

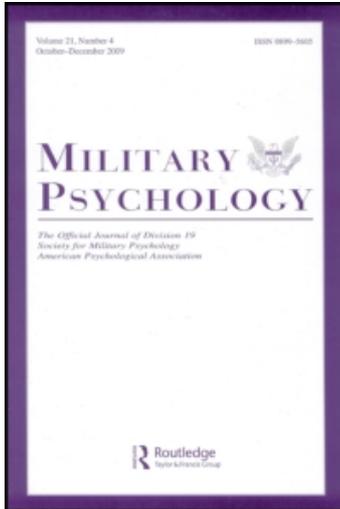
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Relationship Between Psychological Skill Profiles and Soldier Physical Fitness Performance

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We examine the structure of soldier's psychological skills and assess the relationship between psychological skills profiles and physical performance with data from 427 soldiers from a Stryker Brigade. Exploratory factor analyses results provided empirical support for a three-factor structure that included foundation skills, psychosomatic skills, and cognitive skills. Cluster analysis revealed three emergent psychological skills profile groups: (a) strong skills, (b) weak skills, and (c) fearful focus clusters. Soldiers in the strong psychological skill profile group performed better than their peers in the other profile groups on the Army Physical Fitness Test (APFT) performance measure. We discuss the implications of our findings for theory, research, and practice.

Empirical evidence suggests that psychological skills are crucial to high-level expert performance across a range of tasks and populations (e.g., Ericsson &

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Kintsch, 1995; Ericsson & Smith, 1991; Janelle & Hillman, 2003; Williams & Ericsson, 2005); however, evidence indicating which psychological skills are most effective in military settings is lacking. Fiore and Salas (2008) recently highlighted the need for additional research using a sports psychology approach to enhance our understanding of soldier's physical performance. Janelle and Hillman suggested that knowledge of factors underpinning the psychological strengths of high-level performers in sport can provide insight into the factors that underlie effective practice, instruction, and support networks required to facilitate performance and learning in domains such as the military. This study begins to address this issue by examining the role psychological skills may play in enhancing soldiers' physical performance. Specifically, we examine the utility of an adapted version of the Ottawa Mental Skills Assessment Tool-3 (OMSAT-3; Durand-Bush, Salmela, & Green-Demers, 2001) to measure psychological skills in a military population and assess whether differences in psychological skill profiles are related to soldiers' performance on the Army Physical Fitness Test (APFT). Before we present the main findings of our study, we provide a brief review of psychological skills research and theory and sports performance to provide context for the hypotheses examined in our study.

PSYCHOLOGICAL SKILLS IN SPORT SETTINGS

Identifying the most salient psychological characteristics necessary for outstanding athletic performance has been of interest to sport psychologists for decades (e.g., Ogilvie & Tutko, 1966). Considerable evidence suggests that successful athletes possess a constellation of psychological skills that distinguish them from their less successful peers. Successful athletes have been shown to possess better concentration, higher levels of self-confidence, lower levels of anxiety, more affirmative task-oriented thoughts and cope better with competitive stress, use more positive imagery, and have more developed plans for competition and performance evaluation than their lower performing peers (e.g., Boutcher, 1992; Burton, Naylor, & Holliday, 2001; Gould, Ecklund, & Jackson, 1992; Greenspan & Feltz, 1989; Janelle & Hillman, 2003; Krane & Williams, 2006; Landers & Boutcher, 1998; Mahoney, Gabriel, & Perkins, 1987; Meyers, Whelan, & Murphy, 1996; Orlick, 1992; Orlick & Partington, 1988; Thomas, Murphy, & Hardy, 1999; Vealey, 1994; R. S. Weinberg & Comar, 1994). For example, Orlick and Partington showed that successful athletes (a) possessed a high level of commitment; (b) set clear short and long-term goals; (c) engaged in imagery and simulation training; (d) focused and refocused in the face of distractions; (e) established a mental training plan that was refined throughout the season; and (f) established plans for competition—including precompetition/competition mental plans, distraction control plans, and constructive evaluation plans. Similar findings have been re-

ported in studies of U.S. Olympic performers (Gould, Dieffenbach, & Moffett, 2002; Gould, Greenleaf, Chung, & Guinan, 2002; Gould, Guinan, Greenleaf, Medbery & Peterson, 1999). For example, Gould and colleagues (1999) found that teams that met or exceeded performance expectations engaged in extensive mental preparation and were highly focused and committed. Moreover, successful teams reported support from family or friends and participated in residency programs. In contrast, less successful teams did not effectively plan for competition, lacked cohesion, and experienced coaching, traveling, focus, and commitment difficulties. Taken together this body of research suggests that high-performing athletes may have an array of psychological skills that enable them to enhance their capacity for physical performance.

SIMILARITIES BETWEEN MILITARY AND SPORT PERFORMERS

Though soldiers and athletes are clearly different in many respects, Goodwin (2008) pointed out that many sports, especially competitive Olympic sports, evolved from basic military tasks and that fundamental aspects of warfare are exemplified in a variety of sport competitions including marksmanship (e.g., rifle, pistol, archery), overcoming physical defenses and obstacles (e.g., pole vault, high jump, steeplechase), navigation (e.g., orienteering, sailing), and hand-to-hand combat (e.g., boxing, wrestling, judo). Goodwin also linked modern-era team sports (e.g., football, hockey) with formations commonly seen in small-unit military combat operations. Ward and colleagues (2008) suggested a psychological nexus between team sports and small-unit combat operations. According to Ward and colleagues, team sports and small-unit combat operations require individuals to (a) perform in a complex and dynamic environment; (b) utilize a combination of perceptual, cognitive, and motor skills; (c) obtain a tactical advantage over their opponent; (d) act upon partial or incomplete information evolving over time; (e) work both independently and as a team in an effective manner; and (f) operate under stressful circumstances. Tenenbaum, Edmonds, and Eccles (2008) suggested that the mental techniques and strategies used to enhance athletic performance may also be useful for improving performance by soldiers, airmen, and marines, particularly in high-stress environments. Specifically, servicemembers participating in situations that mimic sport settings such as the APFT and Basic Rifle Marksmanship (BRM) might especially benefit from psychological skill training. Unfortunately, we are unaware of any attempt to empirically investigate these ideas. Therefore, a primary objective of this study was to make an initial attempt to address this gap in the military psychology literature. Based on the aforementioned literature we propose that soldiers' psychological skills ought to be related to physical performance.

MEASUREMENT OF PSYCHOLOGICAL SKILLS

Inquiry into the nature of how mental skills are related to psychological constructs and to performance depends on psychometrically sound measurement approaches. Within the sport realm, Durand-Bush et al. (2001) have attempted to meet this need by developing the OMSAT-3, a self-report instrument that categorizes 12 psychological skills into three broad theoretical components that include (a) foundation skills (e.g., goal-setting, self-confidence, commitment); (b) cognitive skills (e.g., imagery, mental practice, focusing, refocusing, planning); and (c), psychosomatic skills (e.g., stress reactions, fear control, relaxation, activation). This conceptual organization of psychological skills has been used extensively within the sport literature (e.g., for foundation skills, see Burton et al., 2001; Orlick, 1992; for psychosomatic skills, see Landers & Boutcher, 1998; Smith & Smoll, 1990; and for cognitive skills, see Boutcher, 1992; Orlick & Partington, 1988), but empirical support for it has been lacking. In fact, the original instrument development report by Durand-Bush and colleagues has not received much empirical support. Specifically, the authors deemed the OMSAT-3 measurement model as adequately fitting their data, despite reporting only marginal fit indices for both first and second order confirmatory factor analyses (i.e., $CFI = .87$, $GFI = .81$, $TLI = .88$ and $CFI = .87$, $GFI = .80$, $TLI = .87$ for the first- and second-order models, respectively). Furthermore, loadings of two of the first-order constructs (fear control and imagery) upon the proposed second-order components (psychosomatic and cognitive skills, respectively) were not statistically significant. Finally, the correlation between the psychosomatic and cognitive skills components was extremely high ($r = .90$), raising concerns regarding the distinctiveness of these two conceptual skill categories. We have attempted to validate the OMSAT-3 but have not been successful. A traditional confirmatory factor analysis (CFA) of the 12 purported subscales resulted in a nonpositive definite covariance matrix and thus an inadmissible CFA solution.¹

In summary, past research with high-performing athletes suggests that these athletes possess a unique set of psychological skills that may serve to enhance physical performance. Although the OMSAT-3 has been adopted in sport research and may be relevant for studies within military contexts, there is insufficient evidence supporting its use and there is no evidence about its potential use for research with military populations. This was of particular concern to us given the modifications to item wording and instructions that were necessary to make the OMSAT-3 relevant to our study participants. Therefore, another objective of this study was to examine the structural characteristics of an adapted version of the OMSAT-3. Specifically, we assess whether the underlying structure of the adapted OMSAT-3 is similar to that found in previous research by Durand-Bush

¹A detailed report examining the measurement properties of the OMSAT-RS is available from the first author upon request.

and colleagues (2001). Furthermore, we examine how psychological skills, as reported on the OMSAT-3, are related to soldiers' performance on the APFT. Specifically, we examine whether psychological profiles using the OMSAT-3 can be used to distinguish soldier performance on the APFT.

METHOD

Participants

A sample of 427 male soldiers from two United States Army Stryker Battalions volunteered to participate in the study. The majority ($n = 378$) of the participants were enlisted soldiers, and 47 were officers (rank was not identified on two surveys) with a mean age of 25.64 years ($SD = 5.28$). Seventy-eight percent of the participants were White/Caucasian, 7% African American, 9% Hispanic, and 2% Asian, with 4% either missing or other. The median time served in the Army was 4.00 years (range = 0 to 24 years) and median number of deployments was 1.00 (range = 0 to 11). Thirty-nine percent reported having never been married, 51% were currently married, and 10% were either divorced or separated.

Instruments

Demographic Assessment

A short demographic survey assessed age, rank, years served in the Army, number of deployments, and current APFT score.

Ottawa Mental Skills Assessment Tool-3 (OMSAT-3)

We used a version of OMSAT-3 (Durand-Bush et al., 2001) that was adapted for use with soldiers (e.g., substituting soldiers for athletes, missions for competition, etc.) to assess soldiers' psychological skills. The OMSAT measures a broad range of mental skills. Example items from each conceptual component include "I set daily goals to improve my job performance" for foundation skills, "I find it difficult to improve because of the fear involved in my job" for psychosomatic skills, and "I can consciously decrease the tension in my muscles" for cognitive skills. Items are presented in Likert format with a 7-point scale that ranges from *strongly agree* to *strongly disagree*. Internal consistency of subscale scores in the original instrument development report ranged from .68 to .88, and intraclass reliability scores ranged from .78 to .96 (Durand-Bush et al., 2001).

Army Physical Fitness Test (APFT)

We measure soldiers' physical performance via self-reported scores on the APFT. The APFT is designed to test the / and cardiovascular respiratory fitness in

three events: s, s, and a 2-mile run. Soldiers are scored based on the number of repetitions performed of the push-ups and sit-ups in two minutes as well as run time. Scores are stratified by age and gender, with scores ranging from 0 to 100 points in each event. The minimum passing score is 180 points, with a minimum score of 60 points in each event. Soldiers who achieve at least 90 points in each event for a total score of 270 are awarded the Physical Fitness Badge to recognize superior physical fitness. For example, 22- to 25-year-old males are required to perform at least 73 push-ups, 66 sit-ups, and completion of the 2-mile run in 13:54 to meet this standard.

Procedure

Participants were recruited from two separate battalions on two different days either immediately prior to or immediately following their regular training activities. Soldiers were given an informational briefing and informed of their rights as human subjects by an investigator in civilian attire to avoid perception of coercion or reward for participation in the study. Soldiers who agreed to participate in the anonymous survey gave implied consent and completed the survey in the battalion staging areas. All study procedures complied with ethical standards in the recruitment and treatment of participants and were subject to approval by the Institutional Review Board (IRB).

RESULTS

Prior to our main analyses, we screened the data for multivariate outliers. We examined multivariate outliers by calculating Mahalanobi's distances based on centroids of the 12 original OMSAT-3 Mental Skill subscale scores (Tabachnick & Fidell, 2007). We found that six cases exceeded the critical chi-square value of $\chi^2(12, N = 427) = 11.35, (p < .001)$. Follow-up analysis revealed that the pattern of multivariate responses was atypical of the data set. We therefore opted to remove these cases from subsequent analyses, yielding a sample size of 421.

Structure of the OMSAT-3 Revised for Soldiers (OMSAT-RS)

We employed exploratory factor analysis using both principle axis and maximum likelihood extraction methods, with an oblique rotation, to examine the underlying structure of responses to the OMSAT-3. Results of these analyses suggested a three-factor solution that was conceptually consistent but not identical to results from the original OMSAT-3 development study (Durand-Bush et al., 2001). Our analyses resulted in a simple structure consisting of three factors that resembled

the original overarching components suggested by Durand-Bush and colleagues (i.e., foundation skills, psychosomatic skills, and cognitive skills) but included only 21 of the original 48 items. The Foundation and Cognitive Skills subscales identified desirable psychological attributes (e.g., ability to set goals effectively, plan properly, etc.), and the Psychosomatic subscale identified undesirable attributes (e.g. fear of failure, inability to focus, etc.). Cronbach's (1951) alpha coefficients were .88 for the foundation skills scale; .84 for the psychosomatic skills scale; and .78 for the cognitive skills scale. We used composite scores based on these results in subsequent analyses (see Table 1) and refer to this scale as the Ottawa Mental Skills Assessment Tool—Revised for Soldiers (OMSAT-RS).

Psychological Skills Profiles of Soldiers

To investigate the prevalence of psychological skill profile groups among Stryker Brigade Soldiers, a nonhierarchical *k*-means cluster analysis was employed. We used *z*-score equivalents of the three OMSAT-RS psychological skill subscales to minimize the influence of extreme responses on the clustering solutions. The cluster analysis revealed three meaningful psychological skill profile groups, which we refer to as a weak skills group, a strong skills group, and a fearful/failure/focus group (see Figure 1). As can be seen in Figure 1, the weak skills group ($n = 127$) scored between one half and a full standard deviation below the mean on the Cognitive and Foundation Skills on the OMSAT-RS subscales but very close to the mean on the Psychosomatic subscale; the strong skills group ($n = 129$) scored .7 *SDs* above the mean on the Foundation and Cognitive Skills OMSAT-RS subscales and .7 *SDs* below the mean on the Psychosomatic subscale; and the fearful/failure/focus group ($n = 137$) scored slightly below the mean on the Foundation and Cognitive Skills subscales but scored well above the mean (.8 *SDs*) on the Psychosomatic subscale.

Psychological Skill Profiles and APFT Performance

We used analysis of variance (ANOVA) techniques to evaluate differences among psychological profile group and physical performance as measure on the APFT. Results indicated a significant group effect on APFT score, $F(2, 365) = 8.99$, ($p < .0001$). Tukey's HSD comparisons demonstrated that the strong skills group scored significantly higher on the APFT than either of the other two groups (see Table 1).

DISCUSSION

Our analyses involving the structural properties of the revised OMSAT-3 items provided partial support for the original three-component conceptualization

TABLE 1
Descriptive Statistics for OMSAT-RS and APFT Scores

Variables	Weak Skills (n = 127)		Strong Skills (n = 129)		Fear/Failure/ Focus (n = 137)		Significance Values		Group Differences
	M	SD	M	SD	M	SD	F	p	
OMSAT-RS									
Psychosomatic skills	3.03	0.91	2.18	0.67	4.10	0.79	195.46	<.01	1, 2, 3
Cognitive skills	3.15	1.11	5.64	0.96	4.35	0.91	196.38	<.01	1, 2, 3
Foundation skills	3.02	0.97	5.20	0.98	4.65	0.70	204.81	<.01	1, 2, 3
APFT scores	252.67	36.78	270.65	34.45	254.72	37.10	9.08	<.01	1, 3

Note. 1 = Group differences exist between group cluster 1 and cluster 2; 2 = group differences exist between group cluster 1 and cluster 3; 3 = group differences exist between group cluster 2 and cluster 3.

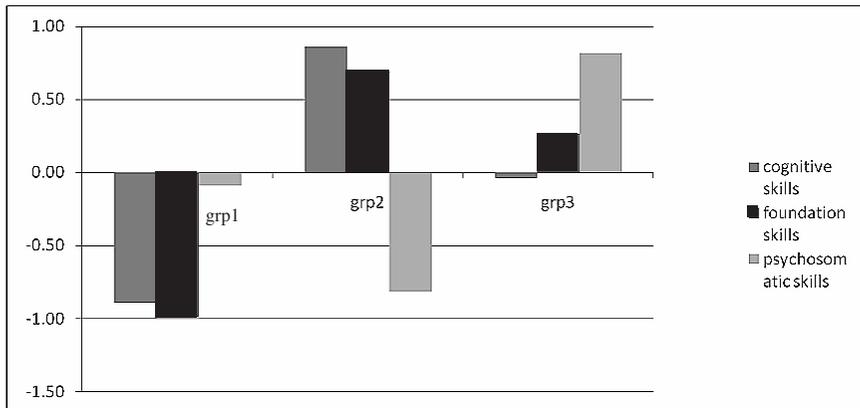


FIGURE 1 Standardized scores on OMSAT-3 variables for the three mental skills clusters. Note. Group 1 is the weak skills, group 2 is the strong skills, and group 3 is the fear/failure/focus.

suggested by Durand-Bush et al. (2001). However, these initial findings suggest that distinguishing more specific psychological skills is problematic, at least with this military sample. On a more positive note, it does appear that the overarching components suggested by Durand-Bush and colleagues might be reasonably assessed with an instrument considerably shorter than the 48-item OMSAT-3. Clearly, more research is needed that is aimed at determining how to improve assessment of psychological skills relevant to military-related performance.

Psychological Skills Profile Groups

Results of cluster analysis suggest that the psychological skills of Stryker Brigade soldiers may be roughly categorized into three psychological skills profile groups. The emergence of both the weak and strong skills clusters in our analysis was not surprising given the empirical evidence identifying these groups in the sport literature (e.g., Gould et al., 1992). However, emergence of the fearful/failure/focus cluster might provide insight into an identifiable group of soldiers with psychological characteristics that may be reliably related to performance on physical tasks. Soldiers in this cluster displayed foundational skills just below overall sample mean, cognitive skills just above the sample mean, but negative psychosomatic skills substantially higher than the overall sample mean (see Figure 1). Although the mechanisms driving this result cannot be determined by this study, one possible explanation might lie in the sport literature. Soldiers in this group appear similar to the failure-oriented athletes described by Burton and colleagues (2001). Failure-oriented athletes are outcome oriented, have a strong desire to please others, view their abilities as somewhat limited, are afraid of failing, disdain social comparisons, do not perform up to their potential, and are at risk of dropping out (Burton et al.). It seems conceivable that soldiers in the fear/failure/focus group may also struggle with these types of issues and could potentially affect personal and unit readiness. Though direct comparison of soldier traits with those of failure-oriented athletes is not possible, the potential similarity between failure-oriented athletes and the fear/failure/focus group in this sample is intriguing. Future research on psychological skill profile groups across the military may wish to further explore these characteristics more directly.

Psychological Skill Profile Group Differences on APFT

Soldiers in the strong skills group scored significantly better on the APFT than did their peers in the other profile groups. This finding reflects a recurring theme in the sport psychology literature whereby fundamental psychological differences exist between more and less successful performers and teams (Durand-Bush & Salmela, 2002; Gould et al., 1992, 2002; Greenleaf, Gould, & Dieffenbach, 2001; Hardy, Jones, & Gould, 1996; Jones, Hanton, & Connaughton, 2002, 2007; Orlick & Partington, 1988; Thomas et al., 1999). It makes sense that a soldier's ability to plan and prepare (e.g., foundation skill), control energy and emotion (e.g., cognitive skill), and effectively manage fear and focus (e.g., psychosomatic skill) are related APFT performance for several reasons. First, to score well on the APFT requires planning and preparation, both physically and mentally. This notion is captured in our foundation skills factor and is also well supported in the sport psychology literature (Burton et al., 2001; Orlick, 1992). Although some physically gifted soldiers may do well on the APFT by "winging it," this is likely not the most

useful approach for the masses and is a recipe for poor performance in high-pressure events by elite athletes (Gould et al., 1992, 2002; Greenleaf et al.).

Second, the ability to appropriately manage stress is also a potential contributor to APFT performance of our strong skills group. The maintenance of an optimally aroused physical and psychological state by achieving just enough activation to perform well, but not so much as to waste energy, is conducive to optimal physical performance (Boutcher, 1992; Gould & Udry, 1994; Orlick & Partington, 1988). Although the APFT does not induce strain on soldiers to the extent seen in combat environments, it is likely a stress-inducing event for many Army personnel because failure to achieve minimum standards can affect promotion, ability to reenlist, and potentially could result in discharge from service. The soldiers in the strong skills group likely had more resources available to effectively deal with their APFT-related stress through their strong foundational skills (e.g., their superior ability to prepare and plan), their cognitive skill proficiency (e.g., intentionally decreasing muscular tension), and their lack of inhibition by psychosomatic concerns (e.g., unnecessary body tightness).

Finally, the ability to maintain an appropriate focus is especially important for events like the APFT that require concentration on the task at hand to score well (Gould et al., 1992; Landers & Boutcher, 1998; Smith & Smoll, 1990). Attention to irrelevant cues can inhibit performance by either allowing for the intrusion of inappropriate outside distractions (e.g., other soldiers, weather conditions, etc.) or internal distractions (e.g., attending to past or future events). Additionally, irrelevant internal emotional distractions, such as a focus on the pressure of performing well, can lead to a disastrous performance climate known in the sport psychology literature as *choking* (R. Weinberg & Gould, 2007). This process seems especially pertinent to soldiers in the fear/failure/focus group as the negative aspects of making mistakes may be particularly salient for them.

The differences seen between the cluster groups on the APFT seems especially congruent with Orlick and Partington's (1988) study with Canadian Olympians that linked psychological success elements with athletic performance. Though Orlick and Partington did not utilize a cluster technique, they did categorize Olympians into those who performed to potential (e.g., had earned Olympic or World Championship medals) and those who did not. Olympic athletes who did not perform to their potential cited poor management of distractions and unforeseen events at the Olympic competitions as key contributors to poor performance. This negative result appears quite similar to our finding regarding the importance of focus. Inversely, Olympic athletes who did perform to their potential were able to overcome adversity and distraction because they were better mentally prepared for their competitions compared to their less successful peers. This finding appears similar to our result showing the importance of foundation skills, especially with regard to the importance of preparation and planning, which was evident in our high-skills group.

Though our sample did not include Olympic athletes, the mean score of the skilled group on APFT performance (271) suggests that these soldiers are in superb physical condition and are good athletes in their own right. Furthermore, it is important to note that APFT scores of over 270 qualifies a soldier for the Army's Physical Fitness Badge.

Limitations and Implications for Future Research

The primary limitation of this study was its cross-sectional design, which restricts our ability to make cause-effect inferences. Future research involving experimental designs aimed at investigating causal relationships between psychological skills and soldier performance measures are in order. Longitudinal studies that track the temporal growth and development of both psychological skills and performance will also aid in improving understanding of these relationships. Also, this study collected data at two separate time points for each respective battalion—one battalion in the morning and one in the afternoon—and it is possible that these temporal differences in our data collection may have had some influence on our findings. Finally, this study utilized a sample of male Stryker Battalion soldiers and therefore may not be generalizable to other U.S. Army populations. The role of psychological skills across different groups of service members (i.e., Special Operations and support personnel) as well as across different demographic groups will provide useful information to target psychological skills training.

This study has numerous practical implications for Army trainers, administrators, and soldiers. First, the identification of the fear/failure/focus cluster signifies the potential necessity for targeted educationally based interventions to address areas for improvement, including relaxation skills, self-confidence techniques, and concentration strategies. Secondly, the weak skills cluster is likely representative of a large population across the force that may benefit from applied sport psychology skills. This study identified low scores on preparation/planning, managing energy, as well as fear control and focus skills, but it is possible that other psychological skills deficits exist within this cohort. Though this group would likely benefit from educational sessions provided by organizations such as the Army Center for Enhanced Performance (ACEP), it may also benefit from more intense psychological screening. Finally, the results of this study are congruent with a wealth of research findings in the sport psychology literature (e.g., Gould et al., 1992, 2002; Greenleaf et al., 2001) showing that superior performers possess a uniquely different set of psychological characteristics than their lower performing peers. This degree of congruence suggests the development of military-specific techniques aimed at enhancing psychological skills across the force may be warranted.

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