be related to greater risk taking and a higher potential for injury in sport as previously reported (Kontos, 2000; Morrongiello & Rennie, 1998). Therefore, education from coaches and sport psychologists regarding developing an accurate, though not excessive, assessment of the risk associated with playing specific sports may be beneficial to both younger and novice athletes.

Overall, the participants in this study perceived relatively low levels of probability and worry/concern of injury in their respective sports, and were confident in their abilities to avoid injury. The participants in this study reported a lower probability of injury than in previous studies of perceived risk of injury in sport (Kontos, in press; Kontos et al., 2000). The participants in the current study were also older (i.e., college-age) than the participants (i.e., youth sport and adolescent age athletes) in previous studies. This supports the contention that levels of perceived risk (Morrongiello & Rennie, 1998) and worry (i.e., fear: Ollendick & King, 1994) of injury decline with age from childhood through adolescence. Based on the findings in the current study, it appears as though this declining trend in perceived risk of injury continues through early adulthood. Future research on perceived risk of injury should focus on the relationships among perceived risk of injury components in middle-aged and older adults, to determine if this trend continues in a linear or curvilinear fashion. Current research examining perceived risk of injury among older adult athletes does not support a linear trend in declining perceived risk with age (Kontos, Bonis, & O'Hanlon, 2002). In fact, based on this initial research, the trend in perceived risk of injury appears to be more reflective of competition age-level than of chronological age.

The relatively high levels of confidence in avoiding injury reported by participants in this study may be reflective of the level of competitive sport from which they were sampled. The participants in this study consisted primarily of competitive collegiate athletes. As such, it is logical to extend the findings regarding confidence in avoiding injury to suggest that the athletes in this study also had confidence in their abilities to perform in their respective sports. In the current study, however, participants' self-efficacy in their respective sports was not assessed. Bandura (1997) hypothesized that athletes lacking confidence in their abilities in sport are more likely to be injured. Kontos (in press) found support for this contention in a study of soccer players wherein a low estimation of ability in soccer (i.e., self-efficacy) was a significant risk factor for injury. Similarly, the results of the current study suggest that athletes lacking confidence in their ability to avoid being injured were more likely to perceive higher levels of probability and worry/concern of injury than athletes who were confident in their ability to avoid injury. To assess the effect of confidence in sport on perceived risk of injury, future studies should also include an assessment of sport-specific confidence apart from the confidence in avoiding injury measure.

As mentioned earlier, the current study's findings supported a positive relationship between previous injuries and perceived risk, as found in previous studies (Kontos, in press; Kontos et al., 2000). The current study, however, did not examine the effects of perceived risk of injury and previous injuries on subsequent injuries. In order to do this, researchers should adopt a prospective research design in which athletes' perceptions of risk and previous injuries are assessed at the beginning of the season and injuries are then monitored over the course of a season or year. Researchers should also attempt to assess the relationship between perceived risk, risk-taking, and subsequent injuries. Only then will we be able to develop the necessary knowledge base to allow for the application of the perceived risk of injury construct to reducing the potential for injury among athletes.

Lastly, although there was support in the present study for the contribution of the three hypothesized components to our understanding of perceived risk and the injury process, an additional component of perceived risk of injury may be relevant to further our understanding of these relationships. Based on Bernoulli's (1954) risk-taking theory it is likely that perceived risk of injury in sport may also involve a fourth component in addition to perceived probability, worry/concern, and confidence in avoiding injury; namely, the perceived consequences of injury. Therefore, the need exists for the development and validation of a measure of perceived consequence of injury that can be incorporated with the existing three components of the RISSc in future research on perceived risk of injury.

Conclusion

Overall, the current study indicated that perceived risk of injury was positively related to previous injury. This relationship was mitigated by gender, in that males who were previously injured reported lower perceived risk, whereas, previously injured females reported higher perceived risk. Males and females also differed in their overall perceptions of risk, with males perceiving less risk and females perceiving more risk in

sport. Sport also interacted with gender in these relationships. Specifically, female hockey players reported higher perceived risk than female soccer players, whereas, male hockey players reported lower perceived risk than male soccer players. The different socialization of males and females, and of participants from different sports, may account for these relationships. Socializing influences in sport should be examined in regard to perception of risk of injury and attitudes and responses toward injury in general. The relatively low perceived risk reported in this study suggests that sport participants in general represent a somewhat homogeneous population with similar perceptions of risk. Future research should also incorporate prospective injury data to attempt to establish direction for the relationship between perceptions and injury risk (see Kontos, 2004). Researchers should also attempt to link perceptions of risk to actual risk taking behaviors, and compare participants' perceptions of risk across different sports.

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