Personality traits that correlate with success in distance running

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Introduction

Anxiety, motivation, group dynamics, audience effects, confidence, concentration, and personality are all psychological factors that can affect the performer. In addition, participation in physical activity can potentially affect the performer in terms of anxiety or depression reduction, aggressive behavior, the enhancement of well-being, and personality development.[1]

Personality consists of an individual's characteristic pattern of behavior that contributes to his or her uniqueness.[2] The study of personality traits, or the relatively enduring characteristics possessed by individuals, has been an extremely popular area of inquiry in sports psychology.[1] Two areas in particular have been explored. Do athletes in a particular sport possess similar personality characteristics that are different from non-athletes or a comparable group of the general population? Do the elite athletes differ from less capable athletes within the same sport? Or in other words, does the personality structure within a sport differ as a function of the ability level?

One sport that has been investigated has been long distance running. Intuitively, one would expect personality factors to play a role in this demanding sport.[3] The rigorous training, willingness to endure physical and mental discomfort for prolonged periods of time especially during racing, the individualistic nature of the activity, and the long-term adherence or continuation within the sport that is necessary to maximize personal abilities all would seem to demand specific types of personality traits.

In explaining human running performance differences, most studies have tended to concentrate on measured physiological differences.[4-6] Relatively few have compared the relationship of success in distance running with personality factors, or, in addition, how the general personality profiles of runners compare to more sedentary individuals.[3 7-14]

Drawing conclusions from a review of the literature is difficult because of the wide variety of personality inventories and research methodologies used. Research to discover characteristic personality profiles of distance runners has therefore resulted in contradictory and inconclusive data.

One of the problems that researchers have faced in trying to relate excellence of performance to some identifiable personality structure has been the failure to set clear criteria for the identification of level of ability.[15] In addition, research has often been conducted within a group of runners who were of fairly homogeneous capacity.

TABLE 1.—*Classification of runners into eight groups using Gardner and Purdy's computerized tables.*[16]

Group and name	Computerized score	Representative times			Number in sample
		Mile	10 km	Marathon	
Class athletes fitness runners					
1. World class	1050 —	3:48 —	27:36 —	2:08:30 —	26
2. National class	950 —	4:01 —	29:15 —	2:16:22 —	34
3. College/local class	850 —	4:16 —	31:06 —	2:25:16 —	29
4. High fitness	750 —	4:32 —	33:12 —	2:35:25 —	29
5. Medium-high fitness	650 —	4:51 —	35:37 —	2:47:05 —	24
6. Medium fitness	550 —	5:12 —	38:24 —	3:00:39 —	29
7. Medium-low fitness	450 —	5:37 —	41:40 —	3:16:36 —	30
8. Low fitness	350 — 250	6:06 — 6:40	45:32 — 50:12	3:35:39 — 3:58:48	30

Note: Runner's were grouped according to an average of their five best-ever running performances.

In the present study, careful criteria were used in determining running ability within a large group of runners who varied widely in performance ability. The purpose of the study was to see if the personality traits of faster runners differed from slower runners. In addition, the entire sample was compared to standard personality trait norms to see if runners in general differed from individuals of the general population.

METHODS

Subjects

A total of 231 male distance runners participated in the study. A distance runner was defined for this study as an individual who competes in races ranging from 800 meters to the marathon (42.2 kilometers). Age restrictions were imposed to exclude subjects who had not yet reached physical maturity, those 18 and younger, and to exclude men who may have begun to decline physiologically, those 40 and older.

Gardner and Purdy's [16] computerized running performance tables were used to establish eight separate groups. These tables employ a progressive rating scale from a value of zero for low-level performance up to 1000 points based on world class performances. The 250 point level was chosen for subject recruitment as the lowest level of performance. Table 1 summarizes the classifications used, and the performance criteria used for each group. The five best-ever performances at any running distance between 800 meters and 42.2 kilometers based on the computerized running performance tables were averaged in determining which group each individual was designated to. The term "athlete" applies to runners in groups 1, 2, and 3. The term "fitness runner" applies to any of the runners in groups four through eight.

Approximately 30 subjects were recruited for each performance group. The majority of the runners in the 250-850 point range were recruited at two different road races in Southern California, the Fullerton

TABLE 2.—*Subject information, means and standard deviations.*

Factor	All N=231	Group 1 N=26	Group 2 N=34	Group 3 N=29	Group 4 N=29	Group 5 N=24	Group 6 N=29	Group 7 N=30	Group 8 N=30
MI/WK	55.1 (29.6)	88.1 (18.5)	83.4 (23.3)	65.6 (23.6)	60.1 (21.4)	51.8 (21.2)	40.6 (16.8)	29.0 (13.4)	22.0 (11.6)
WT/HT	2.12 (.21)	2.03 (.13)	1.96 (.14)	2.03 (.16)	2.08 (.15)	2.12 (.17)	2.15 (.15)	2.29 (.19)	2.34 (.21)
Age	28.6 (7.4)	24.5 (2.4)	23.6 (3.1)	22.9 (4.2)	27.6 (6.8)	30.6 (6.7)	31.1 (6.2)	33.8 (9.3)	35.1 (6.1)

Note: MI/WK=subject reported, miles of running in training per week. WT/HT=weigh in pounds divided by height in inches.

YMCA 10 km run, and the Cal State Northridge 10 km run. Most of the national and world class runners were recruited by phone, using techniques similar to those used in recruiting runners at the road races.

Subjects who agreed to participate were given the Cattell Sixteen Personality Factors Questionnaire (16PF),[17] and were also asked to report best-ever performances, age, weight, height, and weekly running mileage. Reported performance times were compared with actual printed race results when possible. Of all the runners who agreed to participate, close to 55% actually returned data. The world class group ended up being represented by six Olympians, 2 world record holders (6 world records total), 5 national record holders, and 11 national championship winners. Table 2 summarizes the subject information.

The 16PF, a 187 item questionnaire, takes about 30 to 40 minutes to complete, and is designed to measure 16 different general personality traits. The 16PF has been used more frequently in sports research than other tests as a measure of personality traits, and reviews of the 16PF show it to be a valid and reliable measure for scientific research.[18] The 16PF has been validated among all adult age groups and educational levels, and reliability checks vary from .61 to .91 in most studies. Table 3 summarizes the 16 primary personality factors along with a brief description of the low and high end of each scale. The 16PF is based upon STEN scores, that is, each factor has a mean of 5.5 and a standard deviation of 2.0.

Statistical analysis

Success was defined as the mean of the computerized scores for each runner's five best-ever running performances (dependent variable). The 16 personality variables (independent variables) were based upon STEN scores.

A series of t-tests were computed to analyze the differences between the 231 runners of this study and the standard 16PF norms for 30 year old males (N=2255). T-tests were used in 4 additional comparisons within the group of runners. World class (N=26) runners were compared with the rest of the runners in the sample (N=205); world class (N=26) runners were compared with the national class runners(N=34); world class (N=26) runners were compared with the 2 slower athletic groups, groups 2 and 3 combined (N=63); and the athletic runners, groups 1, 2, and 3 combined (N=89) were compared with the fitness runners, groups 4 through eight combined(N=142).

To measure comparisons between the eight groups of runners, a oneway analysis of variance (ANOVA) was conducted to see if there were any significant differences

TABLE 3.—*Listing of Cattell's sixteen personality factors.*

Factor	Low score description	High score description
A	*Reserved*: detached, self-involved	*Outgoing*: Interactive, participating
B	*Less intelligent*: concrete-thinking	*More intelligent*: abstract thinking
C	*Emotionally unstable*: easily upset	*Emotionally stable*: mature, calm
E	*Submissive*: humble, accommodating	*Dominant*: assertive, aggressive
F	*Serious*: sober, prudent, taciturn	*Happy-go-lucky*: impulsively lively
G	*Expedient*: feels few obligations	*Conscientious*: persevering, moralistic
H	*Socially reserved*: reticent, shy	*Socially venturesome*: socially bold
I	*Tough-minded*: realistic	*Sensitive*: tender-minded
L	*Trusting*: accepting, adaptable	*Suspicious*: hard to fool, opinionated
M	*Practical*: down-to-earth	*Imaginative*: absent-minded, Bohemian
N	*Forthright*: simple, unpretentious	*Shrewd*: astute, calculating
O	*Self-assured*: confident, secure	*Apprehensive*: anxious, insecure
Q1	*Conservative*: respecting traditional values	*Experimenting*: liberal, critical, free-thinking
Q2	*Group dependent*: joiner, follower, participator	*Self-sufficient*: resourceful, prefers own decisions
Q3	*Unconventional*: casual, careless of social rules	*Controlled*: socially precise, disciplined
Q4	*Relaxed*: composed, unfrustrated, tranquil	*Tense*: frustrated, driven, overwrought

Note: STEN scores are used for each factor. The mean equals 5.5, the standard deviation equals 2.0.

on any of the 16PF or 3 personal data (age, running mileage, and weight-height ratio). The ratio of weight to height was determined by dividing the weight in pounds by height in inches.

Using success as the dependent variable for all of the 231 runners, and the 16 personality factors as the independent variables, a multiple regression analysis was performed.

RESULTS

Figure 1 shows that the runners as a group were significantly different from 16PF norms on 9 of 16 measures. Runners were found to be more reserved, intelligent, dominant, socially reserved, suspicious, shrewd, experimenting, self-sufficient, and unconventional than the 30 year old men (N=2255) in the 16PF norms.

The world class runners (N=26) in comparison with the rest of the runners (N=205) ran more miles per week (88 vs 51), had a lower ratio of weight to height (2.03 to 2.134), and were younger (24.5 to 29.0) ($p<.001$). Figure 2 shows that world class athletes scored significantly higher on factor F, happy-go-lucky ($p<.002$).

The comparison of world class runners (N=26) with national class runners (N=34) showed no significant differences, but did reveal several trends, with world class runners tending to be more happy-go-lucky ($p<.12$), more expedient (or less conscientious) ($p<.09$), more sensitive ($p<.13$), and less self sufficient (or more group dependent) ($p<.07$).

Groups 1, 2, and three, the athletes, showed significant differences with groups four through eight, the fitness runners, in weekly running mileage (79 vs 40), the ratio of weight to height (2.00 vs 2.20), and age (23.5 vs 31.5) ($p<.001$). Of the personality factors, only factor C, emotional stability, showed a significant difference ($p<.05$), the athletes being more emotionally stable than the fitness runners (Fig. 3).

The 1 way analysis of variance on all 19 variables showed significant differences between the eight groups on weekly mileage, the ratio of weight to height, and

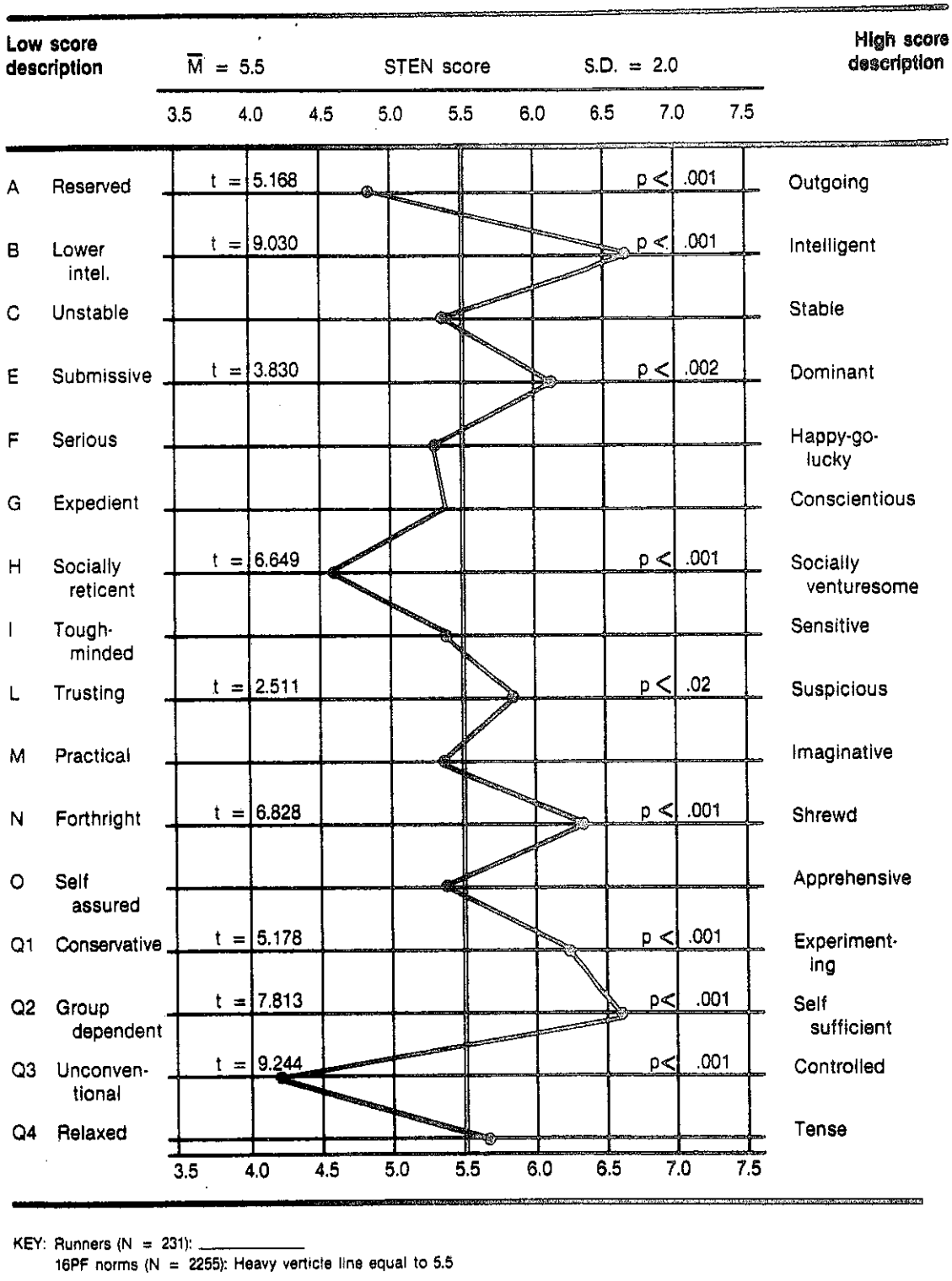

Fig. 1.—Comparison of means: Runners vs. 16PF norms for 30 year old males.

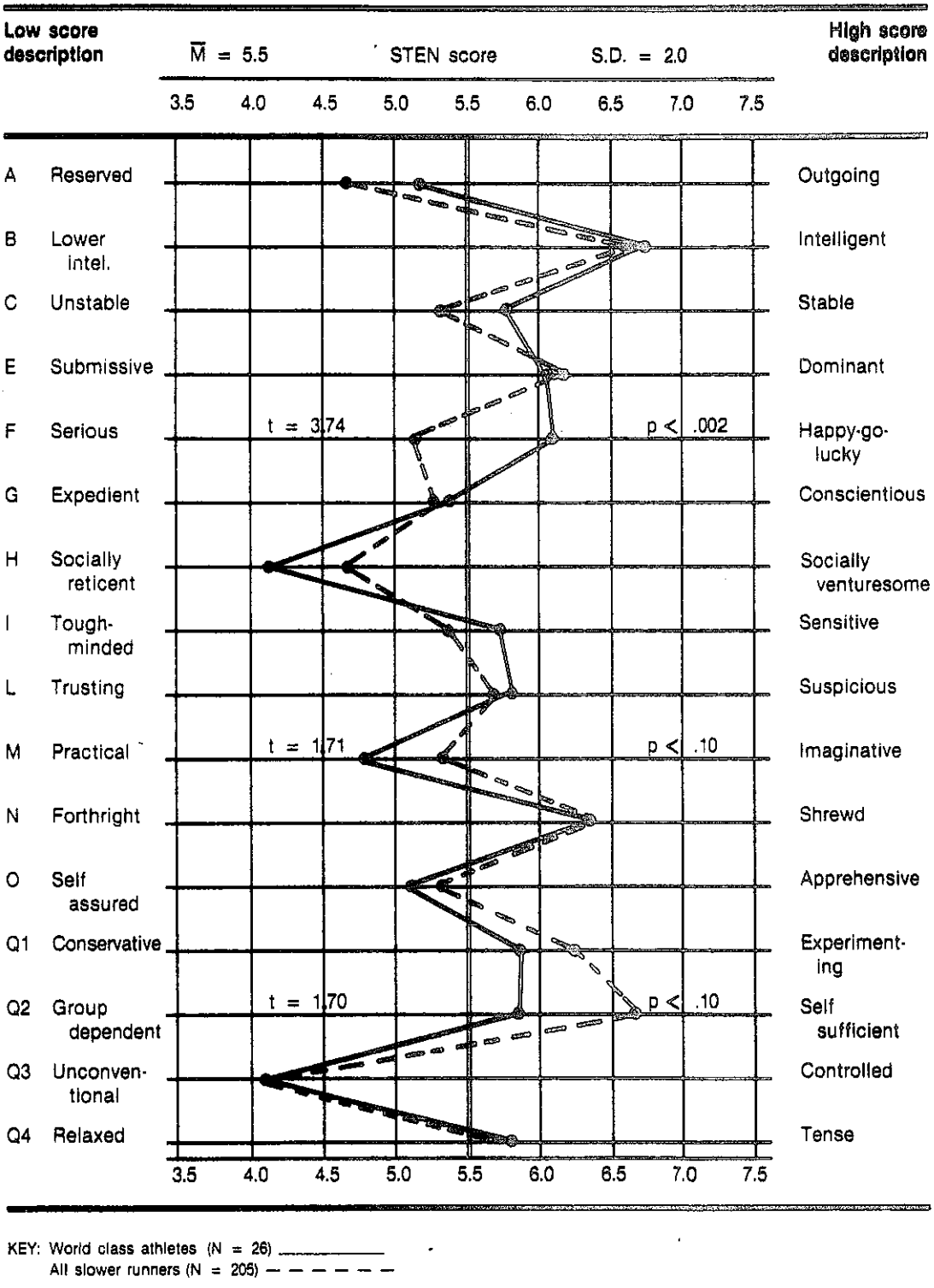

Fig. 2.—Comparison of means: World class vs. all slower runners.

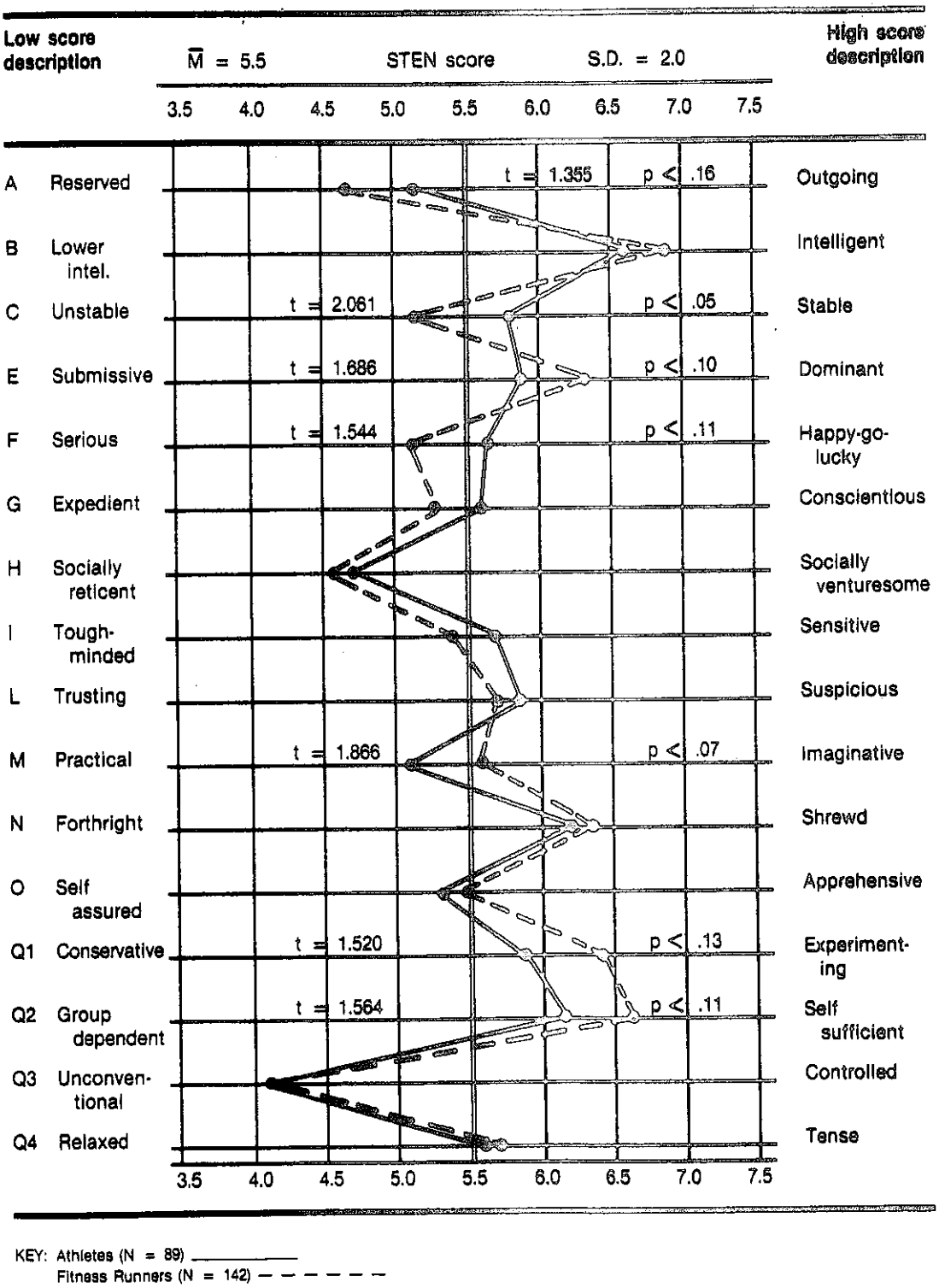

Fig. 3.—Comparison of means: Athletes vs. fitness runners.

TABLE 4.—*Significant results of various statistical measures comparing faster runners with slower runners.*

Test	Means 8 groups ANOVA	Group 1 vs groups 2-3 t-tests	Group 1 vs groups 2-8 t-tests	Groups 1-3 vs groups 4-8 t-tests	Multiple regression	Direction of findings for faster runner
Factor						
MI/WK	$p<.001$	$p<.05$	$p<.001$	$p<.001$		Run more miles
WT/HT	$p<.001$		$p<.001$	$p<.001$		Smaller WT/HT
Age	$p<.001$		$p<.001$	$p<.001$		Are younger
C				$p<.05$		More stable
E					$p<.02$	Less dominant
F			$p<.01$		$p<.01$	Happy-go-lucky
G	$p<.05$					conscientious
H					$p<.01$	Socially reserved
I					$p<.05$	More sentitive

Note: MI/WK=miles run per week in training. WT/HT=see Table 2.

age ($p<.001$). Only 1 personality factor significantly predicted success between groups, this being conscientiousness ($F=2.03$; $p<.05$).

The multiple regression analysis on success and the sixteen personality factors resulted in a multiple R of .368 with an R2 equal to .135. F values for 4 of the personality factors were significant: dominance, factor E, $F(1,230)=6.017$, $p<.015$; happy-go-lucky, factor F, $F(2,229)=6.667$, $p<.010$; social venturesomeness, factor H, $F(3,228)=9.332$, $p<.003$; and sensitivity, factor I, $F(5,226)=4.743$, $p<.031$. On these four factors, faster runners were found to be less dominant (more submissive), more happy-go-lucky, more socially reserved, and more sensitive than slower runners. Table 4 summarizes the findings of the multiple regression analysis, ANOVA, and t-tests.

DISCUSSION

The present investigation was designed to answer two basic questions: are male distance runners different in personality than males from the general population? Are faster runners different in personality than slower runners?

The results indicate that the runners as a group are significantly different from 30 year old males of the general population on 9 of 16 personality factors. This sample of 231 runners was more reserved (detached, self involved), intelligent (abstract thinkers), dominant (assertive, aggressive), socially reserved (reticent, threat sensitive), suspicious (hard to fool, opinionated), shrewd (astute, sophisticated, calculating), experimenting (liberal, critical, free-thinking), self sufficient (resourceful), and unconventional (casual, careless of social rules) than other 30 years old males ($N=2255$) tested with the 16PF.

Table 5 summarizes how these results compare with the other studies that have contrasted male long distance runners with non-runners using the 16PF.[10 11 13 14] The three most consistent findings are that runners tend to be more reserved, intelligent, and self-sufficient as compared to the general population. However, the large number of runners in the present study would also suggest that some of the other factors, especially H (socially reticent) and Q1 (experimenting), are important. The present study differed from the others in factor N (shrewd) and Q3 (unconventional).

TABLE 5.—*Summary of studies comparing runners with individuals from the general population using the 16PF.*

Study	Renfrow [13]	Hartung [14]	Burdick [10]	Hrapmann [11]	Nieman/George
16PF factor					
A	Low	Low		Low	Low
B		High	High	High	High
C					
E				High	High
F		Low			
G	Low				
H		Low			Low
I					High
L	High				
M		High	High		
N	Low	Low	Low		High
O					
Q1	High				High
Q2	High	High		High	High
Q3					Low
Q4					

Note: Low/High=significantly low/high STEN score in comparison with 16PF norms in studies by Hartung, Burdick, and Nieman/George, and control group in study by Renfrow.

Morgan [9] reports that the extensive body of literature in the field of sports psychology suggests that athletes in individual sports (running) are more introverted than team sport athletes. In the 16PF, introversion is equated with a combination of factors including A (reserved), E (submissive), F (serious), H (socially reserved), and Q2 (self sufficient). Three of the five factors were strongly characteristic of the present sample of 231 runners, with one factor (F, serious), weakly associated, and factor E (dominance) being in the opposite direction. Our results agree with those of Gontang [19] who found twice as many introverts as extroverts in a group of 50 sub-3 hour marathoners (averaging 76 miles per week in training). In a study by Morgan,[3] 9 marathoners were also characterized by introversion. However, in a later study with world class marathoners, Morgan reported that they were not more introverted than the general population.[9]

Regular running is a highly individualistic activity. The results from this study suggest that individuals who run and race regularly do tend towards introversion, but are also very intellectual, shrewd, suspicious, and experimenting. Curiously, however, these runners were also strongly unconventional (Q3) instead of self-controlled and disciplined as one might expect. Additional research is needed to corroborate this interesting finding.

Whether these characteristic personality traits are due to self-selection or the effects of years of regular running still needs to be demonstrated with longitudinal research.[9] Some researchers suggest that personality traits are stable over time despite the increase of cardiorespiratory endurance.[20-22] Others, however, such as Sharp,[23] Ismail,[24] Young,[25] and Buccola [26] purport that although such trait variables as introversion and extraversion cannot be modified by an increase in physical activity and fitness, some traits such as self-concept, imaginativeness, emotional stability, conscientiousness, and self sufficiency are amendable to the influences of vigorous and regular aerobic exercise.[1 27 28]

Although the literature is mixed on the effects of regular aerobic exercise on personality traits, there is, however, growing

evidence that physical activity does help alleviate some symptoms associated with various psychological states such as mild to moderate depression, somatic tension and subjective anxiety, aspects of coronary-prone (Type A) behavior, and physiological response to stressors.[29,30]

People who take up running have been found to be different from the general population in other areas besides personality traits. Of the 20% of the population who are physically active,[31] surveys indicate that such persons tend to be upper socio-economic status. One survey by Mediamark Research with Runner's World magazine[32] determined that of the 166 million adults in America, 12 million run at least once per month, with 4,365,000 running at least once per week. These runners were found to be upscale in virtually every way, including education, income, career, and purchasing power. The more serious the runner, the higher the association. This seems to suggest that self-selection does play a role in explaining the personality traits of the long distance runner. One would suspect that the high scores on factor B (intelligence) that were found so consistently in the studies examined in this article are related to the high SES of the American runner.

Faster vs slower runners

The faster runners in this sample in comparison to the slower runners were more submissive (humble, accommodating, mild), happy-go-lucky (spontaneous, impulsively lively), socially reserved (reticent, threat sensitive), and sensitive tender-minded). In comparing the eight groups of runners, the faster runners were also more conscientious (persevering, moralistic). The top three groups (athletes) were more emotionally stable (mature, calm) than the other runners. The world class athletes were more happy-go-lucky than the rest of the runners.

These results show that the faster runners tend more towards introversion than the entire sample of runners taken as a whole, this being characterized by the reversal of factor E (dominance-submissiveness). The results on factor F (happy-go-lucky) agree with the research of Kane[33] who found that most championship athletes, no matter what the sport, tended to rate high in factor F. Top runners, especially world class runners, may possess this personality trait to help counterbalance the reserved and sober nature of the other traits that appear to be necessary for high-level performance in running.

One of the most interesting comparisons in the present study was between the world class (N=26) and national class runners (N=34). Although differences were not statistically significant, the trend of the data suggests that the national class runners were more serious, conscientious, tough minded, and self-sufficient than the world class runners. This appears typical of the "number-two-tries-harder" syndrome. Perhaps some athletes in the national class group frustrate their climb to world class status by such determined effort. On the other hand, these traits may reflect the futile attempt to maximize genetic cabilities that are below those needed for world class level competition. As many elite athletes realize, greater effort is not necessarily equated with greater success. These ideas are supported by the research of Gutmann[34] who reported that speed skaters selected for the 1980 US Olympic Speed Skating Team responded to training with decreased depression and increased vigor, reaching a psychological peak just before the trails. Those not selected never recovered pretraining levels of vigor, reacting negatively to the physical and psychological demands of severe training.

The unique nature of the present study makes comparison with other studies difficult. Morgan[9] conducted a battery of

psychological inventories on world class marathoners (N=8), world class middle distance runners (N=11), and top college runners (N=8). No differences were found between groups. Valliant[7] compared 30 marathoners (averaging just 19 miles per week in training) with 38 joggers. The two groups were found to be significantly different in 9 of 16 personality factors (16PF). Marathoners tended to exhibit a more reserved, intelligent, tender-minded, imaginative, and self-sufficient personality as compared to the joggers who were less assertive, more conscientious and controlled. These results are not similar to the results reported here.

According to Dowd,[15] studies using the Minnesota Multiphasic Personality Inventory (MMPI) and the 16PF have suggested that high level competitors in most sports are more conscientious, self-controlled, intelligent, extraverted,[35] and relaxed than average level competitors. However, there has been a failure to replicate these findings consistently,[15] leading some reviewers to conclude that there is no relationship.[36] The present findings would suggest that high level competitors in long distance running to indeed have unique personality traits. However, the pattern of these traits are not in total agreement with those described by Dowd. Although faster runners in this study do appear to be conscientious, they are not more self-controlled, intelligent, relaxed, or extraverted than slower runners. Comparing high level runners with top competitors from other sports (especially team) is probably not possible because of the unique nature of long distance running.

Conclusion

In conclusion, this study identified several personality traits that are characteristic of a wide spectrum of runners (in comparison to the general population). The entire sample of 231 runners tended towards introversion, and were intelligent, shrewd, suspicious, and experimenting. On the other hand, they were also dominant and unconventional. The faster runners (including national and world class runners) also possessed unique personality traits. While introversion, conscientiousness, and emotional stability were characteristic, the faster runners, especially the world class runners, were also strongly happy-go-lucky.

Those who by high goals, strong drive and ability, and enthusiasm have risen to the top of their sport in long distance running may possess common personality traits. Whether such commonality is due to a change in individuals as they respond and adapt to the demands of achievement, or to a filtering out of persons who do not originally possess the desired traits remains to be explored.[9,15]

Summary

Relatively few studies have investigated the relationship of success in distance running with personality traits. A sample of 231 adult, male distance runners, mean age 28.6 (SD±7.4), ranging in ability from world class athletes to slow fitness runners, took the Cattell Sixteen Personality Factors Questionnaire (16PF), and answered additional questions about their running mileage, height, weight, age, and best-ever running performances. When compared to standard 16PF norms for 30 year old males, this sample of runners was significantly more reserved, intelligent, dominant, socially reserved, suspicious, shrewd, experimenting, self sufficient, and unconventional ($p<.05$). The world class athletes were more happy-go-lucky than the rest of the runners ($p<.01$). The top 89 athletes were more emotionally stable than the 142 slower runners ($p<.05$). A multiple regression analysis on the entire sample of runners showed that the faster runners were more submissive, happy-go-lucky, socially reserved, and sensitive than the slower runners ($p<.05$). These results suggest that success in distance running is associated with several personality factors.

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