

Effect of Negative Life Events on Visuomotor Performance and Injury Incidence

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BACKGROUND AND PURPOSE

- Previous research has demonstrated that athletes with negative life stress are 2-5 X more likely to sustain injury¹⁻³
 - Negative life events have been shown to decrease peripheral vision and prolong reaction time (RT)⁴
- The Life Events Survey for Collegiate Athletes (LESCA) provides a mechanism to quantify life stress⁵
 - Negative LESCA score represents number and perceived impact of negative events in previous 12 months
- The Dynavision D2™ System provides a mechanism to quantify visuomotor RT during performance of various tasks
 - Targets arranged in concentric circles allow for assessment of performance in different visual fields
- The purpose of this study was to assess the possible influences of negative life events on injury incidence and visuomotor RT associated with the peripheral field of view among collegiate athletes

PARTICIPANTS AND PROCEDURES

- 65 NCAA Division I athletes (45 female; 20 male): women's basketball, soccer, and volleyball; men's wrestling
 - Age: 19.6 ± 1.3 years; Height: Male 175.4 ± 7.2 cm; Female 172.9 ± 9.3 cm
- LESCA administered prior to beginning of sport season; "negative" score calculated
- Dynavision D2™ System (Dynavision International; West Chester, OH) used to measure visuomotor RT
 - Standing distance from board (cm) = arm-span (fingertip-to-fingertip; arms elevated to horizontal) x 0.22
 - Board height adjusted to position tachistoscope (T-scope) at eye level (Figure 1)
 - 60-s "reactive" test (target illumination terminated if not touched within 1 s; minimum of 60 opportunities)
 - Target appearances (illumination) randomized across 4 quadrants and among 5 concentric rings (Figure 2)
 - Participant instructed to maintain visual focus on T-scope and to hit targets when illuminated
 - Single-digit number displayed on T-scope for 0.75 s, which participant was instructed to recite
- Receiver operating characteristic (ROC) analyses used to identify optimal cut-points for variable dichotomization
- Repeated measures ANOVA used to assess high versus low negative LESCA score group x D2 ring average RT

Figure 1



Figure 2

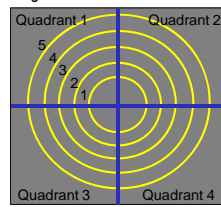
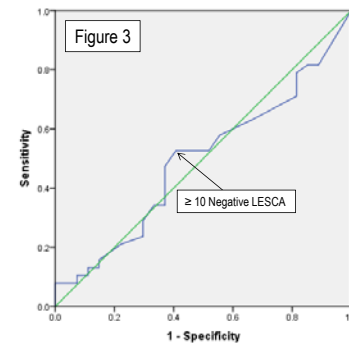


Table 1

	Shoulder	Upper Arm	Elbow	Forearm/Hand	Core	Upper Leg	Knee	Lower Leg	Ankle	Foot
Sprain	1	0	1	3	0	0	5	0	6	1
Strain	4	1	0	0	2	7	0	2	0	0
Fracture	0	0	0	0	1	0	0	0	0	2
Other	4	0	0	0	7	0	7	3	0	3

RESULTS

- Negative LESCA score ≥ 10 identified as optimal cut-point for discrimination of injured versus uninjured athletes
 - 1.6 X greater odds for injury occurrence (≥ 10 versus < 10)
- No significant group x ring interaction ($F_{4,252}=0.79$; $p=.532$) and no significant group difference ($F_{1,63}=0.03$; $p=.863$)
 - Significant difference among rings; increasing RT from 1-5 ($F_{4,252}=262.55$; $p<.001$)
- Despite lack of statistically significant interaction, a different ring 1-5 pattern of change clearly evident (Figure 4)
 - Ring 5 10-ms RT difference a possible indication of impaired peripheral visual awareness (Table 3)
- Ring 5 RT ≥ 675 ms identified as optimal cut-point for discrimination of negative LESCA score ≥ 10 versus < 10
 - 3 X greater odds for high negative LESCA score (≥ 675 ms versus < 675 ms)



Neg. LESCA	Injury	
	Yes	No
≥ 10	20	11
< 10	18	16
Total	38	27

Fisher's Exact One-Sided $p = .244$
 Sensitivity = 53% Specificity = 59%
 Odds Ratio = 1.6 (90% CI: .70 – 3.73)

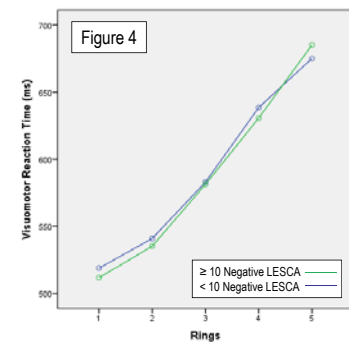
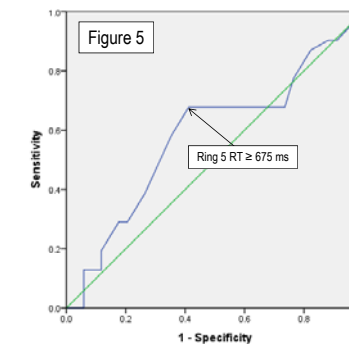


Table 3

Board Position	LESCA (Negative)	Mean (ms)	SD	Difference
Ring 1	<10	519	± 57.3	-8
	≥10	511	± 72.0	
Ring 2	<10	541	± 79.1	-6
	≥10	535	± 80.1	
Ring 3	<10	583	± 64.5	-2
	≥10	581	± 65.3	
Ring 4	<10	639	± 57.8	-8
	≥10	631	± 55.9	
Ring 5	<10	675	± 57.5	+10
	≥10	685	± 52.2	



Ring 5 RT (ms)	Neg. LESCA	
	≥ 10	< 10
≥ 675	21	14
< 675	10	20
Total	31	24

Fisher's Exact One-Sided $p = .028$
 Sensitivity = 68% Specificity = 59%
 Odds Ratio = 3.0 (90% CI: 1.28 – 7.04)

CLINICAL RELEVANCE

- Despite a relatively weak negative LESCA association with injury occurrence, a clear cut-point was evident
 - Psychosocial stress caused by negative life events has previously been associated with elevated injury risk¹⁻³
- Despite lack of statistical significance, a difference in peripheral visuomotor performance appeared to exist
 - As little as 5-10 ms of delay in muscle activation may have a significant adverse effect on joint mechanics⁷
- Screening for psychosocial stress and impaired peripheral visuomotor RT may identify high-risk athletes
 - Injury risk reduction interventions might include counseling, social support, and visuomotor training
- Utilization of the Dynavision D2™ T-scope during visuomotor training may be important for improvement of peripheral visual acuity, which may result in faster Ring 5 RT

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