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**CHARACTERISTICS OF PHYSICAL TRAINING ACTIVITIES  
OF WEST COAST U.S. NAVY SEA-AIR-LAND  
PERSONNEL (SEALS)**

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## **Characteristics of Physical Training Activities of West Coast U.S. Navy Sea-Air-Land Personnel (SEALs)**

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### SUMMARY

A detailed physical training activity questionnaire was administered to U.S. Navy Special Warfare (NSW) Sea, Air, Land (SEAL) personnel undergoing advanced training. Responses to this questionnaire provided information on the types, frequencies, and intensities of aerobic and strength conditioning activities in which the SEALs engaged, as well as the locations in which these activities occurred. These data were used to evaluate the training programs currently used by the West Coast SEALs.

One hundred and two (102) SEALs completed the questionnaire; their responses were used to characterize training activity according to the American College of Sports Medicine guidelines for maintenance of aerobic and strength fitness. Overall, SEALs reported engaging in aerobic activities (running, bicycling, and swimming) in frequencies, intensities, and durations appropriate for maintenance of aerobic fitness levels. Strength conditioning also occurred with sufficient frequency and quantity for maintenance of current levels of muscular strength fitness; however, during strength training, more time was used concentrating on upper-body muscles.

Although SEALs participated in aerobic and strength training in quantities sufficient to maintain fitness, the overall volume of training was somewhat less than for most elite or competitive athletes. The quality of the physical training programs varied widely depending on the advanced course/activity in which the SEALs were engaged. Through education in the basic principles of athletic training, SEALs could implement more effective training regimens to develop and maintain aerobic and strength fitness. Ultimately, SEALs could achieve higher levels of readiness for demanding missions.

## INTRODUCTION

U.S. Navy Special Warfare (NSW) Sea, Air, Land (SEAL) personnel engage in missions requiring high levels of aerobic fitness, muscular strength, power, and endurance. A wide range of physical fitness attributes are necessary to successfully complete operations in both terrestrial and maritime environments while transporting moderate to heavy loads. It has been suggested that SEALs may rely on their physical attributes more than any other group in the military (Barnes and Strauss, 1986). In addition, SEALs are required to maintain higher fitness standards than other Navy Fleet personnel (BUPERS Manual 1410-380). Physical fitness and anthropometric profiles of Basic Underwater Demolition/SEAL (BUD/S) trainees and SEALs have been reported previously (Beckett et al., 1989). These profile data showed that both BUD/S trainees and platoon SEALs possess a relatively high aerobic capacity ( $62.4 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$  and  $57.7 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ , respectively), but SEALs are somewhat stronger. Further, SEALs possess a high mesomorphic component ( $5.9 \pm 0.9$ ) on the Heath-Carter somatotype rating scale (Carter, 1980). Interestingly, the mesomorphy rating reported for successful BUD/S trainees in 1989 ( $5.8 \pm 0.8$ ) was not significantly different from that reported for successful trainees in 1975 ( $5.9 \pm 1.5$ ) (Beckett et al., 1989; Carter and Rahe, 1973). These profile data provide a baseline from which to evaluate the effects of training practices employed by SEALs in order to maintain high levels of physical fitness.

To maintain a high level of fitness, SEALs perform regular physical training with their platoons or detachments. Also, these men typically engage in additional voluntary physical training (Barnes and Strauss, 1986), either individually or in small group/skill sport activities. Documentation of SEALs' physical training practices allows analysis of the suitability of their training regimens for maintaining aerobic and strength fitness. A database of current practices also provides a basis from which to determine if any modifications should be recommended for existing programs. The purpose of this study was to determine if SEALs train optimally in their efforts to maintain aerobic and strength fitness at levels required during physically demanding missions.

## MATERIALS AND METHODS

Physical activity questionnaires (Attachment 1) were distributed to 105 West Coast SEALs undergoing advanced training at SEAL Teams Three and Five, and Seal Delivery Vehicle (SDV) Team One. SEALs were attending one of eleven different advanced training courses/activities: 1) Combat Swimmer; 2) Land Warfare; 3) Maritime Operations; 4) Cold Weather Training; 5) Classroom Preparation; 6) Stand-Down Preparation; 7) Mission Preparation; 8) Exercises; 9) Field Activities; 10) Core Training; or 11) Advanced SDV Operator Training. The questionnaire was designed to collect data on the characteristics of SEALs' physical training, including the types of fitness activities (i.e., aerobic, anaerobic, strength, skill/team sport), frequency, duration, and intensity of participation, as well as training activity locations and conditions.

## RESULTS

A total of 102 questionnaires were completed and were used in the analyses.<sup>1</sup> Respondents' mean ( $\pm$  standard deviation [SD]) age, height, and weight were 27 ( $\pm$  6.0) yr., 70.0 ( $\pm$  2.4) in., and 172.8 ( $\pm$  18.2) lbs., respectively; these characteristics are very similar to those reported previously for platoon SEALs (Beckett, et al., 1989). The mean frequency with which SEALs engaged in individual physical conditioning activities, and the number of respondents participating in those activities, are presented in Table 1.

Table 1. Frequency of participation (times per week) in fitness activities during advanced training.

| ACTIVITY         | NUMBER OF<br>RESPONDENTS | MEAN | STANDARD<br>DEVIATION |
|------------------|--------------------------|------|-----------------------|
| Running          | 98                       | 3.3  | 1.3                   |
| Weightlifting    | 72                       | 3.3  | 1.7                   |
| Calisthenics     | 93                       | 2.6  | 1.3                   |
| Bicycling        | 64                       | 2.4  | 1.6                   |
| Walking          | 24                       | 2.3  | 2.0                   |
| Swimming         | 95                       | 1.9  | 0.9                   |
| Aerobic Class    | 12                       | 1.8  | 0.9                   |
| Scuba/Snorkeling | 73                       | 1.5  | 1.0                   |
| Rowing           | 10                       | 1.5  | 0.9                   |
| Obstacle Course  | 78                       | 1.1  | 0.3                   |

Frequency scale: 0 - (never); 1 - ( $\leq$  1x/wk); 2 - (2x/wk); 3 - (3x/wk);  
4 - (4x/wk); 5 - (5x/wk); 6 - (6x/wk); 7 - ( $\geq$  7x/wk)

<sup>1</sup> NUMBER OF RESPONDENTS varies among tables, reflecting the total number of respondents completing each questionnaire item.

SEALs' mean frequency and number of respondents participating in various skill, team, and other organized sports are summarized in Table 2.

Table 2. Frequency of participation (times per week) in skill, team, and other activities during advanced training.

| ACTIVITY               | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|------------------------|-----------------------|------|--------------------|
| Volleyball             | 34                    | 1.4  | 1.3                |
| Racket Sports/Handball | 19                    | 1.3  | 0.8                |
| Football               | 18                    | 1.2  | 0.9                |
| Other                  | 14                    | 3.4  | 1.8                |
| Martial Arts           | 14                    | 2.6  | 1.9                |
| Boxing/Wrestling       | 13                    | 1.7  | 1.5                |
| Basketball             | 12                    | 1.0  | 0.0                |
| Baseball/Softball      | 11                    | 1.3  | 0.9                |

Frequency scale: 0 - (never); 1 - ( $\leq 1x/wk$ ); 2 - ( $2x/wk$ ); 3 - ( $3x/wk$ ); 4 - ( $4x/wk$ ); 5 - ( $5x/wk$ ); 6 - ( $6x/wk$ ); 7 - ( $\geq 7x/wk$ )

The attributes of running, the most frequently employed aerobic training activity, are presented in Tables 3 through 6. These tables summarize the frequency (runs/week), duration (minutes/day), volume (miles/week), and intensity (minutes/mile), respectively, of run training for members of each training status. To determine total time of running per week, the product of frequency and duration was calculated. The mean frequency-duration product was 162.7 minutes/week, ranging from a low of 83.0 minutes/week for SDV Advanced Operator Training to a high of 220.0 minutes/week for Combat Swimmers.

Table 3. Number of runs per week during advanced training.

| TRAINING STATUS            | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|----------------------------|-----------------------|------|--------------------|
| Advanced Operator Training | 6                     | 2.2  | 1.6                |
| Classroom                  | 6                     | 3.2  | 0.4                |
| Cold Weather Training      | 2                     | 3.0  | 0.0                |
| Combat Swimmer             | 6                     | 5.3  | 4.4                |
| Core Training              | 2                     | 3.0  | 1.4                |
| Exercises                  | 4                     | 3.8  | 1.7                |
| Field Activities           | 8                     | 3.4  | 0.9                |
| Land Warfare               | 19                    | 3.4  | 1.1                |
| Maritime Operations        | 8                     | 3.7  | 1.3                |
| Other                      | 15                    | 3.2  | 1.4                |
| Preparation                | 12                    | 3.5  | 1.4                |
| Combined                   | 88                    | 3.4  |                    |

Table 4. Total daily running time (minutes per run) during advanced training.

| TRAINING STATUS            | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|----------------------------|-----------------------|------|--------------------|
| Advanced Operator Training | 5                     | 35.4 | 8.4                |
| Classroom                  | 5                     | 35.0 | 7.1                |
| Cold Weather Training      | 2                     | 42.5 | 3.5                |
| Combat Swimmer             | 5                     | 52.0 | 38.5               |
| Core Training              | 2                     | 22.5 | 10.1               |
| Exercises                  | 4                     | 29.8 | 19.2               |
| Field Activities           | 8                     | 37.5 | 6.6                |
| Land Warfare               | 19                    | 41.5 | 22.7               |
| Maritime Operations        | 8                     | 36.1 | 10.8               |
| Other                      | 13                    | 37.0 | 16.1               |
| Preparation                | 10                    | 34.0 | 6.5                |
| Combined                   | 88                    | 34.8 |                    |

Table 5. Total weekly running mileage during advanced training.

| TRAINING STATUS            | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|----------------------------|-----------------------|------|--------------------|
| Advanced Operator Training | 6                     | 10.2 | 8.3                |
| Classroom                  | 6                     | 20.0 | 10.4               |
| Cold Weather Training      | 2                     | 11.5 | 5.0                |
| Combat Swimmers            | 6                     | 34.0 | 33.0               |
| Core Training              | 2                     | 9.5  | 2.1                |
| Exercises                  | 4                     | 17.0 | 7.9                |
| Field Activities           | 8                     | 18.8 | 9.3                |
| Land Warfare               | 19                    | 14.4 | 5.7                |
| Maritime Operations        | 8                     | 18.4 | 8.4                |
| Other                      | 14                    | 13.6 | 7.9                |
| Preparation                | 12                    | 17.9 | 11.5               |
| Combined                   | 85                    | 17.0 |                    |

Table 6. Average running pace (minutes per mile) during advanced training.

| TRAINING STATUS            | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|----------------------------|-----------------------|------|--------------------|
| Advanced Operator Training | 6                     | 7.1  | 0.6                |
| Classroom                  | 6                     | 6.5  | 0.4                |
| Cold Weather Training      | 2                     | 7.0  | 0.7                |
| Combat Swimmer             | 6                     | 7.0  | 0.3                |
| Core Training              | 2                     | 6.0  | 1.4                |
| Exercises                  | 4                     | 7.0  | 0.7                |
| Field Activities           | 8                     | 7.2  | 1.1                |
| Land Warfare               | 19                    | 7.1  | 0.7                |
| Maritime Operations        | 8                     | 7.1  | 0.7                |
| Other                      | 15                    | 6.8  | 0.8                |
| Preparation                | 12                    | 7.0  | 0.8                |
| Combined                   | 88                    | 7.0  |                    |

Only 5% of the respondents reported using running and/or walking with load carriage (backpacks) as a training activity. The mean ( $\pm$  SD) load carried by SEALs was 22.3 ( $\pm$  11.3) kg, which constituted 28.0 ( $\pm$  13.9) percent of an average SEAL's total body mass. Load carriage activity data are presented in Tables 7 and 8.

Table 7. Average running pace (minutes per mile) with load during advanced training.

| TRAINING STATUS            | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|----------------------------|-----------------------|------|--------------------|
| Advanced Operator Training | 2                     | 8.0  | 1.4                |
| Cold Weather Training      | 1                     | 8.0  | 0.0                |
| Combat Swimmer             | 2                     | 8.3  | 0.4                |
| Exercises                  | 2                     | 8.1  | 0.9                |
| Field Activities           | 1                     | 11.0 | 0.0                |
| Land Warfare               | 2                     | 10.0 | 0.0                |
| Other                      | 2                     | 9.0  | 1.4                |
| Preparation                | 1                     | 12.0 | 0.0                |
| Combined                   | 13                    | 9.1  |                    |

Table 8. Average walking pace (minutes per mile) with load during advanced training.

| TRAINING STATUS            | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|----------------------------|-----------------------|------|--------------------|
| Advanced Operator Training | 1                     | 16.0 | 0.0                |
| Classroom                  | 1                     | 24.0 | 0.0                |
| Cold Weather Training      | 2                     | 10.3 | 0.4                |
| Exercises                  | 1                     | 10.5 | 0.0                |
| Field Activities           | 1                     | 18.0 | 0.0                |
| Land Warfare               | 5                     | 16.4 | 7.7                |
| Maritime Operations        | 1                     | 20.0 | 0.0                |
| Other                      | 4                     | 12.3 | 0.5                |
| Preparation                | 5                     | 19.6 | 0.9                |
| Combined                   | 21                    | 16.1 |                    |

Table 9 summarizes the characteristics of the locations/conditions of SEALs' aerobic activities. Running was performed most often (65% of runs) on hard surfaces, with hard sand/packed dirt the preferred surface (29%), followed by asphalt (21%), concrete (15%), and artificial tracks (1%). Soft sand and grass were used 26% and 7% of the time, respectively. Swim training was performed in the ocean 63% of the time and 37% of the time in a pool. The percentages of swims, with and without fins, were the same as the percentages of ocean and pool swims (i.e., 63% and 37%, respectively), suggesting that SEALs use fins when



swimming in the ocean but not when swimming in a pool. As expected, scuba and snorkeling activities were most frequently conducted in the ocean (85% of the time). SEALs averaged 2.2 miles/week swimming during scuba/snorkeling at an intensity (pace) that varied with training status and ranged from 31.7 to 55.3 minutes/mile (Table 10).

Table 9. Frequency of use (time per week) of physical training location/conditions for aerobic activities.

| ACTIVITY              | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|-----------------------|-----------------------|------|--------------------|
| Swim Ocean            | 88                    | 1.5  | 0.6                |
| Swim Fins             | 82                    | 1.6  | 0.7                |
| Swim Pool             | 56                    | 1.4  | 0.9                |
| Swim No Fins          | 56                    | 1.4  | 0.9                |
| Scuba/Snorkel Ocean   | 69                    | 1.5  | 0.9                |
| Scuba/Snorkel Fins    | 69                    | 1.5  | 1.0                |
| Scuba/Snorkel No Fins | 14                    | 1.2  | 0.4                |
| Scuba/Snorkel Pool    | 12                    | 1.5  | 0.8                |
| Run on Sand           | 95                    | 1.8  | 1.1                |
| Run on Dirt           | 87                    | 2.2  | 1.2                |
| Run on Asphalt        | 75                    | 1.9  | 1.1                |
| Run on Concrete       | 55                    | 1.8  | 1.0                |
| Run on Grass          | 33                    | 1.4  | 0.7                |
| Run on Track          | 9                     | 1.0  | 0.0                |
| Row Machine           | 8                     | 1.5  | 0.8                |
| Row Boat              | 5                     | 1.2  | 0.5                |
| Bicycle Road          | 53                    | 2.5  | 1.6                |
| Bicycle Stationary    | 18                    | 2.2  | 1.4                |

Frequency scale: 0 - (never); 1 - ( $\leq 1x/wk$ ); 2 - ( $2x/wk$ ); 3 - ( $3x/wk$ ); 4 - ( $4x/wk$ ); 5 - ( $5x/wk$ ); 6 - ( $6x/wk$ ); 7 - ( $\geq 7x/wk$ )

Table 10. Average swimming pace (minutes per mile) while scuba/snorkeling during advanced training.

| TRAINING STATUS            | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|----------------------------|-----------------------|------|--------------------|
| Advanced Operator Training | 4                     | 32.0 | 2.3                |
| Classroom                  | 2                     | 49.0 | 1.4                |
| Cold Weather Training      | 2                     | 55.0 | 7.1                |
| Exercises                  | 3                     | 55.3 | 9.3                |
| Land Warfare               | 6                     | 37.9 | 15.5               |
| Other                      | 3                     | 31.7 | 24.7               |
| Preparation                | 4                     | 45.0 | 17.3               |
| Combined                   | 24                    | 41.9 |                    |

SEALs who bicycled (63% of respondents) reported exercising on the road 77% of the time and on a stationary bicycle 23% of the time (see Table 9). Only 10% of SEALs used rowing as an aerobic training activity. Of those, respondents reported using rowing machines 67% of the time and a boat/shell the remaining 33% of the time.

Table 11 summarizes SEALs' participation in skill/team activities. Participation in these activities was far less frequent than for individual aerobic and strength conditioning activities, occurring only slightly more than once per week (mean = 1.3 times/week). Volleyball (on all surfaces) was the most popular skill/team activity, with a mean frequency of participation of 1.5 times/week.

Table 11. Frequency of use (times per week) of physical training location/condition for skill and team activities.

| ACTIVITY                           | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION |
|------------------------------------|-----------------------|------|--------------------|
| Racket Sports/Handball on Wood     | 17                    | 1.1  | 0.5                |
| Racket Sports/Handball on Asphalt  | 6                     | 1.3  | 0.8                |
| Racket Sports/Handball on Concrete | 6                     | 1.3  | 0.8                |
| Basketball on Wood                 | 12                    | 1.0  | 0.0                |
| Basketball on Asphalt              | 7                     | 1.1  | 0.4                |
| Basketball on Concrete             | 6                     | 1.0  | 0.0                |
| Volleyball on Sand                 | 28                    | 1.5  | 1.3                |
| Volleyball on Asphalt              | 19                    | 1.3  | 0.7                |
| Volleyball on Grass                | 13                    | 1.5  | 1.7                |
| Volleyball on Wood                 | 12                    | 1.8  | 1.8                |
| Volleyball on Concrete             | 9                     | 1.1  | 0.3                |

Frequency scale: 0 - (never); 1 - ( $\leq 1x/wk$ ); 2 - ( $2x/wk$ ); 3 - ( $3x/wk$ ); 4 - ( $4x/wk$ ); 5 - ( $5x/wk$ ); 6 - ( $6x/wk$ ); 7 - ( $7x/wk$  or more)

Weightlifting sessions lasted an average of 55 minutes and tended to concentrate on upper-body exercises. Detailed information on the number of sets performed, number of repetitions per set, perceived intensity of exercise, weights used, duration of each exercise, and one-repetition maximal (1-RM) weight lifted are presented in Table 12.

Tables 13 and 14 summarize the frequency, duration, and perceived intensity of SEALs' participation in each of the individual physical training activities and in the skill/team sports, respectively.

Table 12. Characteristics of weightlifting exercise.

## SETS (NUMBER)

| EXERCISE        | NUMBER OF<br>RESPONDENTS | MEAN | STANDARD<br>DEVIATION | RANGE |
|-----------------|--------------------------|------|-----------------------|-------|
| Neck            | 11                       | 3.3  | 0.7                   | 2-4   |
| Upright Rowing  | 18                       | 3.9  | 1.3                   | 3-8   |
| Bent Rowing     | 20                       | 4.1  | 1.2                   | 3-8   |
| Bench Press     | 49                       | 4.7  | 1.8                   | 1-9   |
| Military Press  | 37                       | 4.1  | 1.3                   | 1-8   |
| Incline Press   | 34                       | 4.4  | 1.4                   | 3-8   |
| Biceps Curl     | 42                       | 4.4  | 1.5                   | 3-9   |
| Triceps Curl    | 34                       | 4.2  | 1.2                   | 3-8   |
| Latissimus Pull | 35                       | 4.2  | 1.7                   | 1-9   |
| Wrist Curl      | 10                       | 3.9  | 1.0                   | 3-6   |
| Sit-up          | 19                       | 3.6  | 1.4                   | 1-6   |
| Leg Press       | 16                       | 4.2  | 1.1                   | 3-6   |
| Squat           | 18                       | 4.1  | 0.9                   | 3-6   |
| Leg Curl        | 21                       | 4.1  | 1.1                   | 1-6   |
| Toe Raises      | 16                       | 4.3  | 1.2                   | 3-6   |
| Leg Extension   | 20                       | 4.2  | 0.9                   | 3-6   |
| Stair Climb     | 4                        | 3.8  | 1.0                   | 3-5   |
| Other           | 7                        | 3.0  | 1.9                   | 0-5   |

## ONE-REPETITION MAXIMUM (POUNDS)

| EXERCISE        | NUMBER OF<br>RESPONDENTS | MEAN  | STANDARD<br>DEVIATION | RANGE   |
|-----------------|--------------------------|-------|-----------------------|---------|
| Neck            | 1                        | 140.0 | ---                   | ---     |
| Upright Rowing  | 8                        | 128.8 | 40.4                  | 50-180  |
| Bent Rowing     | 12                       | 191.3 | 59.6                  | 50-260  |
| Bench Press     | 31                       | 255.2 | 55.2                  | 180-450 |
| Military Press  | 23                       | 170.9 | 53.9                  | 75-300  |
| Incline Press   | 20                       | 200.1 | 40.0                  | 135-275 |
| Biceps Curl     | 25                       | 114.0 | 34.0                  | 40-185  |
| Triceps Curl    | 15                       | 109.7 | 43.6                  | 55-200  |
| Latissimus Pull | 17                       | 178.2 | 31.6                  | 110-225 |
| Wrist Curl      | 1                        | 20.0  | ---                   | ---     |
| Sit-up          | 6                        | 63.3  | 63.1                  | 10-175  |
| Leg Press       | 7                        | 357.9 | 107.0                 | 180-530 |
| Squat           | 10                       | 299.0 | 105.0                 | 200-500 |
| Leg Curl        | 9                        | 140.6 | 48.1                  | 75-200  |
| Toe Raises      | 5                        | 279.0 | 48.3                  | 225-350 |
| Leg Extension   | 10                       | 183.0 | 46.4                  | 120-260 |
| Stair Climb     | 1                        | 8.0   | ---                   | ---     |
| Other           | 4                        | 78.5  | 70.0                  | 4-150   |

Table 12. Characteristics of weightlifting exercise (cont'd).

| REPETITIONS (PER SET) |                       |      |                    |       |
|-----------------------|-----------------------|------|--------------------|-------|
| EXERCISE              | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION | RANGE |
| Neck                  | 9                     | 11.8 | 6.9                | 8-30  |
| Upright Rowing        | 16                    | 9.9  | 4.2                | 7-25  |
| Bent Rowing           | 19                    | 9.4  | 2.4                | 6-15  |
| Bench Press           | 48                    | 8.2  | 2.3                | 1-12  |
| Military Press        | 37                    | 8.8  | 1.4                | 6-12  |
| Incline Press         | 34                    | 8.8  | 1.3                | 6-10  |
| Biceps Curl           | 43                    | 9.6  | 2.8                | 6-20  |
| Triceps Curl          | 32                    | 9.5  | 2.5                | 6-20  |
| Latissimus Pull       | 34                    | 9.1  | 2.1                | 5-15  |
| Wrist Curl            | 8                     | 9.4  | 1.4                | 8-12  |
| Sit-up                | 17                    | 33.8 | 30.9               | 8-99  |
| Leg Press             | 16                    | 11.1 | 5.9                | 6-30  |
| Squat                 | 17                    | 12.8 | 12.6               | 6-60  |
| Leg Curl              | 20                    | 11.1 | 5.3                | 8-30  |
| Toe Raise             | 15                    | 11.3 | 4.2                | 8-20  |
| Leg Extension         | 19                    | 11.6 | 5.8                | 8-30  |
| Stair Climb           | 1                     | 9.0  | ---                | ---   |
| Other                 | 9                     | 9.4  | 2.7                | 6-15  |

## PERCEIVED EFFORT

| EXERCISE        | NUMBER OF RESPONDENTS | MEAN | STANDARD DEVIATION | RANGE |
|-----------------|-----------------------|------|--------------------|-------|
| Neck            | 11                    | 7.0  | 2.9                | 2-10  |
| Upright Rowing  | 16                    | 7.6  | 2.1                | 4-10  |
| Bent Rowing     | 20                    | 7.8  | 2.3                | 0-10  |
| Bench Press     | 46                    | 7.5  | 2.0                | 3-10  |
| Military Press  | 35                    | 7.7  | 1.7                | 4-10  |
| Incline Press   | 33                    | 7.5  | 1.9                | 4-10  |
| Biceps Curl     | 42                    | 7.3  | 1.8                | 4-10  |
| Triceps Curl    | 31                    | 7.5  | 1.8                | 4-10  |
| Latissimus Pull | 33                    | 7.6  | 1.8                | 4-10  |
| Wrist Curl      | 8                     | 8.0  | 3.3                | 0-10  |
| Sit-up          | 17                    | 7.5  | 2.8                | 0-10  |
| Leg Press       | 15                    | 8.1  | 1.8                | 4-10  |
| Squat           | 16                    | 8.8  | 1.6                | 5-10  |
| Leg Curl        | 19                    | 8.5  | 1.8                | 4-10  |
| Toe Raise       | 15                    | 7.5  | 3.0                | 0-10  |
| Leg Extension   | 18                    | 8.7  | 1.3                | 6-10  |
| Stair Climb     | 4                     | 6.0  | 4.0                | 0- 8  |
| Other           | 8                     | 8.3  | 1.4                | 6-10  |

Perceived effort scale: 1 - very easy; 2 - easy; 3-4 - moderately difficult;  
5-6 - difficult; 7-8 - intense; 9-10 - very intense

Table 12. Characteristics of weightlifting exercise (cont'd).

## WEIGHTS USED (POUNDS)

| EXERCISE        | NUMBER OF<br>RESPONDENTS | MEAN  | STANDARD<br>DEVIATION | RANGE   |
|-----------------|--------------------------|-------|-----------------------|---------|
| Neck            | 7                        | 80.7  | 61.0                  | 10-180  |
| Upright Rowing  | 13                       | 95.8  | 27.0                  | 60-150  |
| Bent Rowing     | 15                       | 130.0 | 28.2                  | 80-175  |
| Bench Press     | 42                       | 186.8 | 47.3                  | 100-365 |
| Military Press  | 32                       | 122.5 | 37.1                  | 70-250  |
| Incline Press   | 29                       | 140.5 | 43.0                  | 45-230  |
| Biceps Curl     | 38                       | 75.7  | 22.6                  | 30-115  |
| Triceps Curl    | 27                       | 76.6  | 32.4                  | 20-180  |
| Latissimus Pull | 27                       | 137.4 | 32.0                  | 25-180  |
| Wrist Curl      | 4                        | 57.4  | 28.4                  | 40-100  |
| Sit-up          | 6                        | 83.0  | 86.5                  | 25-208  |
| Leg Press       | 10                       | 237.5 | 68.7                  | 90-315  |
| Squat           | 11                       | 215.5 | 90.0                  | 90-400  |
| Leg Curl        | 14                       | 94.6  | 33.8                  | 50-160  |
| Toe Raise       | 6                        | 193.3 | 57.2                  | 100-250 |
| Leg Extension   | 13                       | 128.2 | 41.3                  | 70-190  |
| Stair Climb     | --                       | ---   | ---                   | ---     |
| Other           | 4                        | 103.8 | 52.8                  | 35-150  |

## EXERCISE DURATION (MINUTES)

| EXERCISE        | NUMBER OF<br>RESPONDENTS | MEAN | STANDARD<br>DEVIATION | RANGE |
|-----------------|--------------------------|------|-----------------------|-------|
| Neck            | 7                        | 10.9 | 9.6                   | 1-30  |
| Upright Rowing  | 10                       | 10.2 | 5.9                   | 2-10  |
| Bent Rowing     | 12                       | 9.8  | 4.8                   | 2-20  |
| Bench Press     | 34                       | 13.0 | 8.6                   | 1-40  |
| Military Press  | 27                       | 9.6  | 5.2                   | 1-20  |
| Incline Press   | 22                       | 11.0 | 5.3                   | 1-20  |
| Biceps Curl     | 30                       | 11.0 | 5.6                   | 1-25  |
| Triceps Curl    | 22                       | 10.7 | 4.2                   | 4-20  |
| Latissimus Pull | 21                       | 11.1 | 6.3                   | 1-20  |
| Wrist Curl      | 6                        | 9.7  | 6.8                   | 2-20  |
| Sit-up          | 10                       | 9.4  | 6.5                   | 1-20  |
| Leg Press       | 9                        | 11.8 | 5.7                   | 4-20  |
| Squat           | 8                        | 10.0 | 6.0                   | 4-20  |
| Leg Curl        | 11                       | 9.2  | 5.7                   | 1-20  |
| Toe Raise       | 10                       | 10.6 | 5.4                   | 5-20  |
| Leg Extension   | 11                       | 10.6 | 6.2                   | 2-20  |
| Stair Climb     | 3                        | 7.0  | 7.2                   | 1-15  |
| Other           | 7                        | 7.4  | 5.2                   | 1-15  |

Table 13. Summary of the quality and quantity of physical training activities of West Coast SEALs.

| <u>ACTIVITY</u><br>Attribute | NUMBER OF<br>RESPONDENTS | MEAN | STANDARD<br>DEVIATION |
|------------------------------|--------------------------|------|-----------------------|
| <u>RUNNING</u>               |                          |      |                       |
| Frequency                    | 98                       | 3.3  | 1.3                   |
| Intensity                    | 93                       | 5.5  | 2.0                   |
| Duration                     | 101                      | 4.3  | 1.2                   |
| <u>SCUBA/SNORKELING</u>      |                          |      |                       |
| Frequency                    | 73                       | 1.5  | 1.0                   |
| Intensity                    | 67                       | 4.1  | 2.0                   |
| Duration                     | 71                       | 6.0  | 1.9                   |
| <u>SWIMMING</u>              |                          |      |                       |
| Frequency                    | 95                       | 1.9  | 0.9                   |
| Intensity                    | 89                       | 5.1  | 1.8                   |
| Duration                     | 94                       | 4.3  | 1.3                   |
| <u>BICYCLING</u>             |                          |      |                       |
| Frequency                    | 64                       | 2.4  | 1.6                   |
| Intensity                    | 60                       | 4.8  | 2.1                   |
| Duration                     | 61                       | 4.5  | 2.0                   |
| <u>ROWING</u>                |                          |      |                       |
| Frequency                    | 10                       | 1.5  | 0.9                   |
| Intensity                    | 8                        | 5.5  | 2.7                   |
| Duration                     | 8                        | 3.8  | 1.2                   |
| <u>WALKING</u>               |                          |      |                       |
| Frequency                    | 24                       | 2.3  | 2.0                   |
| Intensity                    | 20                       | 3.3  | 1.3                   |
| Duration                     | 21                       | 4.5  | 2.1                   |
| <u>AEROBICS CLASS</u>        |                          |      |                       |
| Frequency                    | 12                       | 1.8  | 0.9                   |
| Intensity                    | 10                       | 4.8  | 2.0                   |
| Duration                     | 10                       | 4.4  | 1.9                   |
| <u>WEIGHTLIFTING</u>         |                          |      |                       |
| Frequency                    | 72                       | 3.3  | 1.7                   |
| Intensity                    | 67                       | 6.5  | 2.1                   |
| Duration                     | 72                       | 5.8  | 1.5                   |
| <u>CALISTHENICS</u>          |                          |      |                       |
| Frequency                    | 93                       | 2.6  | 1.3                   |
| Intensity                    | 86                       | 6.0  | 2.0                   |
| Duration                     | 85                       | 4.8  | 1.5                   |
| <u>OBSTACLE COURSE</u>       |                          |      |                       |
| Frequency                    | 78                       | 1.1  | 0.3                   |
| Intensity                    | 74                       | 6.1  | 2.2                   |
| Duration                     | 1                        | 4.0  | ---                   |

Frequency scale: 0 - (never); 1 - ( $\leq 1x/wk$ ); 2 - ( $2x/wk$ ); 3 - ( $3x/wk$ ); 4 - ( $4x/wk$ ); 5 - ( $5x/wk$ ); 6 - ( $6x/wk$ ); 7 - ( $7x/wk$  or more)

Intensity scale: 1 - very easy; 2 - easy; 3-4 - moderately difficult; 5-6 - difficult; 7-8 - intense; 9-10 - very intense

Duration scale (minutes): 0 - (not applicable); 1 - ( $< 11$ ); 2 - ( $11-20$ ); 3 - ( $21-30$ ); 4 - ( $31-40$ ); 5 - ( $41-50$ ); 6 - ( $51-60$ ); 7 - ( $61-119$ ); 8 - ( $120-180$ ); 9 - ( $> 180$ )

Table 14. Summary of the quality and quantity of skilled physical activities of West Coast SEALs.

| <u>ACTIVITY</u><br>Attribute  | NUMBER OF<br>RESPONDENTS | MEAN | STANDARD<br>DEVIATION |
|-------------------------------|--------------------------|------|-----------------------|
| <u>RACKET SPORTS/HANDBALL</u> |                          |      |                       |
| Frequency                     | 19                       | 1.3  | 0.8                   |
| Intensity                     | 18                       | 4.4  | 1.8                   |
| Duration                      | 19                       | 5.2  | 1.7                   |
| <u>BASKETBALL</u>             |                          |      |                       |
| Frequency                     | 12                       | 1.0  | 0.0                   |
| Intensity                     | 12                       | 3.7  | 1.7                   |
| Duration                      | 13                       | 4.8  | 1.5                   |
| <u>BASEBALL/SOFTBALL</u>      |                          |      |                       |
| Frequency                     | 11                       | 1.3  | 0.9                   |
| Intensity                     | 10                       | 3.7  | 1.6                   |
| Duration                      | 12                       | 5.9  | 1.4                   |
| <u>FOOTBALL</u>               |                          |      |                       |
| Frequency                     | 18                       | 1.2  | 0.9                   |
| Intensity                     | 17                       | 4.3  | 2.6                   |
| Duration                      | 17                       | 5.4  | 1.1                   |
| <u>VOLLEYBALL</u>             |                          |      |                       |
| Frequency                     | 34                       | 1.4  | 1.3                   |
| Intensity                     | 32                       | 4.2  | 2.3                   |
| Duration                      | 33                       | 5.4  | 1.8                   |
| <u>BOXING/WRESTLING</u>       |                          |      |                       |
| Frequency                     | 13                       | 1.7  | 1.5                   |
| Intensity                     | 2                        | 1.0  | 0.0                   |
| Duration                      | 10                       | 5.5  | 2.4                   |
| <u>MARTIAL ARTS</u>           |                          |      |                       |
| Frequency                     | 14                       | 2.6  | 1.9                   |
| Intensity                     | 14                       | 6.5  | 1.7                   |
| Duration                      | 15                       | 6.7  | 1.5                   |
| <u>OTHER</u>                  |                          |      |                       |
| Frequency                     | 14                       | 3.4  | 1.8                   |
| Intensity                     | 12                       | 7.2  | 2.9                   |
| Duration                      | 14                       | 7.0  | 2.4                   |

Frequency scale: 0 - (never); 1 - ( $\leq 1x/wk$ ); 2 - ( $2x/wk$ ); 3 - ( $3x/wk$ ); 4 - ( $4x/wk$ ); 5 - ( $5x/wk$ ); 6 - ( $6x/wk$ ); 7 - ( $\geq 7x/wk$ )

Intensity scale: 1 - very easy; 2 - easy; 3-4 - moderately difficult; 5-6 - difficult; 7-8 - intense; 9-10 - very intense

Duration scale (minutes): 0 - (not applicable); 1 - ( $< 11$ ); 2 - ( $11-20$ ); 3 - ( $21-30$ ); 4 - ( $31-40$ ); 5 - ( $41-50$ ); 6 - ( $51-60$ ); 7 - ( $61-119$ ); 8 - ( $120-180$ ); 9 - ( $> 180$ )

## DISCUSSION

This study was conducted to examine the aerobic and strength conditioning activities of West Coast SEALs and to evaluate the effectiveness of their self-selected training programs in maintaining physical readiness. A detailed questionnaire was administered to SEALs undergoing advanced training that provided information on the kinds and quantities of aerobic and strength conditioning activities in which they engaged. These data supplement information previously collected on the physical profiles of BUD/S trainees and platoon SEALs (Beckett et al., 1989).

Muza and colleagues (1987) have suggested that U.S. Army Special Forces personnel have the highest aerobic power ( $\dot{V}O_{2peak}$ ) within the U.S. military population. However, data previously collected on West Coast SEALs show they possess a higher  $\dot{V}O_{2peak}$  than the Army Special Forces (57.7 ml·kg<sup>-1</sup>·min<sup>-1</sup> for SEALs versus 54.4 ml·kg<sup>-1</sup>·min<sup>-1</sup> for Army Special Forces). Although the  $\dot{V}O_{2peak}$  of platoon SEALs is higher than that of other U.S. military members (Vogel, 1985), it is significantly lower than that of new BUD/S graduates (62.4 ml·kg<sup>-1</sup>·min<sup>-1</sup>) (Beckett et al., 1989). This decrement cannot be attributed solely to age differences (22.2 years for BUD/S and 25.9 years for SEALs); rather, it may reflect reduced training volume or relative ineffectiveness of the aerobic training methods SEALs employ after completion of BUD/S training.

The American College of Sports Medicine (ACSM) has published guidelines for the development and maintenance of cardiorespiratory (aerobic) and muscular fitness in healthy adults (American College of Sports Medicine, 1990). Most SEALs responding to the present questionnaire reported engaging in aerobic activities in frequencies (> 3 times/week), durations (> 30 minutes), and intensities (> 60%  $\dot{V}O_{2peak}$ ) necessary for the maintenance of aerobic fitness as established by the ACSM guidelines. All SEAL participants, except those in SDV Advanced Operator Training, performed running exercise exceeding the required volume. The high  $\dot{V}O_{2peak}$  reported for SEALs (Beckett et al., 1989) suggests that SEALs perform running at or above maintenance levels. However, from the previous profile data, platoon SEALs showed a diminished peak aerobic power after BUD/S training (Beckett et al., 1989). The literature suggests that reductions in peak aerobic power occurring with reduced training frequency may be counteracted by maintaining the training intensity in individuals of average peak aerobic power (Brynteson and Sinning, 1973; Hickson and Rosenkoetter, 1981; Hickson et al., 1982; Hickson et al., 1985; Neufer, 1989). The SEALs' average running pace reported in this study would elicit approximately 85% of SEALs' mean  $\dot{V}O_{2peak}$ , suggesting that the intensity is appropriate for maintaining the aerobic power in individuals of average aerobic fitness. However, there are few data on the characteristics of training required to maintain a high peak aerobic power.



Additionally, self-reports of the quantity of aerobic activity are often erroneous, especially in very active individuals (Klesges et al., 1990).

The previous profile data suggested that platoon SEALs have greater muscular strength than BUD/S trainees, which was attributed to a greater participation of SEALs in regular weight training (Beckett et al., 1989). In the previous study, only one BUD/S trainee participated in weight training more than three times per week, compared to 41% of platoon SEALs. In this study, 71% of SEALs reported regular participation in weightlifting exercise, with a mean frequency of 3.3 times/week. Frequency of participation is, however, only one component of strength development and maintenance.

The effectiveness of current SEAL strength conditioning programs may be evaluated by comparing SEAL strength levels with those of other athletes who must maintain high levels of both cardiorespiratory and strength fitness -- specifically, college football backs. Olson and Hunter (1985) surveyed the strength characteristics of Division I secondary defenders and offensive backs. Although these individuals are younger and somewhat larger than SEALs, they provide a reference group against which strength training outcomes may be evaluated. When normalized for body size (kg weight lifted per kg body weight), SEALs 1-RM for bench press (upper body) was comparable to, but slightly lower than, collegiate backs: 1.48 and 1.51 for SEALs and backs, respectively. Conversely, the normalized 1-RM squats were 1.73 and 2.02 for SEALs and backs, respectively. This relation is also seen when SEALs are compared to Division II college backs (Mayhew et al., 1987) and probably reflects the relative lack of SEALs' lower-body (compared to upper-body) strength training.

Limited data are available on the optimal quantities of conditioning activities required to maintain strength. The ACSM guidelines suggest at least two days per week of 8 to 12 repetitions per day to develop muscular strength. SEALs in this study performed, on average, according to these guidelines. However, many mission-essential tasks performed by SEALs require muscular power as well as strength and endurance. Neuffer and associates (1987) found that when swim training frequency was reduced from six times per week, muscular strength did not diminish over four weeks, even when training frequency was reduced to once per week. These competitive swimmers showed significant (13.6%) reductions in power, even when training frequency was dropped to three times per week. Thus, it is very important that the volume and intensity of strength training be maintained at a level sufficient to avoid a loss of muscular power.

These data provide a representative characterization of West Coast SEALs. Additional data were collected from East Coast SEALs and are currently being compared with the physical training habits and levels of aerobic and strength

fitness of West Coast SEALs. Although these data suggest that West Coast SEALs' volume of aerobic training (running, swimming, and cycling) meets ACSM guidelines for maintenance of aerobic conditioning, these levels appear somewhat modest compared to higher level recreational and club athletes. In contrast, exercises involving strength training (particularly upper-body training) received more attention and time than aerobic training. However, strength training produced outcomes only comparable to upper-body strength and somewhat poorer than lower-body strength of collegiate football backs.

Individuals in occupations requiring a high degree of aerobic fitness, muscular strength, endurance, and power must participate in conditioning activities with sufficient frequency and intensity to maintain high fitness levels. It appears that SEALs, on average, participate with sufficient frequency to maintain aerobic fitness, but the participation varies greatly among training activities. It also appears that platoon SEALs' peak aerobic power decreases significantly following BUD/S training. Overall, SEALs could attain higher levels of aerobic power and muscular strength through an increase in the volume of training, but these modifications must be individualized. Through education in basic principles of developing and maintaining aerobic power and strength, SEALs may implement better, and perhaps more uniform, training regimens, and effectively develop and maintain higher levels of aerobic and strength fitness than is demonstrated. The appropriate use of a combined aerobic and strength training program may prove to be a more effective method for SEALs to attain this goal. Additional research is needed to develop improved, efficient, and mission-specific physical training programs.

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**ATTACHMENT 1**  
**PHYSICAL ACTIVITY QUESTIONNAIRE**

# **PHYSICAL ACTIVITY QUESTIONNAIRE**

Name \_\_\_\_\_ Date \_\_\_\_\_

Height \_\_\_\_\_ Weight \_\_\_\_\_ Age \_\_\_\_\_ Organization \_\_\_\_\_

Years of experience in a SEAL Team \_\_\_\_\_ Social Security Number \_\_\_\_\_

## **CURRENT PHYSICAL ACTIVITY**

The following questions are designed to provide information about exercise habits. Please read the instructions carefully and complete this questionnaire to the best of your ability.

Circle the number that most closely represents your present status:

|                     |     |                           |     |
|---------------------|-----|---------------------------|-----|
| Combat Swimmer      | - 1 | Land Warfare              | - 2 |
| Maritime Operations | - 3 | Exercises                 | - 4 |
| Field Activities    | - 5 | Cold Weather Training     | - 6 |
| Classroom           | - 7 | Stand Down or Preparation | - 8 |
| Other               | - 9 |                           |     |

For SDV Team only:

|               |      |     |      |
|---------------|------|-----|------|
| Core Training | - 10 | AOT | - 11 |
|---------------|------|-----|------|

### **A. Frequency of Exercise (How many times per week or month do you exercise?)**

**Intensity** - In the blank space next to selected frequency, place the number that best describes the intensity of each particular exercise:

1-very easy; 2-easy; 3-; 4-moderately difficult; 5-; 6-difficult; 7-; 8-intense; 9-; 10-very intense

|                            | Never | 1-4X<br>Per<br>Month | 2X<br>Per<br>Week | 3X<br>Per<br>Week | 4X<br>Per<br>Week | 5X<br>Per<br>Week | 6X<br>Per<br>Week | 7X<br>Per Week<br>or More |
|----------------------------|-------|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|
| 1. Running                 | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 2. Scuba/snorkeling        | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 3. Swimming                | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 4. Bicycling               | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 5. Rowing                  | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 6. Continuous walking      | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 7. Aerobic exercise class  | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 8. Weightlifting           | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 9. Calisthenics            | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 10. Racket sports/handball | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 11. Basketball             | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 12. Baseball/softball      | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 13. Football               | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 14. Volleyball             | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 15. Boxing/wrestling       | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 16. Martial arts           | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 17. Obstacle course        | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |
| 18. Other (specify: _____) | 0     | 1__                  | 2__               | 3__               | 4__               | 5__               | 6__               | 7__                       |

**B. Duration of Workouts** (What is the average time per session you spend exercising?)

|                            | Not<br>Appli-<br>cable | Less<br>Than 11<br>Minutes | 11-20<br>Minutes | 21-30<br>Minutes | 31-40<br>Minutes | 41-50<br>Minutes | 51-60<br>Minutes | 61-119<br>Minutes | 2-3<br>Hours | More<br>Than<br>3 Hours |
|----------------------------|------------------------|----------------------------|------------------|------------------|------------------|------------------|------------------|-------------------|--------------|-------------------------|
| 1. Running                 | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 2. Scuba/snorkeling        | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 3. Swimming                | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 4. Bicycling               | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 5. Rowing                  | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 6. Continuous walking      | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 7. Aerobic exercise class  | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 8. Weightlifting           | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 9. Calisthenics            | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 10. Racket sports/handball | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 11. Basketball             | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 12. Baseball/softball      | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 13. Football               | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 14. Volleyball             | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 15. Boxing/wrestling       | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 16. Martial arts           | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |
| 17. Other (specify: _____) | 0                      | 1                          | 2                | 3                | 4                | 5                | 6                | 7                 | 8            | 9                       |

**C. Exercise History** (How long have you been on this or a similar schedule?)

|                            | Not<br>Appli-<br>cable | Less<br>Than 1<br>Month | 1-3<br>Months | 4-11<br>Months | 1-2<br>Years | 3-4<br>Years | 5 Years<br>or More |
|----------------------------|------------------------|-------------------------|---------------|----------------|--------------|--------------|--------------------|
| 1. Running                 | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 2. Scuba/snorkeling        | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 3. Swimming                | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 4. Bicycling               | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 5. Rowing                  | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 6. Continuous walking      | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 7. Aerobic exercise class  | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 8. Weightlifting           | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 9. Calisthenics            | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 10. Racket sports/handball | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 11. Basketball             | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 12. Baseball/softball      | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 13. Football               | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 14. Volleyball             | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 15. Boxing/wrestling       | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 16. Martial arts           | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |
| 17. Other (specify: _____) | 0                      | 1                       | 2             | 3              | 4            | 5            | 6                  |

D. Exercise Surfaces/Equipment (How often do you exercise on these surfaces/use this equipment?)

|   | Not<br>Appli-<br>cable | 1-4X<br>Per<br>Month | 2X<br>Per<br>Week | 3X<br>Per<br>Week | 4X<br>Per<br>Week | 5X<br>Per<br>Week | 6X<br>Per<br>Week | 7X<br>Per Week<br>or More |
|---|------------------------|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|
| 1. Run on soft sand                         | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 2. Run on hard sand or packed dirt          | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 3. Run on grass                             | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 4. Run on asphalt                           | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 5. Run on concrete                          | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 6. Run on artificial track surface          | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 7. Scuba/snorkel in pool                    | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 8. Scuba/snorkel in ocean                   | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 9. Scuba/snorkel with fins                  | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 10. Scuba/snorkel without fins              | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 11. Swim in pool                            | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 12. Swim in ocean                           | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 13. Swim with fins                          | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 14. Swim without fins                       | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 15. Bicycle on the road                     | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 16. Bicycle on a stationary cycle           | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 17. Row a boat or shell                     | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 18. Row on a machine                        | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 19. Play racket sports/handball on wood     | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 20. Play racket sports/handball on asphalt  | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 21. Play racket sports/handball on concrete | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 22. Play basketball on wood                 | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 23. Play basketball on asphalt              | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 24. Play basketball on concrete             | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 25. Play volleyball on sand                 | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 26. Play volleyball on grass                | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 27. Play volleyball on wood                 | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 28. Play volleyball on asphalt              | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |
| 29. Play volleyball on concrete             | 0                      | 1                    | 2                 | 3                 | 4                 | 5                 | 6                 | 7                         |

H. Weightlifting (If you do not lift weights, skip this section)

Repetition = one complete exercise movement

Set = a number of continuous repetitions

1-repetition maximum = the greatest weight that can be lifted in one repetition

Intensity (In this column, place the number that best describes the intensity of each particular exercise):

1-very easy; 2-easy; 3-; 4-moderately difficult; 5-; 6-difficult; 7-; 8-intense; 9-; 10-very intense

Modality (In this column, place the number that best describes the modality of each particular exercise):

1-free weights; 2-universal; 3-nautilus; 4-friction or hydraulic resistance; 5-other

IF YOUR SETS, REPETITIONS, OR LOADS VARY, USE THE AVERAGE FOR YOUR RESPONSE TO THESE QUESTIONS

Body Weight: \_\_\_\_\_ pounds

| Exercise            | 1 Repetition<br>Maximum | Sets  | Repetitions | Intensity | Average<br>Weight | Duration* | Modality |
|---------------------|-------------------------|-------|-------------|-----------|-------------------|-----------|----------|
| Neck                | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Upright Rowing      | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Bent Rowing         | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Bench Press         | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Military Press      | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Incline Press       | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Biceps Curl         | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Triceps Curl        | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Wrist Curl          | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Sit-up with weights | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Leg Press           | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Squat               | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Leg Curl            | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Toe Raises          | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Latissimus Pull     | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Leg Extension       | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Stair Climb         | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| Others (specify)    | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| _____               | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| _____               | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |
| _____               | _____                   | _____ | _____       | _____     | _____             | _____     | _____    |

\*Entire time spent performing this exercise, including rest between sets.



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