

ORIGINAL PAPERS

COMPARING PERSONALITY TRAITS OF NAVY DIVERS, NAVY NON-DIVERS AND CIVILIAN SPORT DIVERS

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Key Words

Health, occupational diving, recreational diving, personality

Abstract

This study compared 28 South African Navy divers, 28 South African Navy non-divers and 28 civilian sport divers, using the 16 Personality Factor Questionnaire. Four traits appeared to be prominent descriptors of the SAN divers, namely enthusiasm, adventurousness, confidence and group orientation. The navy divers differed from the navy non-divers with higher scores for ego strength, and were more adventurous and tough minded. In comparison to the civilian sport divers, they were less assertive, had higher superego scores, were more practical, shrewd, group orientated and had a higher self-sentiment. Possible implications of the findings are discussed.

Introduction

Research on the personality of military divers have described them in terms of biographical variables,¹ psychiatric "disturbances",² psychopathology,^{3,4} anxiety,⁵⁻⁷ aggression,⁶ personality traits,^{5,8} locus of control,⁵ personality styles,⁹ and neuropsychological profiles.^{10,11}

These findings suggest that navy divers exhibit more psychiatric disturbances than other sailors,² although different studies have found different results using the MMPI with navy divers.^{3,4} Both navy and recreational divers are less anxious,⁵⁻⁷ more aggressive in social situations,^{3,6} and tend to seek adventure and thrills.^{5,12} Navy divers show a more internal locus of control,⁵ and have lower scores on measures of social contact.⁵ Some neuropsychological impairment has been found in abalone divers.^{10,11} On the Millon Index of Personality Styles, 5 styles appeared descriptive of divers, namely Enhancing, Modifying, Individuating, Thinking and Controlling.⁹ Personality traits associated with divers on the 16 Personality Factor Questionnaire (16PF) were Group dependency, Enthusiasm, Adventurousness, and Confidence.¹³

Much of the published research has been done on US Navy Divers, and only one study reported on divers in the South African Navy (SAN).¹³ This study found SA navy divers to be more social and group orientated, when

compared with studies from other navies. The South African study raised a number of questions. Firstly, to what extent are their different social orientation due to sampling; secondly, as the SAN divers shared many factors on the 16PF with SAN submariners, to what extent do they actually differ from other navy personnel; and thirdly, since the literature suggests that naval and recreational divers share a number of traits (lower anxiety, higher aggression, adventure seeking), to what extent can the description of navy divers can be generalised to other divers.

The study reported here is a follow up of the study on SAN divers. It aimed to answer these three questions:

- a will the same results be found in a different group of SAN divers,
- b do navy divers differ from general navy sailors, and
- c can personality traits of navy divers be typical of those of civilian recreational divers?

Methodology

TEST USED

16 Personality Factor Questionnaire (16PF) was administered to all participants.¹⁴ The 16PF was developed by Cattell and is a measurement of personality described by 15 personality factors and one mental ability factor. Each factor on this self-report instrument is scored on a bipolar scale, indicating a personality trait. Factor A is reserved vs warm hearted. Factor B is low intelligence vs high intelligence. Factor C is high ego strength vs low ego strength. Factor E is submissiveness vs dominance. Factor F is sombre vs enthusiastic. Factor G is low superego vs high superego. Factor H is timid vs adventurous. Factor I is tough-minded vs tender-minded. Factor L is trusting vs suspicious. Factor M is practical vs imaginative. Factor N is artlessness vs shrewdness. Factor O is untroubled adequacy vs guilt proneness. Factor Q1 is conservatism vs radicalism. Factor Q2 is group orientation vs self-sufficiency. Factor Q3 is low self-sentiment vs high self-sentiment, and factor Q4 is low ergic tension vs high ergic tension (referring to irrational worry and anxiety). The South African edition of the 16PF that was used is standardised for non-clinical populations and has previously been used in the South African context for a wide range of personnel selection applications and vocational guidance. At present it is mostly used for research purposes.

PARTICIPANTS

The participants were recruited through visits to the various units at the naval base and through visits to two

sport diving clubs. Each time a short briefing about the research was given, after which the sailors and sport divers were invited to participate. Participation was voluntary, and participants received no financial benefit. Naval personnel were given time off their work to complete the questionnaire and the sport divers completed theirs during a club evening. In all cases the testing was administered in groups (ranging from 9 to 30 in size), with participants sitting at separate desks in a quiet room. Twenty-eight non-navy diver-profiles were collected at the dive clubs. Thirty navy non-diving profiles were collected, but two had missing data and were discarded. This represented 84% of the group invited. The profiles of the first 28 navy divers who volunteered to do the test, 52% of those invited, were collected.

Navy diver group

Twenty-eight SA Navy divers on active duty participated in the study. All were qualified as clearance divers, and each diver had 12 years of formal schooling. They were all medically and psychologically fit for military diving. The mean age for the 27 men and one woman was 25.57 years (see table 1). On average they had been involved with military diving for 4.5 years.

Navy non-diver group

Twenty-eight sailors comprising of shore-based protection service personnel and ship-based technical personnel acted as a comparison group. The 23 men and 5 women were all attached to the same naval base as the divers. None of them had any diving background. Their mean age was 26.39 years, and each sailor had 12 years of formal schooling. There was no significant difference in the time spent in the navy when compared with the divers.

Civilian recreational diver group

Twenty-eight civilian sport divers from 2 local diving clubs formed the non-navy recreational diver comparison group. The 4 women and 24 men had a mean age of 24.14 years, and had been, on average, involved with sport diving for 3.6 years. Their qualifications ranged from Open Water I to Divemaster and none of the sport divers had any military background. They had on average 4 years of tertiary education.

A certain amount of (self) selection took place involving individuals in the 3 groups studied. Navy divers are selected before training and can be expected to already constitute a defined group. As selection forms an integral part of SA Navy diving, it needs to be factored in when comparing to other groups. Recreational diving is an equipment dependant sport and usually only individuals from economically better off communities participate in scuba diving.

The navy divers had a mean age of 25.57 years. There was no significantly age difference between them and the non-diver group (mean = 26.39), nor with the recreational divers (mean = 24.14). The navy divers and non-divers had

the same years of service in the navy, and the navy divers had been involved in diving for slightly longer than the civilian sport divers (navy divers = 4.5 years, sport divers = 3.6 years). The navy divers included one woman (3.6%), the non-diver naval group had 5 women (17.9%) and the civilian divers 4 women (14.3%).

STATISTICAL ANALYSIS

The scores were analysed using *STATISTICA '95*. The descriptive statistics for age are shown in table 1 and naval divers' 16PF profiles are shown in table 2. The navy diver group is compared with the navy non-diver group in table 2 using t-tests for independent groups. T-tests for independent groups were also used to compare the navy divers with the recreational divers.

TABLE 1

DESCRIPTIVE STATISTICS FOR AGE

Group	Mean	SD	Min	Max	No
Navy divers	25.57	2.95	20	36	28
General navy	26.39	3.14	20	33	28
Sport divers	24.14	2.90	20	28	28

Results

Table 2 presents the means and standard deviations for the 15 personality factors. The 16PF pattern for the navy diver group is one of enthusiasm (F⁺), adventurousness (H⁺), confidence (O⁻) and group orientation (Q₂⁻).

Table 3 presents the comparative scores between the navy diver and navy non-diver groups. The navy diver group had higher ego-strength (C⁺), were more enthusiastic (F⁺) and tough minded (I⁻) than their non-diving comrades.

The comparative scores for the navy diver and civilian diver groups are presented in table 4. The navy divers showed less dominance and assertiveness (E⁻), had a higher superego (G⁺), were more practical (M⁻), more shrewd (N⁺), more group orientated (Q₂⁻), and had a higher self-sentiment (Q₃⁺).

Discussion

The 4 prominent traits of the navy divers replicate what has been found before with SAN divers, even though the present sample size was small. A discussion of the traits and their implications can be found in Van Wijk and Waters.¹³ It is possible that the difference found between SA and US navy divers on sociability may indicate a social

TABLE 2**MEANS AND STANDARD DEVIATIONS FOR 16PF FACTORS**

Factor	Navy diver group		Mean of norm group
	Mean	Standard deviation	
A	5.29	1.86	5.5
C	6.75	1.51	5.5
E	6.21	1.79	5.5
F*	7.32	2.13	5.5
G	6.21	1.64	5.5
H*	7.07	1.12	5.5
I	4.75	2.17	5.5
L	4.21	1.93	5.5
M	4.75	1.04	5.5
N	5.64	2.13	5.5
O*	3.96	1.17	5.5
Q ₁	6.36	1.83	5.5
Q ₂ *	3.32	1.59	5.5
Q ₃	6.79	1.75	5.5
Q ₄	4.46	1.73	5.5

(* p < 0.05)

TABLE 4**COMPARATIVE SCORES FOR NAVY DIVERS AND CIVILIAN SPORT DIVERS**

Factor	Mean navy diver	Mean civilian diver	t-value	p-value
A	5.29	5.00	0.52	0.6064
C	6.75	6.29	1.28	0.2049
E*	6.21	7.93	-4.16	0.0001*
F	7.32	6.57	1.40	0.1672
G*	6.21	4.93	3.25	0.0020*
H	7.07	7.21	-0.26	0.7933
I	4.75	4.50	0.44	0.6605
L	4.21	4.64	-0.68	0.4986
M*	4.75	5.57	-2.30	0.0251*
N*	5.64	4.50	2.39	0.0206*
O	3.96	3.14	1.83	0.0728
Q ₁	6.36	6.86	-0.97	0.3375
Q ₂ *	3.32	5.21	-3.96	0.0002*
Q ₃ *	6.79	5.57	2.69	0.0094*
Q ₄	4.46	5.07	-1.22	0.2273

(* p < 0.05)

TABLE 3**COMPARATIVE SCORES FOR NAVY DIVERS AND NAVY NON-DIVERS**

Factor	Mean navy diver	Mean navy non-diver	t-value	p-value
A	5.29	5.82	-0.99	0.3271
C*	6.75	5.36	3.13	0.0028*
E	6.21	5.43	1.66	0.1029
F*	7.32	5.07	4.44	0.0000*
G	6.21	6.32	-0.26	0.7977
H	7.07	6.75	0.83	0.4096
I*	4.75	6.14	-2.42	0.0190*
L	4.21	5.32	-1.99	0.0521
M	4.75	5.18	-1.14	0.2604
N	5.64	5.89	-0.50	0.6173
O	3.96	4.46	-1.43	0.1574
Q ₁	6.36	5.54	1.96	0.0557
Q ₂	3.32	4.21	-1.81	0.0765
Q ₃	6.79	7.36	-1.26	0.2126
Q ₄	4.46	5.07	-1.40	0.1682

(* p < 0.05)

orientation typical to South African navy divers and is not just a function of sampling.

When compared to other navy personnel not involved in diving, differences emerged on 3 factors. This is in keeping with previous research which found that divers differed from submariners on 2 factors of the 16PF¹³, and from a group of general navy personnel on some anxiety and hostility scores.¹⁶

Factor C (ego-strength) refers to emotional stability, with a higher score indicating maturity and calmness or self-control amidst difficulties. A lower score describes a person who is more easily distressed and influenced by feelings, and with a lower frustration tolerance.¹⁴ The divers' higher scores reflect the demands of military diving which requires maturity and self-control, maybe more than for the general navy. A form of self-selection may have taken place, as only those who stay calm under difficulties would qualify and work as a clearance diver.

A high score on Factor F is indicative of an enthusiastic, happy-go-lucky person. It further points to a quick and alert person, without too many cares.¹⁴ The higher score of the navy divers can then be expected, as such persons seem to adjust well in groups and to adverse environments.¹³ Risk taking behaviour has also been correlated to high scores,¹⁵ which may reflect the attitude of divers compared to those of the general navy personnel.

Factor I (tough-minded vs tender-minded) refers to emotional sensitivity, where a lower score describes a person who is tough and independent. A higher score describes a person who is more tender, sensitive and dependent.¹⁴ A low score on this factor is favoured during the divers' selection process, and is further influenced by self selection during the arduous training where only the tough-minded complete the program. The low score for the divers could be expected, given their selection procedure and their training and work conditions.

The direction of the differences may indicate a good person-environment, or person-task fit, where individuals find themselves in that situation where they can successfully deal with the demand of the environment.

When compared to other divers not involved in the military, differences emerged on 6 traits, which is in contrast with a previous South African study which indicated that naval divers compare more closely with civilian divers than with general navy personnel on certain measures of anxiety and hostility.¹⁶

Factor E indicates dominance and poses obedience vs assertiveness. A person with a lower score is more obedient and easily influenced, while a person with a high score is more assertive and competitive.¹⁴ The sport divers' higher scores on assertiveness may be an indication of their superior academic education. Their graduate status may tend to make them see themselves as more assertive than the navy divers, who were all junior NCOs at the time. The navy divers were also subject to military indoctrination, trained to follow orders, a form of conditioning not necessarily experienced by civilians. The lower (more obedient) scores of the non-diving navy group seem to support this explanation.

Factor G (super ego) poses a person who discards rules and chooses expedient solutions (lower score) against a person who is conscientious, rule-bound and persevering (higher score).¹⁴ The higher scores of the naval divers may reflect their environment, the tightly regimented and regulated world of the military. Civilian divers do not necessarily live in such an environment, and are more free to choose expedient solutions.

A low score on factor M refers to a practical orientated person, who has his or her feet on the ground and is focussed on practical needs. A high score is indicative of an imaginative person, who is more caught up in ideas.¹⁴ Navy divers live in a practical world, where they build or demolish or repair with whatever tools are at hand. The sport divers all had an academic background, which would prime them to be more comfortable with ideas and possibilities.

A high score on factor N is indicative of a shrewd, world-wise person, as opposed to a more naive, forthright

person.¹⁴ Why navy divers tend to be more world-wise is unclear. It can be that through their exposure in the navy they have seen more of life, but this remains speculation and needs to be further explored.

Factor Q₂ refers to group orientation, and low scores are typical of SAN divers.¹³ Navy divers may be more group dependant, due to the nature of SAN diving which has a close focus on group work, interdependency for safety, etc. Sport divers may be less group dependant due to the nature of recreational diving, which can be done in buddy-pairs on their own, without any group affiliation. A positive group orientation is possibly also a trait of SA naval personnel in general, as studies with submariners have indicated,¹⁷ reflecting the team-approach of SA Navy operations.

Factor Q₃ (self sentiment) poses individuals who are more careless, or less controlled, against individuals who are self-controlled, precise and even compulsive.¹⁴ The demands of navy diving (adverse conditions, dangerous situations, technical challenges) may require a precision that is not necessary for the sport diver who mostly dives under pleasant conditions. Navy divers share this trait with submariners, who also require a high level of precision for the execution of their tasks.¹⁷ Military indoctrination also encourage meticulous checking of equipment and imposes regimented diving procedures.

The differences with civilian divers may be a function of other factors not associated with their military/civilian backgrounds. As noted before, the sports divers come from a group with tertiary academic attainments, and a higher socioeconomic status. Ross found that student divers did not differ significantly from student non-divers on personality measures.⁸ So the differences between navy divers and civilian divers may reflect a difference between young people of different educational backgrounds. More research would be needed to determine this.

Do navy divers constitute a unique group? Our findings suggest that they differ from non-diving naval personnel, which supports previous studies comparing divers with submariners, where there were differences on 2 traits using the same instrument.¹³ It also gives support to other studies where navy divers differed from other navy non-divers on anxiety and hostility scales.¹⁶ Some of the differences may be explained by selection, whether formal or self-selection, and some may reflect the diving environment. In comparison with civilian divers there are differences on 6 traits, some of which may again be explained by the demands of the military diving environment. In support of the findings, the groups were easy to compare, as they had the same size, without any significant differences in age, time in the navy, or time involved with diving. They were further all located in the same geographical area, although there was some gender inequality in the groups. However, it cannot be assumed

that the samples are representative of their populations. The navy groups were recruited on the basis of availability, and were all taken from one naval base. In the same way the recreational divers were from only 2 clubs and some self-selection may have taken place when they responded to the invitation to participate in this research. The small sample size (28 per group) also cautions against easy generalisations. Trait personality is seen as fairly stable over time and is not expected to change too much due to environmental demands.¹⁸ However, the 16PF profiles of this study could have been influenced by the norms of the different groups, and so reflect group culture as well as the personality traits associated with those groups. It is not clear to what extent the different gender mixes may have skewed the results. For example, women and men divers scored the same on the STAI,⁷ and others have argued that “experienced female divers are similar in personality profile to other established divers”.¹⁹ It is possible that the women in the populations from which these groups were drawn from may have the same profiles as the men, but that cannot be assumed until further research is conducted.

These findings may suggest the value of using a person-task or person-environment model to view the results of studies like this one and the eventual potential for occupational placing. The military environment provides scope for a wide variety of personalities and only some are suitable for the tasks and demands of military diving. Occupational selection may be important for individuals within the military who express an interest in military diving, but some may not meet the person-task fit. This does not disqualify them from being good sailors and will allow the opportunity to direct them to other applications to meet their military aspirations. In the same way civilian divers applying for military diving may not necessarily meet the person-environment fit and may need to be directed elsewhere for developing their diving aspirations. However, the role of personality in predicting success in the South African diving context is only speculative and further research is needed to investigate this.

This study supports previous findings of SAN divers’ personality traits and illuminated differences with non-diving naval personnel and differences with civilian sport divers. Due to the concerns regarding representivity, future research would benefit from larger numbers of participants which would increase the opportunities for generalisations. The use of more instruments may also give a more accurate measurement of group profiles and intergroup differences. Research comparing navy divers that succeed in training with those who do not and comparing divers who remain in the navy for longer service to those who leave after a short period, would help answer the question of what role personality plays in this person-task and person-environment fit.

In summary, navy divers are enthusiastic, adventurous, confident and group orientated. They display

higher ego-strength, adventurousness and tough-mindedness than their non-diving counterparts in the navy. They were less assertive, displayed higher superego scores, practical orientation, shrewdness, group orientation and self-sentiment (precision) than civilian sport divers.

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COMMENTS OF A PEER REVIEWER

The implication from the introduction to this paper, is that this small cross-sectional study of navy divers, navy non-divers and non-navy divers, is adding to a relatively small medical literature on diver and sub-mariner selection, in the hope of using selection criteria for subsequent diving activities.

This is misleading for the following reasons.

1 There has already been a great deal of research undertaken on both psychometric assessments and occupational selection, during the post world-war 2 period, on both submariners and divers. It was mainly performed by the US navy and this is well reviewed in the references 1-3, as well as in the later investigations cited in references 4-15, together with their references.

In many of these reports, the investigations were conducted on large numbers of submarine and diving personnel, in a prospective manner – a much more informative research technique than a cross-sectional study, if one wishes to apply the results to selection.

2 One of these reports (ref 4), describes a prospective, psychometric and physiological analysis of 500 prospective navy divers, comparing the successes and failures and performing a discriminate function analysis upon them, with relative weightings to the various factors which positively or negatively are correlated with success

3 A great deal of information regarding various diving personality factors has been derived from both the

psychiatric investigations into divers (of which only a few references were described in the above paper) and more especially of the many subsequent investigations into organic brain damage in divers, which utilized non-damaged diver controls. Reference 11 in the South African paper was thoroughly discounted in subsequent work (reference 12)

These papers have been surfacing in the diving literature since 1975, and have been the subject of at least three international symposia. They have been very informative regarding the personality characteristics of divers and also have clarified some of the problems in drawing conclusions, and which were not referred to in the above article.

Although some of the references are now difficult to obtain, most are still available from the navies that undertook the work and abstracts of the reports are still available in the more widespread medical literature.

It is possible that the author has limited himself to a very specific MEDLARS type search and thereby omitted many of the texts, published conference proceedings, and less recognized journals. Fortunately, much of the material is still obtainable from a comprehensive diving medical library. Alternatively, a personal approach to some of the experts or original workers in this field would have directed the author, and others, to these sources. To not have perused the literature because of this difficulty is hardly acceptable when the author uses references to his own unpublished research reports (his reference 16).

4 The statistical techniques employed are not ideal for their stated purpose, and their conclusions have to be questioned. As admitted in the article, the groups were not controlled for age, sex, education and IQ standards. The inadequacies of a small-number, cross-sectional study of different groups is appreciated by all, including the author. More importantly, the populations were selected differently.

The results could represent the effects of peer pressures to conform with the groups, i.e., they could reflect the mores and cultures of special communities (navy divers and recreational diving clubs), more than the characteristics needed for diving proficiency.

Selected Additional References of Relevance to this Subject (some of which have been included in the revised paper)

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LATE SEQUELAE OF CARBON MONOXIDE POISONING 2 CASE REPORTS

Robert Noll

Key Words

Carbon monoxide, hyperbaric oxygen, sequelae, treatment.

Introduction

Neuropsychiatric manifestations of acute carbon monoxide (CO) poisoning may include non-focal changes in mental state, seizures, amnesia, apraxia, agnosia, Parkinsonism, cortical blindness, incontinence and peripheral neuropathy. A lucid period of up to twenty one days may occur followed by the delayed sequelae of CO poisoning which may include aphasia, apathy, disorientation, psychosis, gait disturbances, faecal and urinary incontinence and bradykinesia. Cognitive and neurological deficits may also be present, as can personality changes with impulsiveness, violence, verbal aggressiveness and mood changes.¹

This syndrome has a reported incidence of 3% to 40%,² with a set of risk factors having been identified within the group of affected patients.³ The neuropsychological deficits associated with CO poisoning are highly variable despite exposure to similar levels of CO poisoning.⁴ The white matter of the frontal lobe is involved but the pathological mechanism leading to demyelisation, petechiae, oedema and necrosis is poorly defined. Depressed cardiovascular function induced by CO, and a limited cerebral blood flow, may be major factors leading to neurologic cellular damage from CO poisoning.¹

Case histories

The Hyperbaric Unit at Fremantle Hospital actively treats CO poisoning with about 30 cases per annum being referred from Perth and more remote regions. The unit recently treated two cases with apparent late sequelae with resulting clinical improvement.

CASE ONE

A 61 year old female patient, who attempted suicide by connecting the exhaust pipe of her car to the cabin, was found by her neighbour at about 0950 with the car engine still running. The Glasgow Coma Scale (GCS) at the site was reported to be 9/15. In the Emergency Department of a peripheral hospital the patient was noted to have deteriorated with hypotension (55/28 mm Hg). She had an oxygen

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