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Comparison of Overweight and Obese Military-Dependent and Civilian Adolescent Girls with Loss-of-Control Eating

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Abstract

Objective—Limited data suggest that the children of U.S. service members may be at increased risk for disordered-eating. To date, no study has directly compared adolescent military-dependents to their civilian peers along measures of eating pathology and associated correlates. We, therefore, compared overweight and obese adolescent female military-dependents to their civilian counterparts along measures of eating-related pathology and psychosocial functioning.

Method—Adolescent females with a BMI between the 85th and 97th percentiles and who reported loss-of-control eating completed interview and questionnaire assessments of eating-related and general psychopathology.

Results—23 military-dependents and 105 civilians participated. Controlling for age, race, and BMI-z, military-dependents reported significantly more binge episodes per month (p<.01), as well as greater eating-concern, shape-concern, and weight-concern (p's<.01) than civilians. Military-dependents also reported more severe depression (p<.05).

Discussion—Adolescent female military-dependents may be particularly vulnerable to disordered-eating compared to civilian peers. This potential vulnerability should be considered when assessing military-dependents.

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Keywords

Military dependents; adolescents; loss of control and binge eating; disordered-eating; overweight; obesity

Children of military personnel face unique stressors and experience high rates of substance abuse, bullying, victimization, gang affiliation, and reduced access to support services (1–6), which may adversely affect physical and psychological health. As limited data suggest that military families may be at increased risk for eating disorders (EDs) (e.g., anorexia and bulimia nervosa, misuse of diuretics/diet pills) and obesity (7–10), and EDs among parents contribute to eating pathology in their children (11–13), military-dependents may be especially vulnerable to eating disturbances. However, no study has directly compared overweight adolescent military-dependents to their civilian counterparts on eating-related psychopathology, depression, and social adjustment. Therefore, we compared female adolescent military-dependents and civilians, all of whom were at high-risk for adult obesity (14, 15) (16). Based on extant research reporting stress and psychopathology among military-dependents (4), we hypothesized that military-dependents would present with greater impairment compared to their civilian counterparts.

Methods

Participants and Procedures

Samples of convenience were drawn from two contemporaneously-conducted studies with common measures; a pilot study of military-dependents (NCT02334202) (17), and an efficacy trial of civilians (NCT00680979) (18). Baseline data were collected from girls prior to participation in programs designed to prevent EDs and excess weight gain. Recruitment strategies and exclusion/inclusion criteria are described elsewhere (17, 18). Both studies employed similar language on advertisements, and utilized flyers and mailings to local families. Military-dependents were also recruited via mailings to TRICARE enrollees with 12–17y children. Adolescent assent and parent/guardian consent were provided. Both protocols were approved by the USU IRB. The civilian protocol was also approved by the NICHD IRB and secondary approval for the military study was provided by the FBCH Research Office.

The presence of LOC was required for study participation in the civilian efficacy study, whereas the presence of either LOC **or** ≥ 2 LOC-related behaviors (e.g., eating in response to negative affect (19)) was required for the military-dependent pilot trial. In order to match the two groups for the present analyses, we included only military dependents who reported LOC within the past month as assessed by the EDE, and individuals with a BMI between the 85th and 97th percentile.

Civilian girls were assessed at USU and the NIH Clinical Center (Bethesda, MD) (20). Military-dependents were seen at the Family Medicine clinic at the FBCH (Fort Belvoir, Virginia). All girls underwent the following:

Anthropometric measurements

Height and fasting weight were obtained and used to compute BMI and BMI standard deviation scores (BMI-z). Abdominal waist-circumference (WC) was measured according to convention (21).

The Eating Disorder Examination V.14 OD/C.2, *EDE*, (22) was administered to assess the presence of binge-eating-disorder (BED: ≥ 1 episode of binge-eating/week in the absence of compensatory behaviors over the past 3 months) (23), and the presence and number of objective binge-episodes (OBE), subjective binge-episodes (SBE), and overeating-episodes (OO), over the past 3 months. The EDE yields restraint, eating-concern, shape-concern, weight-concern subscales, and a global score. The EDE has excellent psychometric properties (24), and demonstrated good reliability (α=.88) in the present sample.

Beck Depression Inventory (25) assesses current depressive symptoms. Scores range from 0–63; higher scores indicate greater depression. The measure has demonstrated excellent reliability and validity (26) and showed good internal consistency in the present sample (α=.86).

Social Adjustment Scale (SAS)-Self-Report (27) measures satisfaction and functioning in: school, friendships, and family (subscales), over the past 2 weeks. Subscales range from 1–5. The SAS has been used with adolescents (28) and demonstrated good reliability in the present sample (α=.83).

Exploratory Metabolic Assessment

The FBCH and the NIH Clinical Research Center utilize slightly different assay techniques for determination of insulin and glucose concentrations. For the civilian trial, plasma for glucose was collected in tubes containing powdered sodium fluoride and measured by the NIH Clinical Center laboratory using a Hitachi 917 analyzer (Roche Diagnostics Indianapolis). Insulin concentrations were determined using a commercially-available immunochemiluminometric assay purchased from Diagnostic Product Corp., Los Angeles and calibrated against insulin reference preparation 66/304. The insulin assay uses a monoclonal anti-insulin antibody and was run on an Immulite2000 machine (Diagnostic Product Corp., Los Angeles). For the military trial, plasma glucose levels were collected in serum separator tubes and measured by the FBCH laboratory using an enzymatic hexokinase method on a COBAS 6000 analyzer (Roche Diagnostics Indianapolis). Insulin concentrations were collected in serum separator tubes and measured by the Walter Reed National Military Medical Center laboratory using an electro-chemilluminescence immunoassay method on a COBAS 8000 (Roche Diagnostics Indianapolis).

Data Analysis

Analyses were conducted using SPSS v.22 (29). Outliers (<5%) were adjusted to fall 1.5 times the interquartile range (IQR). Eating episodes were log-transformed (base10). ANCOVA, accounting for BMI-z, race, and age, were used to examine group differences in EDE, depression, and SAS scores. Chi-square and Fisher's exact tests were used to determine the likelihood of meeting criteria for BED (23), hyperinsulinemia (fasting insulin

≥15 μU/L), and insulin resistance (homeostatic model assessment of insulin resistance (HOMA-IR) ≥ 3.16) controlling for BMI-z, race, age, depression, and WC. Differences were considered significant when *p* values were ≤0.05. All tests were two-tailed.

Results

Twenty-three overweight and obese military-dependents and 105 overweight and obese civilians did not differ on demographic variables (Table 1).

Accounting for age, race, and BMI-z, military-dependents reported more OBEs over the past 3 months compared to civilians (median (IQR)=.00 (2.0) vs .00 (.33) episodes/month; F (4,127)=7.93, p=.006; η^2=.05). Groups did not differ with regard to number of SBEs or OOs (p's > .05). More military-dependents (17%) met criteria for BED (23) compared to civilians (2%) (χ^2=10.13, Fisher's p=.01, Cramer's V=.28). Compared to civilians, military-dependents reported greater EDE eating- (p=.001), shape-(p<.001), and weight- (p=.001) concern, and global score (p<.001). Groups did not differ on EDE restraint (p=.30). (Table 2).

Military-dependents reported greater depressive symptoms (median (IQR)=15.00 (11.0) vs 10.00 (9.0), F (5,121)=4.17, p=.044; η^2=.03), after controlling for BMI-z, race, and age. Military-dependents did not differ from civilians on the SAS school or family subscales (p's > .05). The difference in the friendship subscale approached significance (median (IQR)=2.11 (.64) vs 1.78 (.78), F (5,118)=3.64, p=.059), such that military-dependents reported marginally worse functioning in friendships (Table 2).

Accounting for BMI-z, race, age, depression, and WC, military-dependents had greater fasting insulin (median (IQR)=18.50 (8.8) vs 10.90 (9.9) uIU/mL, F (6,105)=7.84, p=.006; η^2=.06). More military-dependents (63%) had hyperinsulinemia (30), compared to civilians (31%) (χ^2=6.94, Fisher's p=.016, Cramer's V=.25). Accounting for BMI-z, race, age, depression, and WC, military-dependents also had greater HOMA-IR (median (IQR)=3.84(1.89) vs 2.48 (2.17), F (6,102)=6.82, p=.01, η^2=.06). More military-dependents (63%) had clinically elevated insulin resistance (HOMA-IR ≥ 3.16 (31, 32)), compared to civilians (33%) (χ^2=6.21, Fisher's p=.018, Cramer's V=.24). Groups did not differ in fasting glucose (p's > .05) (Table 2).

Discussion

In this comparison of overweight and obese military-dependent and civilian adolescents, children of service-members reported greater disordered-eating and depression. Military-dependents reported more OBEs per month, and were more likely to meet criteria for BED (23). Results must be interpreted with caution due to the low rate of BED and the unequal sample sizes. As binge-eating during youth predicts excess weight and adiposity gain (33), military-dependents may be at especially high-risk for inappropriate weight gain. Military-dependents also reported greater disordered-eating attitudes. Since weight-related concerns may predict the onset of EDs (15, 34), military-dependents may have multiple risk factors for the development of EDs and obesity. As children's eating behaviors are influenced by those of their parents via epigenetic mechanisms (13) and learned behaviors (11), eating pathology reported by military-dependents may be partially explained by the high rates of EDs observed among service-members (7, 9, 35, 36).

Although results should be considered with caution due to the use of slightly different assays, a greater proportion of military-dependents had hyperinsulinemia and clinically elevated insulin resistance. Thus, overweight military-dependents may be vulnerable for the development metabolic disorders. Chronic stress may mediate the relationship between military life and metabolic risk (37). Depressive symptoms have also been linked to (38), and predictive of (39), insulin resistance in youth. Indeed, the daughters of service-members reported greater depression; in fact, military-dependents' depression scores placed them in the mild depression range, whereas civilian adolescents' scores indicated only minimal depression (25). Together, our findings are consistent with research indicating that military-dependents face additional stressors compared to civilian peers (4, 5). Prospective data are required to examine whether psychosocial stress associated with military life provides a mechanism for the development of EDs.

Strengths include the interview assessment of eating pathology, and the racially-diverse samples. Limitations include the use of cross-sectional data, and different assays for metabolic indices. The unequal sample distributions of may also be a limitation. Finally, the inclusion criterion of LOC limits generalizability to other overweight girls. However, the high prevalence of LOC and the adverse outcomes for those whose LOC persists (16, 33, 40), render this an important group to study.

In conclusion, overweight female adolescent military-dependents with LOC may be at greater risk for disordered-eating than their civilian peers. As adolescent girls are already vulnerable to EDs (34), overweight (41), and depression (42), any unique risks faced by military-dependents is important to identify.

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References

1. Astor RA, De Pedro KT, Gilreath TD, Esqueda MC, Benbenishty R. The promotional role of school and community contexts for military students. Clinical child and family psychology review. 2013; 16(3):233–244. [PubMed: 23760904]
2. Jensen PS, Martin D, Watanabe H. Children's response to parental separation during Operation Desert Storm. Journal of the American Academy of Child and Adolescent Psychiatry. 1996; 35(4): 433–441. [PubMed: 8919705]
3. Huebner, AJ.; Mancini, JA. Adjustment among adolescents in military families when a parent is deployed: A final report submitted to the Military Family Research Institute and the Department of Defense Quality of Life Office. Falls Church, VA: Virginia Tech; 2005.
4. Card NA, Bosch L, Casper DM, Wiggs CB, Hawkins SA, Schlomer GL, et al. A meta-analytic review of internalizing, externalizing, and academic adjustment among children of deployed military service members. Journal of Family Psychology. 2011; 25(4):508–520. [PubMed: 21707171]

5. Esposito-Smythers C, Wolff J, Lemmon KM, Bodzy M, Swenson RR, Spirito A. Military youth and the deployment cycle: Emotional health consequences and recommendations for intervention. Journal of Family Psychology. 2011; 25(4):497–507. [PubMed: 21707172]

6. Reed SC, Bell JF, Edwards TC. Adolescent well-being in Washington state military families. American journal of public health. 2011; 101(9):1676–1682. [PubMed: 21778477]

7. McNulty PAF. Prevalence and contributing factors of eating disorder behaviors in active duty Navy men. Military Medicine. 1997; 162(11):753–758. [PubMed: 9358723]

8. McNulty PA. Prevalence and contributing factors of eating disorder behaviors in a population of female Navy nurses. Mil Med. 1997; 162(10):703–706. [PubMed: 9339088]

9. McNulty PA. Prevalence and contributing factors of eating disorder behaviors in active duty service women in the Army, Navy, Air Force, and Marines. Mil Med. 2001; 166(1):53–58. [PubMed: 11197099]

10. Eilerman PA, Herzog CM, Luce BK, Chao SY, Walker SM, Zarzabal LA, et al. A Comparison of Obesity Prevalence: Military Health System and United States Populations, 2009–2012. Military Medicine. 2014; 179(5):462–470. [PubMed: 24806489]

11. Stice E. Modeling of eating pathology and social reinforcement of the thin-ideal predict onset of bulimic symptoms. Behaviour Research and Therapy. 1998; 36(10):931–944. [PubMed: 9714944]

12. Patel P, Wheatcroft R, Park R, Stein A. The Children of Mothers with Eating Disorders. Clinical child and family psychology review. 2002; 5(1):1–19. [PubMed: 11993543]

13. Campbell IC, Mill J, Uher R, Schmidt U. Eating disorders, gene–environment interactions and epigenetics. Neuroscience & Biobehavioral Reviews. 2011; 35(3):784–793. [PubMed: 20888360]

14. Field A, Cook N, Gillman M. Weight Status in Childhood as a Predictor of Becoming Overweight or Hypertensive in Early Adulthood. Obesity Research. 2005; 13(1):163–169. [PubMed: 15761176]

15. Investigators TM. Risk Factors for the Onset of Eating Disorders in Adolescent Girls: Results of the McKnight Longitudinal Risk Factor Study. American Journal of Psychiatry. 2003; 160(2):248–254. [PubMed: 12562570]

16. Sonneville KR, Horton NJ, Micali N, Crosby RD, Swanson SA, Solmi F, et al. Longitudinal associations between binge eating and overeating and adverse outcomes among adolescents and young adults: Does loss of control matter? JAMA pediatrics. 2013; 167(2):149–155. [PubMed: 23229786]

17. Spieker E, Sbrocco T, Theim KR, Maurer D, Johnson D, Bryant EJ, et al. Preventing Obesity in the Military Community (POMC): The Development of a Clinical Trials Research Partnership in Military Training Facilities. International Journal of Environmental Research and Public Health. 2015; 12(2):1174–1195. [PubMed: 25648176]

18. Tanofsky-Kraff M, Shomaker LB, Wilfley DE, Young JF, Sbrocco T, Stephens M, et al. Targeted prevention of excess weight gain and eating disorders in high-risk adolescent girls: a randomized controlled trial. The American Journal of Clinical Nutrition. 2014; 100(4):1010–1018. [PubMed: 25240070]

19. Tanofsky-Kraff M, Goossens L, Eddy KT, Ringham R, Goldschmidt A, Yanovski SZ, et al. A multisite investigation of binge eating behaviors in children and adolescents. Journal of Consulting and Clinical Psychology. 2007; 75(6):901–913. [PubMed: 18085907]

20. King R, Gaines L, Lambert EW, Summerfelt WT, Bickman L. The co-occurrence of psychiatric and substance use diagnoses in adolescents in different service systems: Frequency, recognition, cost, and outcomes. The Journal of Behavioral Health Services & Research. 2000; 27(4):417–430. [PubMed: 11070635]

21. NHANES III Anthropometric Procedures Video. Washington, DC: National Center for Health Statistics; 1996.

22. Fairburn, C.; Cooper, Z. The Eating Disorder Examination (12th ed.). In: Fairburn, C.; Wilson, G., editors. Binge eating: Nature, assessment and treatment. New York: Guilford Press; 1993. p. 317-360.

23. APA. Diagnostic and Statistical Manual of Mental Disorders: DSM-5 5th ed. Washington, DC: American Psychiatric Publishing; 2013.

24. Fairburn C, Beglin S. Assessment of eating disorders: Interview or self-report questionnaire? International Journal of Eating Disorders. 1994; 16:363–370. [PubMed: 7866415]
25. Beck A, Steer RA, Carbin M. Psychometric Properties of the Beck Depression Inventory: Twenty-Five Years of Evaluation. Clin Psychol Rev. 1988; 8:77–100.
26. Reynolds W, Gould J. A Psychometric Investigation of the Standard and Short Form Beck Depression Inventory. J Consult Clin Psych. 1981; 49:306–307.
27. Weissman MM, Bothwell S. Assessment of social adjustment by patient self-report. Arch Gen Psychiatry. 1976; 33(9):1111–1115. [PubMed: 962494]
28. DeBar LL, Wilson GT, Yarborough BJ, Burns B, Oyler B, Hildebrandt T, et al. Cognitive Behavioral Treatment for Recurrent Binge Eating in Adolescent Girls: A Pilot Trial. Cognitive and behavioral practice. 2013; 20(2):147–161. [PubMed: 23645978]
29. Corp I. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp; Released 2013.
30. Raikkonen K, Keltikangas-Jarvinen L, Adlercreutz H, Hautanen A. Psychosocial stress and the insulin resistance syndrome. Metabolism. 1996; 45(12):1533–1538. [PubMed: 8969288]
31. Thomas H. Obesity prevention programs for children and youth: why are their results so modest? Health education research. 2006; 21(6):783–795. [PubMed: 17099075]
32. Raikkonen K, Matthews KA, Salomon K. Hostility predicts metabolic syndrome risk factors in children and adolescents. Health Psychol. 2003; 22(3):279–286. [PubMed: 12790255]
33. Tanofsky-Kraff M, Cohen ML, Yanovski SZ, Cox C, Theim KR, Keil M, et al. A Prospective Study of Psychological Predictors of Body Fat Gain Among Children at High Risk for Adult Obesity. Pediatrics. 2006; 117(4):1203–1209. [PubMed: 16585316]
34. Striegel-Moore RH, Bulik CM. Risk factors for eating disorders. American Psychologist. 2007; 62(3):181–198. [PubMed: 17469897]
35. Antczak AJ, Brininger TL. Diagnosed eating disorders in the U.S. Military: a nine year review. Eat Disord. 2008; 16(5):363–377. [PubMed: 18821361]
36. Lauder TD, Williams MV, Campbell CS, Davis GD, Sherman RA. Abnormal eating behaviors in military women. Medicine & Science in Sports & Exercise. 1999; 31(9):1265–1271. [PubMed: 10487367]
37. Aschbacher K, Kornfeld S, Picard M, Puterman E, Havel PJ, Stanhope K, et al. Chronic stress increases vulnerability to diet-related abdominal fat, oxidative stress, and metabolic risk. Psychoneuroendocrinology. 2014; 46(0):14–22. [PubMed: 24882154]
38. Shomaker L, Tanofsky-Kraff M, Young-Hyman D, Han JC, Yanoff LB, Brady SM, et al. Psychological symptoms and insulin sensitivity in adolescents. Pediatric Diabetes. 2010; 11(6): 417–423. [PubMed: 19912553]
39. Shomaker L, Tanofsky-Kraff M, Stern EA, Miller R, Zocca JM, Field SE, et al. Longitudinal Study of Depressive Symptoms and Progression of Insulin Resistance in Youth at Risk for Adult Obesity. Diabetes Care. 2011; 34(11):2458–2463. [PubMed: 21911779]
40. Tanofsky-Kraff M, Yanovski SZ, Schvey NA, Olsen CH, Gustafson J, Yanovski JA. A prospective study of loss of control eating for body weight gain in children at high risk for adult obesity. International Journal of Eating Disorders. 2009; 42(1):26–30. [PubMed: 18720473]
41. Haines J, Kleinman KP, Rifas-Shiman SL, Field AE, Austin S. Examination of shared risk and protective factors for overweight and disordered eating among adolescents. Archives of Pediatrics & Adolescent Medicine. 2010; 164(4):336–343. [PubMed: 20368486]
42. Hankin BL, Abramson LY. Development of gender differences in depression: description and possible explanations. Annals of Medicine. 1999; 31(6):372–379. [PubMed: 10680851]

Table 1

Descriptive Statistics

	Civilians			Military Dependents			
	Mean	**SD**	**N**	**M**	**SD**	**N**	**F**
Age (y)	14.49	1.64	105	14.66	1.72	23	.215
BMI (kg/m^2)	27.20	2.39	105	27.98	2.31	23	2.02
BMI %ile	92.94	3.62	105	94.39	2.39	23	3.34
Waist Circumference (cm)	85.75	8.49	99	86.66	8.34	23	.217
Race			%			%	2.71
White	--	--	62	--	--	52	
Black	--	--	24	--	--	22	
Asian	--	--	3	--	--	0	
Multiple	--	--	9	--	--	17	
Other/Unknown	--	--	4	--	--	9	

Note: BMI = Body mass index (kg/m^2); BMI %ile = Body Mass Index Percentile

M = mean; SD = standard deviation.

Statistical test conducted: one-way analysis of variance.

** $p < .01$

* $p < .05$

Table 2

Dependent Variables, Controlling for Relevant Covariates

	Civilians			Military Dependents			
	Mean	**SD**	**N**	**M**	**SD**	**N**	**F**
Objective Binge Episodes/Month [a]	.26	.53	105	1.06	1.83	23	7.93**
Subjective Binge Episodes/Month [a]	2.41	2.79	105	2.67	2.47	23	.47
Objective Overeating Episodes/Month [a]	.09	.30	105	.13	.43	23	.01
Eating Disorder Examination Interview							
Restraint [a]	1.14	.89	105	1.39	.83	23	1.07
Eating-Concern [a]	.81	.93	105	1.58	1.36	23	10.14**
Shape-Concern [a]	1.93	1.23	105	3.02	1.58	23	12.74**
Weight-Concern [a]	1.96	1.18	105	2.85	1.39	23	8.74**
Global Score [a]	1.46	.83	105	2.21	1.09	23	12.44**
Depressive Symptoms [b]	10.81	6.59	90	14.17	7.77	23	4.17*
Social Adjustment Scale							
School [a]	1.75	.52	81	1.92	.62	17	1.43
Family [a]	1.89	.63	105	2.00	.72	20	.59
Friendships [a]	1.87	.52	105	2.14	.50	20	3.64
Romantic Relationships [a]	3.72	1.02	102	3.85	.78	20	.26
Total [a]	2.03	.42	105	2.22	.46	20	2.52
Fasting Insulin (μIU/mL) [b]	12.39	6.62	85	17.01	5.70	19	7.08**
Fasting Glucose (mg/dL) [b]	87.06	5.92	89	86.89	5.84	19	.02
HOMA-IR [b]	2.71	1.46	84	3.65	1.27	19	6.81**

Note: HOMA-IR = homeostatic model assessment of insulin resistance

M = mean; SD = standard deviation

Statistical test conducted: one-way analysis of covariance

[a] covariates = Age, Race, BMI-Z

[b] covariates = Age, Race, BMI-Z, Waist Circumference, Depression

** $p < .01$

* $p < .05$