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Perceived Stress, Heart Rate, and Blood Pressure among Adolescents with Family Members Deployed in Operation Iraqi Freedom

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Abstract

This study compared the impact of the 2003 Operation Iraqi Freedom on heart rate (HR) and blood pressure (BP) and self-reported stress levels among three groups of self-categorized adolescents: 1) military dependents with family members deployed; 2) military dependents with no family members deployed; 3) civilian dependents. At the onset and end of the "major hostilities" of Operation Iraqi Freedom, 121 adolescents (mean age = 15.8 ± 1.1 years) completed questionnaires evaluating the psychological impact of the war and were evaluated for HR and BP. The military deployed dependents exhibited significantly higher HR than other groups at both evaluations (both $p < 0.04$). Ethnicity by group interactions indicated that European American-deployed dependents had higher stress scores at both time points ($p < 0.02$). Military dependent European Americans exhibited higher systolic BP compared to the other groups on the second evaluation ($p < 0.03$).

Introduction

Relatively little is known with regard to how military dependents respond emotionally and physiologically to the stress of deployment of family members to war zones. Findings indicate that youth are likely to experience sadness, anxiety, and behavior problems depending upon age and previous adjustment levels when a parent is unexpectedly deployed to a war zone.[1] Rosen et al.[2] evaluated psychological functioning in 1,601 youth that were 1 to 18 years of age whose fathers were deployed during Operation Desert Storm (ODS). Parents left at home, typically mothers, completed questionnaires which collectively indicated that across ages and gender, symptoms of sadness and demand for attention were elevated but, in general, they did not perceive their children as requiring professional counseling. In another study of 383 children and spouses of military personnel deployed during ODS, elevated self-reported symptom levels of depression and significantly more intervening life stressors were reported, but no comparison was made with civilians.[3] The best predictors of youth requiring professional intervention were history of previous counseling and maternal and siblings' symptom levels. Neither self-report of psychological adjustment nor physiological indices of arousal/anxiety were evaluated among the youth.

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The purpose of this exploratory study was to evaluate self-reported psychological responses among adolescents who had a family member deployed to Operation Iraqi Freedom (OIF) compared to adolescents who did not have a family member deployed and to their civilian dependent counterparts. In addition, measures of general sympathetic nervous system arousal, resting heart rate (HR), and blood pressure (BP) were evaluated. Importantly, evaluations were conducted at the onset and end of major OIF hostilities.

Methods

Subjects

Permission to conduct this study was granted by the Superintendent of Richmond County Public Schools and the Medical College of Georgia Human Assurance Committee. Data collections occurred during a voluntary health screening conducted on 149 youth at an inner city high school in Augusta, Georgia. Parents were informed about the screening via a memo sent home from the principal's office and were given the opportunity to refuse consent for their child's participation. No parents or children refused permission. Participants included those from low to middle socioeconomic status neighborhoods. Forty-three percent of the students in the participating high school were eligible to receive free/reduced price lunches and 74.4% of the sample were non-European American (EA); i.e., non-Caucasian. The military dependent students lived on or near the Fort Gordon Army Signal Center in Augusta, Georgia. The civilian dependents attended the same school as the military dependents.

Procedures

Completion of questionnaires and anthropometric and resting HR and BP evaluations were conducted on March 21 and 25, 2003 at the onset of OIF and on May 15 and 16, 2003 at the declaration of the end of "major hostilities." Height (via stadiometer) and weight (via Detecto CN20 scale, Cardinal Scale Manufacturing Co., Webb City, Missouri), measurements were recorded using established protocols.[4] Critikon Dinamap 1846SX BP monitors (Critikon, Inc., Tampa, Florida) were used to measure BP and HR.[5] Following placement of the appropriate BP cuff, subjects were seated and instructed to relax as completely as possible. HR and BP responses were then measured during minutes 5, 7, and 9. Measures taken at minutes 7 and 9 were then averaged.

Instruments

Subjects completed questionnaires evaluating perceived stress impact at the onset and end of major OIF hostilities. Because there are few validated instruments to examine children's affective and cognitive reactions to war, two self-report instruments measuring war stress impact were adapted from those recommended for use in research studies by the Office of Behavioral and Social Science Research of the National Institutes of Health. These are available on the Internet: (http://obssr.od.nih.gov/activities/911/attack.htm. The 12-item Psychosocial Resources Scale (PRS) measures loss of psychosocial resources such as control, hope, perceived support, social embeddedness, coping self-sufficiency, and optimism.[6] The PRS has been shown to correlate with a global measure of total stress (r = 0.54) and exhibited an α coefficient of internal consistency of 0.78.[7] A 17-item measure of stress symptoms entitled the post-traumatic stress disorder checklist (PCL) was used to measure symptoms such as increased arousal including sleep disturbance, hyper-vigilance, estrangement, and foreshortened future.[8] This instrument was used in several studies which examined the impact of the September 11, 2001 events.[9-11] The PCL has demonstrated high levels of diagnostic accuracy, excellent 2- to 3-day test-retest reliability (r = 0.96), high internal consistency (coefficient α = 0.97), and strong correlations (range of 0.46-0.93) with

other stress measures.[8, 12-16] Subjects also completed an information form that included questions on deployment status of family members (i.e., mother, father, brother, sister).

Statistical Analyses

Statistical differences between the three group classifications (i.e., civilian dependents, military dependents with family members deployed, and military dependents with family members not deployed) at two time points (at the onset of and following the end of major hostilities in OIF) were analyzed by ethnicity (EA/non-EA), and statistical tests were adjusted for age, sex, and body mass index (BMI). Due to the observational nature of the study and the testing of multiple dependent variables, a 3 × 2 (group by ethnicity) multivariate analysis of covariance and subsequent univariate analyses of covariance were used to decrease the probability of chance associations.

Results

Based on the self-report of the 149 students, at the beginning of the war, 51 were classified as civilian, 64 as military nondeployed dependents, and 34 as military deployed. At the end of hostilities, 28 families had moved and were not available for posttesting (3 civilians, 11 military nondeployed, and 14 military deployed). Thus, 121 subjects were included in the analysis: 48 civilian, 53 military nondeployed, and 20 military deployed. Table I gives descriptive statistics (means and SDs) across the three group classifications at the initial evaluation for subjects that completed the study. The subjects had a mean age (SD) of 15.8 ± 1.1 years. The military deployed group had a significantly higher BMI ($p < 0.05$) than the civilian and military nondeployed groups. Although not statistically significant, the military deployed group also had a higher percentage of females ($p > 0.14$) and non-EAs ($p > 0.12$).

The multivariate analysis of covariance was significant for the group effect ($p < 0.01$) and the group-by-ethnicity interaction ($p < 0.01$). Univariate analyses found that the group effect was significant for HR at both time points (both $p < 0.04$), with the civilian dependents having the lowest mean HR and the military dependents having the highest (Table II).

For systolic BP (SBP), PRS, and PCL scores, the univariate analyses found the group effects were part of the group-by-ethnicity interactions. For SBP, at the first time point, this effect was a trend ($p < 0.08$), but was significant at the second time point ($p < 0.03$). The nature of the interaction was such that within the civilian dependent groups, non-EAs had higher SBP than EAs but within both military dependent groups, EAs had higher SBP than non-EAs. The highest mean SBP was observed for the deployed military dependent EAs at the first time point.

The group-by-ethnicity interaction was significant at both time points for both the PRS and the PCL (all $p < 0.02$). At both time points, the military deployed dependents had higher mean values than the other two groups with the EAs within this group having considerably higher values than non-EAs (Table II).

Discussion

To our knowledge, no published studies have examined the impact of onset of a war compared with the declared end of a war on affective and cognitive stress, HR, and BP in military offspring. The present study compared a sample of children with self-reported deployed or nondeployed military family members to civilian peers on HR, BP, and perceived levels of stress at the onset of and after the end of major 2003 OIF hostilities. On both evaluations, military dependents, particularly those with deployed family members, reported significantly higher levels of posttraumatic stress and showed significantly higher

HR than the civilian group. EA youth with deployed family members reported higher levels of post-traumatic symptoms and loss of psychosocial support resources at both time points compared to all other subgroups. After the end of major hostilities, the EA military dependents had higher SBP compared to their non-EA counterparts, whereas among civilian youth EAs exhibited lower SBP compared to non-EAs. Among the dependents of nondeployed personnel, whether there was no threat of deployment or threat of deployment in the near future was not assessed. Whether stress effects in the non-EA military dependent groups are buffered due to factors such as social support via extended families, church, or other networks, or whether previous exposure to high levels of psychosocial stress provides masking insulation or inoculation effects are unknown.

During wartime, stress is magnified for families of military personnel.[17] Concerns have been raised about greater behavioral problems among children in military families,[18-20] with the psychopathology prevalence estimates ranging from 1 to 35%.[21] Variability in estimates may be due to differences in psychiatric disturbance classification. Military children's psychopathology self-reports indicate consistency with national norms.[22] Studies in adults have found that a high HR following trauma was predictive of post-traumatic stress.[23] Studies in children have shown that resting HR is inversely associated with externalizing psychopathology and positively associated with anxiety disorders.[24] Background stress has been reported to increase BP responses to acute stress compared with less-stressed counterparts in children.[25] In the present study, stress levels may have been impacted more in the 41% of the deployed group that had moved compared to 6% of the civilians and 17% of the nondeployed group.

It has been suggested that military families experience greater levels of stress than deployed soldiers due to factors such as the impact of the media, disruption in family routines, uncertainty about the return of the service member, and fears of their potential bodily or psychogenic injury.[26] On the other hand, in a sample of 91, Ryan-Wenger[27] did not find significant differences in anxiety levels or coping strategies among active duty, reserve, and civilian dependent children. In the present study, classification of military dependents as active duty, Guard, or Reserves was not assessed.

The first several months of OIF had an unprecedented high level of media coverage with news reporters imbedded with combat troops relaying live coverage during the conflict. Due to factors such as opposition from a number of sources within and outside the United States, the stress imposed on families by OIF has not been analogous to that of previous routine peacetime deployments. The call to duty was initially disruptive and "hazardous" (i.e., highly dangerous) which created unique stress beyond those experienced during peacetime deployments. The deployment also carried with it potential health concerns seen in previous war time deployments, such as unexplained chronic illnesses,[28] chemical exposure concerns,[29] infections,[30] and prolonged "anticipation of trauma."[1] For these reasons, OIF deployment created a special situation of "family trauma" for military families.

Although these findings are intriguing, they need to be interpreted cautiously due to several limitations of the study. The potential role of war stress-related factors such as amount of media coverage viewed, discussion of events, and other non-war-related sources of stress was not assessed. Anxiety due to continued traumatic events related to OIF such as the added burden of uncertainty regarding the perceived threat of terrorist attacks both at home and attacks abroad may have contributed to the intensity of the responses. The study did not introduce interventions and did not assess other sources of support that may have moderated the results.

In summary, adolescent offspring of military personnel reported higher levels of stress and showed higher SBP and HR compared with civilian adolescents. Given the continued presence of U.S. soldiers deployed to OIF and mounting causalities, these findings suggest that youth with family members in the military, particularly those deployed overseas, may warrant increased attention of parents, educators, and counselors during the period of active conflict. Further research is warranted to determine whether stress reduction interventions may be effective in reducing stress levels and associated indices of sympathetic nervous system arousal in children of military personnel.

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TABLE I

MEANS AND SDS FOR DESCRIPTIVE MEASURES AT ONSET OF OIF BY GROUP CLASSIFICATION

	Group (*n*)		
Variable	**Civilian (48)**	**Military Nondeployed (53)**	**Military Deployed (20)**
Sex (% male)	50.0	60.4	35.0
Ethnicity (% EA)	33.3	24.5	10.0
Age (years)	15.6 (1.1)	15.8 (1.1)	16.1 (1.2)
Height (cm)	168.4 (9.0)	168.4 (8.6)	166.7 (8.5)
Weight (kg)	68.4 (14.7)	66.6 (18.5)	74.8 (19.7)
BMI (kg/m^2)	24.1 (4.8)	23.3 (5.1)	27.0 (7.8)[a]

Values are mean ± SD.

[a] $p < 0.05$.

TABLE II

RESTING HR, BP, AND STRESS LEVELS AT OIF ONSET AND AT END OF MAJOR HOSTILITIES BY GROUP AND ETHNICITY CLASSIFICATIONS

	Civilian (*n* = 53)				Nondeployed (*n* = 59)				Deployed (*n* = 21)			
	OIF Onset		After War		OIF Onset		After War		OIF Onset		After War	
Ethnicity	**EA**	**Non-EA**	**EA**	**Non-EA**	**EA**	**Non-EA**	**EA**	**Non-EA**	**EA**	**Non-EA**	**EA**	**Non-EA**
SBP	110.3 ± 2.2	114.3 ± 1.6	106.1 ± 2.5	113.3 ± 1.8	114.9 ± 2.4	110.5 ± 1.4	113.7 ± 2.8	109.1 ± 1.6	118.0 ± 6.1	112.6 ± 2.1	111.0 ± 7.0	109.0 ± 2.4
DBP	62.7 ± 1.5	61.1 ± 1.1	61.2 ± 1.5	62.6 ± 1.1	60.4 ± 1.7	63.3 ± 1.0	60.1 ± 1.7	62.1 ± 1.0	66.1 ± 4.3	65.9 ± 1.5	64.1 ± 4.3	63.0 ± 1.5
HR	71.0 ± 2.5	72.6 ± 1.8	74.3 ± 2.5	71.2 ± 1.8	82.1 ± 2.8	76.4 ± 1.6	80.4 ± 2.8	75.0 ± 1.6	86.9 ± 7.1	76.5 ± 2.5	88.9 ± 7.0	72.6 ± 2.4
PRS	26.0 ± 2.0	24.0 ± 1.4	23.6 ± 2.1	22.0 ± 1.5	21.6 ± 2.2	26.3 ± 1.3	18.0 ± 2.4	25.2 ± 1.4	39.7 ± 5.5	28.1 ± 1.9	46.3 ± 6.1	26.0 ± 2.1
PCL	26.3 ± 2.1	22.1 ± 1.5	21.2 ± 2.3	19.6 ± 1.6	21.5 ± 2.4	27.0 ± 1.4	18.5 ± 2.5	24.6 ± 1.4	48.1 ± 6.0	27.9 ± 2.1	52.8 ± 6.4	26.3 ± 2.2

Values are means ± SE. Variables adjusted for age, BMI, and sex.