

A Study of Panic in Recreational Scuba Divers

by David F. Colvard, MD and Lynn Y. Colvard, PhD

Introduction

Out of millions of certified divers, about 90 recreational scuba divers have died each year during the past decade, but little is known about the precipitating events for many of these deaths. A coroner's report of "drowning" tells us nothing about what led to, or caused, a diver's death. Bachrach and Egstrom state in *Stress and Performance in Diving* (1987), "Most researchers in diving accidents implicate panic, as a response to stress, as the major cause of diving fatalities." In *Medical Examination of Sport Scuba Divers* (1998), Alfred Bove states, "panic, or ineffective behavior in the emergency situation when fear is present, is the single biggest killer of sport divers." The 1998 Recreational Scuba Training Council (RSTC) guideline for the Recreational Scuba Diver's Physical Examination listed "a history of panic disorder" as an absolute contraindication to scuba diving. However, the 2001 guideline lists "a history of untreated panic disorder" as a severe risk condition, recognizing that many individuals now receive treatment for this condition and could possibly dive at less risk.

In a 1987 survey of 254 recreational scuba divers, William Morgan reported that 64 percent of female respondents and 50 percent of male respondents had "panic or near-panic" episodes while diving on one or more occasions. Clearly, panic while diving rarely results in death. (One could point out that there is no way to determine panic in accidents resulting in fatalities.) So what is going on? For one thing, not everyone who has panic meets the *American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders*, 4th Edition, (DSM-IV, 1994) criteria for a panic attack or panic disorder. The goal of our study was to examine the incidence of panic while diving, the relationship to a history of panic prior to diving and the results of panic during a dive.

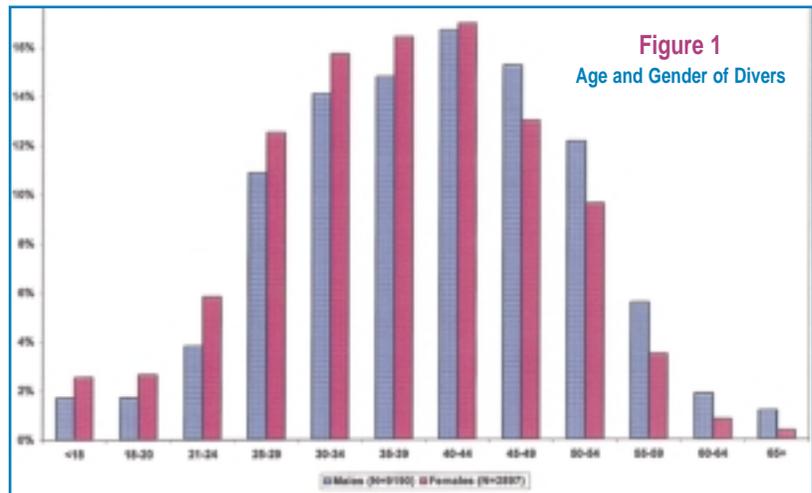
Methods

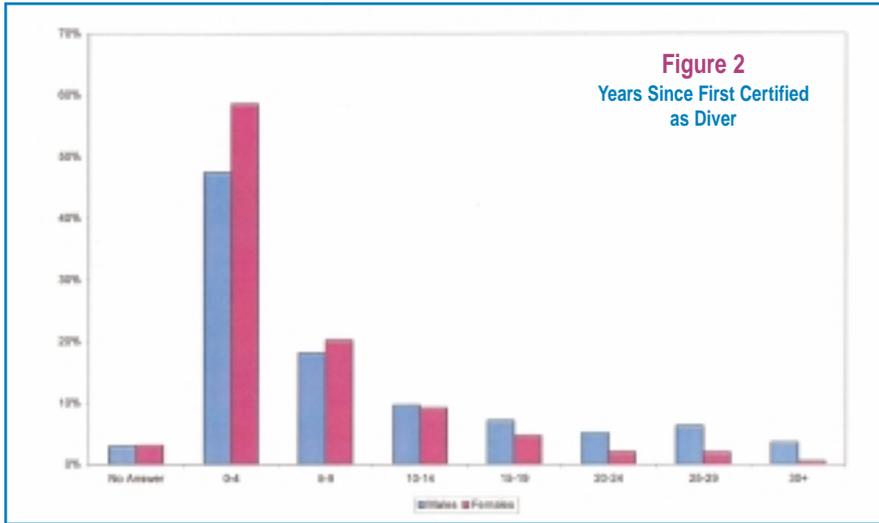
With the help of Rodale's *Scuba Diving* magazine and website, and PADI, which provided a hotlink through its e-newsletter, Dear Fellow Diver, to about 200,000 divers, we surveyed certified recreational scuba divers from 14 September 2000 to 2 January 2001. The survey addressed demographics, diver certification, dive history and any history of panic while diving or at other times. Because "panic" can be an imprecise or vague term used in a casual sense, the survey defined a panic experience as "an intense fear of losing control or dying," consistent with a panic attack as defined by the APA in DSM-IV. "[The] essential feature of a Panic Attack is a discrete period of intense fear or discomfort that is accompanied by at least 4 of 13 somatic or cognitive symptoms... often accompanied by a sense of imminent danger or impending doom and an urge to escape...or desire to flee from wherever the attack is occurring." An expected result of a diver having a panic attack would be a rapid ascent or other flight response. Respondents with a panic experience while diving were directed to additional questions about the situation and results of the panic.

The data were sorted according to history of panic prior to diving and panic during diving, and were compared while controlling for gender and whether the first panic during diving occurred during or after initial training. The relative risks and 95 percent confidence intervals were computed from the incidence rates of first panic. The calculations were made using the computer program "Confidence Interval Analysis" from *Statistics With Confidence*, 2nd edition, Altman, et al, BMJ Books 2000. (Relative risk is the ratio of the incidence of some outcome in two groups of individuals defined by the presence or absence of some characteristic.)

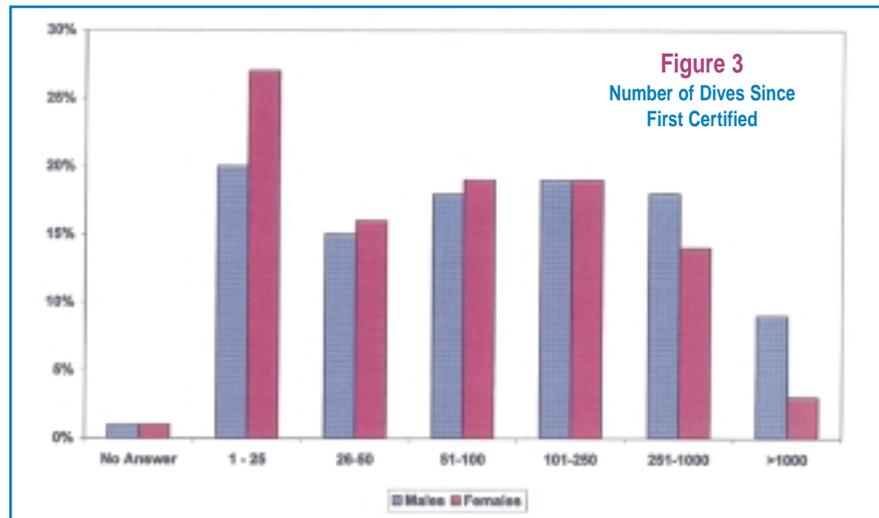
Results

Demographics — Complete responses came from 12,087 individuals; 76 percent male and 24 percent female, with more than 60 percent being PADI-certified divers. We categorized the divers into two groups: Those with a history of panic prior to diving and those with no history prior to diving. We subdivided them into those who had a panic on a dive, and those who had not. Age, years diving and lifetime number of dives were similar for each group, as shown in the following figures. The average range of dives during the past three years was 26-50 for both males and females.

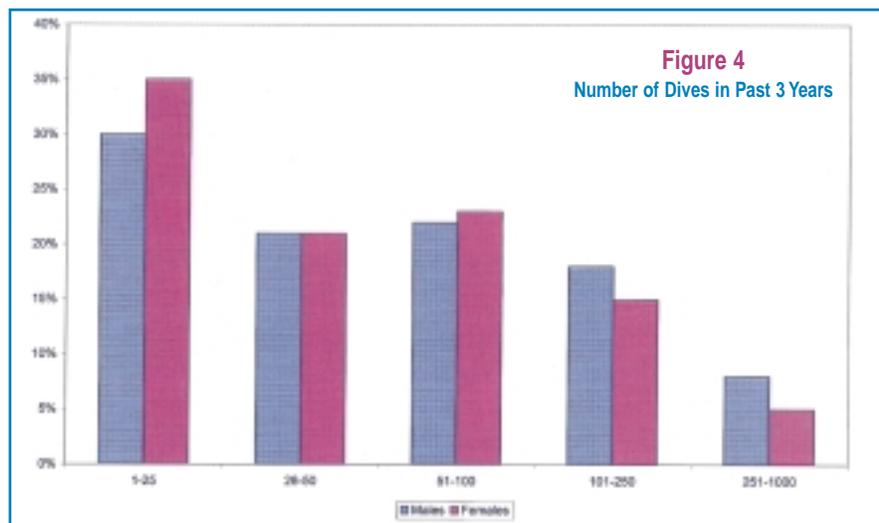




Most divers (47 percent of males and 59 percent of females) had been certified for less than five years.



The average range of dives since initial certification was 51-100 for males and 26-50 for females.



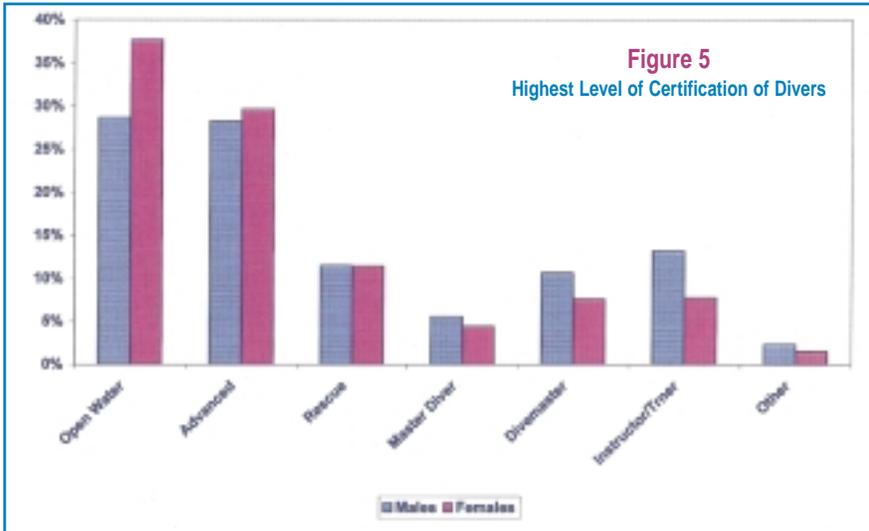
The average range of dives during the past three years was 26-50 for both males and females.

Incidence of panic and prediving panic in divers — Similar percentages of males and females (16 percent and 18 percent, respectively) reported a history of panic before they took up scuba diving. But, overall, significantly more females reported one or more panic experiences while diving (37 percent versus 24 percent of males). Probability (p) was calculated to better than 99.99 percent confidence that this difference wasn't random ($p < 0.0001$). Forty-five percent of males and 57 percent of females with a history of panic before they began diving reported panic during one or more dives, compared to only 19 percent of males and 33 percent of females without a prediving panic history ($p < 0.0001$ for both). [Editor's note: References to "prediving panic" indicate prior to becoming involved with diving, not panic immediately prior to a specific dive.]

The risk ratio for a first panic during a dive for divers with a prediving panic history compared to those without was 2.3 for males (95 percent confidence interval, 1.9 to 2.7) and 1.7 for females (95 percent confidence interval, 1.4 to 2.0). This means that individuals with a prediving history of panic are about twice as likely to panic while diving compared to those without a prediving history of panic.

Panic during and after initial certification training — Eleven percent of males with a prediving history of panic experienced their first dive panic during their initial certification training, compared to four percent of those without a prediving history of panic. Thirty-four percent of males with a prediving history of panic had their first dive panic after their initial training, compared to only 16 percent of those without a prediving history of panic. Twenty-one percent of females with a prediving history of panic had their first panic experience during their initial training compared to 11 percent of those without a prediving history of panic. Thirty-five percent of females with a prediving history of panic had their first dive panic after their initial training, compared to 21 percent of those without a prediving history of panic.

For both males and females whose first



Open Water Diver was the most common highest level of certification (29 percent of males and 38 percent of females).

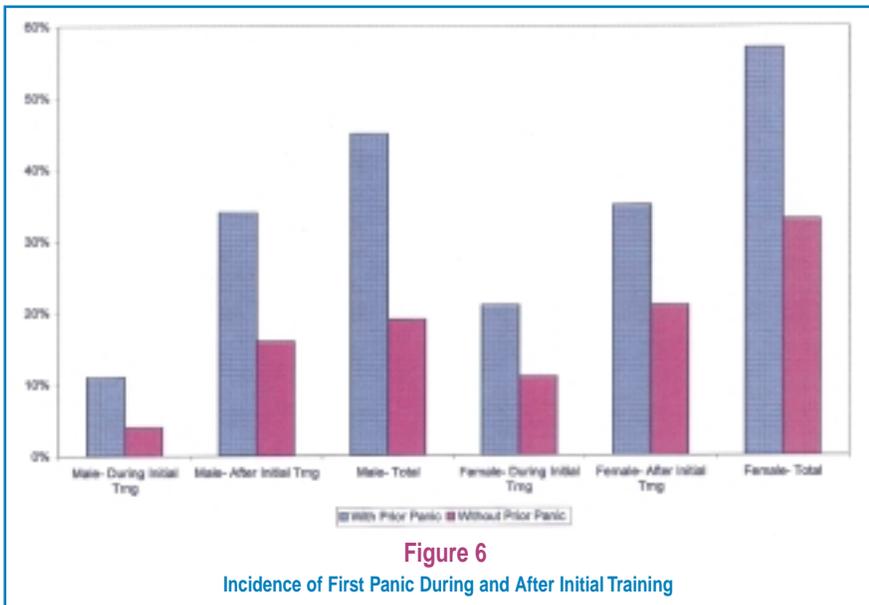


Figure 6
Incidence of First Panic During and After Initial Training

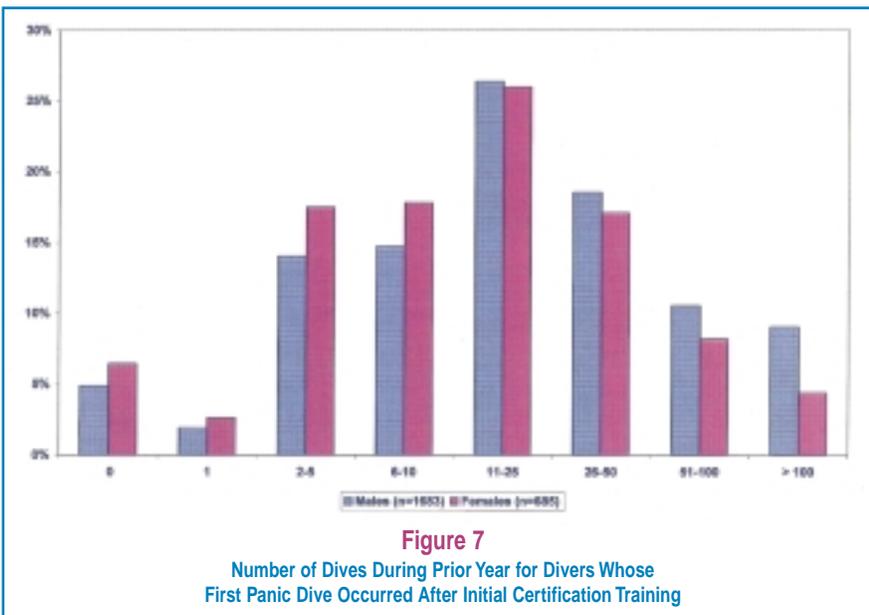


Figure 7
Number of Dives During Prior Year for Divers Whose First Panic Dive Occurred After Initial Certification Training

dive panic occurred after their initial training, the average number of dives during the year prior to the first panic experience during a dive was 11-25 dives, suggesting that recent dive activity made little difference.

We found no statistically significant difference in the highest certification levels attained between divers with or without panic during diving. Unfortunately, the survey did not ask the level of certification at the time of the panic dive, just the highest level they had obtained at the time of the survey.

Prediving history of panic and number of panic experiences during diving — A prediving history of panic was also associated with having multiple panic experiences during diving. Thirty-eight percent of males and 41 percent of females with a prediving history of panic reported more than one panic experience while diving, compared to only 25 percent of males and 30 percent of females without ($p < 0.0001$ for males and $p < 0.001$ for females). The risk ratio for having more than one panic experience while diving for divers with a prediving history of panic compared to those without a prior history was 1.5 for males (95 percent confidence interval, 1.1 to 2.0) and 1.4 for females (95 percent confidence interval, 1.0 to 1.9).

Incidence of panic and subsequent panic in divers — Some divers reported panic before and after they began diving, but not during diving (two percent of all divers). Others reported having their first panic during diving and then having another, nondiving panic (two percent of all males and three percent of all females). Still other divers reported a prediving history of panic, panic during diving and panic after they began diving (three percent of all males and four percent of all females).

Diver's perceptions and consequences of first panic experience during a dive — Males and females differed in their perceptions and reactions to their first panic during a dive. While females were more likely to have a panic during a dive (37 percent versus 24 percent, $p < 0.0001$), more males perceived their first panic during a dive as life-threatening (37 percent versus 27 percent, $p < 0.0001$).

Table 1. Relative Risk of First Panic With vs. Without Prediving Panic

	Relative Risk (95% C.I.)
Males – Total (N = 9190)	2.3 (1.9, 2.7)
Males - Panic during initial training (N = 1426)	3.2 (2.6, 3.8)
Males - Panic after initial training (N = 7764)	2.1 (1.9, 2.3)
Females - Total (N = 2897)	1.7 (1.4, 2.0)
Females - Panic during initial training (N = 527)	1.9 (1.6, 2.3)
Females - Panic after initial training (N = 2370)	1.6 (1.4, 1.9)

Table 2. Diver Response to First Panic Attack During Diving

	Males (N = 2206)	Females (N = 1099)
Remembered Training	82%	77%
Used Training	81%	73%
Recognized Offer of Help*	38%	67%
Made Rapid or Uncontrolled Ascent	15%	15%
Obtained More Training	82%	80%

*p<0.0001

Most divers who had a panic during a dive reported they remembered their training in how to deal with panic and used that training (81 percent of males and 73 percent of females). More females than males recognized offers of help during their first dive panic experience (67 percent versus 38 percent, $p < 0.0001$).

Fifteen percent of both males and females made a rapid or uncontrolled ascent during their first panic while diving. But, within that 15 percent, only five percent of males and four percent of females reported signs or symptoms of DCI, and only one percent of males and two percent of females underwent recompression. Only one reported a permanent injury: Residual numbness in the left toes after five years. Granted, deceased divers made no reports of injuries or deaths. Eighty-two percent of males and 80 percent of females obtained additional training or retraining as a result of their first dive panic.

Discussion

Demographics — Seventy-six percent of our respondents were male and 24 percent were female, comparing favorably with 75.6 percent male recreational divers reported in a Rodale's *Scuba Diving* random subscriber survey of August 2000. The median age of our male and female survey respondents was 35 to 39 years old. A Gallup Organi-

zation random telephone poll in December 1997 and January 1998 found the average active diver is 36 years old, with about 62 percent of divers between 25 and 44.

Our survey participants differed from those in other published polls in at least two ways: certification level and dive activity. Essentially all our participants were certified, however, in the previously mentioned Gallup poll, only 29 percent of those who had tried scuba diving were certified recreational divers. Our participants were also certified to higher levels: 71 percent of males and 62 percent of females had certifications beyond open water, compared to only 56.6 percent in a recent Rodale's *Scuba Diving* survey.

In all fairness, uncertified and certified divers who had dropped out of the sport were unlikely to have participated in the survey. Divers who dropped out of diving because of severe panic problems while diving would not be represented in the survey unless they had maintained a passive interest or a friend or spouse encouraged them to participate in the survey. Analysis of the survey suggested that most respondents were active certified divers, with 70 percent of males and 65 percent of females having made more than 25 dives in the past three years.

Incidence of panic — The incidence of panic during diving reported in our survey was

lower than that reported by Morgan and Griffiths. One explanation could be that Morgan and Griffiths asked about "panic or near panic" without further definition, which would broaden what a respondent might report as a "panic experience." Our survey asked only about panic and, as noted earlier, provided a limited definition. We also found that 82 percent of males and 77% of females remembered their training in response to the first panic attack. This contradicts previous conclusions.

Conclusions

Within a 95 percent confidence interval, the survey found that male recreational scuba divers with a prediving history of panic were 1.9 to 2.7 times as likely to panic during a dive as those without a prior history. Females with a prediving history of panic were 1.4 to 2.0 times as likely as those without a prior history. Most divers who panicked during a dive reported they remembered their training in how to deal with panic and used that training. Eighty-five percent of those who panicked while diving did not make a rapid or uncontrolled ascent. Even among the 15 percent who made a rapid or uncontrolled ascent, only five percent of males and four percent of females reported suffering from symptoms of decompression illness.

Limitations of Survey

This survey and its conclusions have obvious limitations. First, the survey was not random: A large number of participants does not make up for possible selection bias. Our participants were self-selected and there is no way to know how representative they were of the certified recreational diver population. This was a survey of active divers and may tell us nothing about other divers. Little is known about divers who drop out of the sport or what leads to their dropping out. If panic dives led many of them to drop out and lose interest in the sport, then this survey's results must be interpreted very conservatively. On the other hand, this survey shows that many divers are able to continue diving despite having experienced panic while diving.

Second, our survey was retrospective and

subject to convenient and favorable revision of memories by participants. A prospective study is needed using new dive students before their first training session and then following up with them each year for at least three years. Such a study might also offer new information as to what leads divers to drop out of the sport.

Third, the data provided by participants was self-reported. We did not ask to see dive logs or certification cards, etc. We made no attempts to verify information or claims other than to follow up by email on seemingly extreme and mutually exclusive responses. Some respondents volunteered additional information and a few offered to have their medical records sent to me and asked for advice. Over the two years since the study began, we have been impressed with how eager divers were to talk about their panic dive experience and how much they wanted to help us understand what had happened to them. ♦

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What is Panic?

Panic Attack:

A discrete period of intense fear or discomfort, in which four (or more) of the following symptoms developed abruptly and reached a peak within 10 minutes:

1. palpitations, pounding heart, or accelerated rate
2. sweating
3. trembling or shaking
4. sensations of shortness of breath or smothering
5. feeling of choking
6. chest pain or discomfort
7. nausea or abdominal distress
8. feeling dizzy, unsteady, lightheaded or faint
9. derealization (feelings of unreality) or depersonalization (being detached from oneself)
10. fear of losing control or going crazy
11. fear of dying
12. paresthesias (numbness or tingling sensations)
13. chills or hot flashes

Panic Disorder:

1. recurrent unexpected panic attacks
2. at least one of the attacks has been followed by one month (or more) of one (or more) of the following:
 - persistent concern about having additional attacks
 - worry about the implications of the attack or its consequences (e.g., losing control, having a heart attack, "going crazy")
 - a significant change in behavior related to the attacks
3. The panic attacks are not due to the direct physiological effects of a substance (e.g., drug abuse, a medication) or a general medical condition (e.g., hyperthyroidism).

The panic attacks are not better accounted for by another mental disorder, such as Social Phobia, etc.

From the American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, 4th Edition. Washington, DC, American Psychiatric Association, 1994, p. 394-403.

Editor's Note:

What the Panic Survey Tells Us About Diver Training

The panic survey has some interesting implications for diver training. The data suggest that training is largely effective; 81 percent of males and 73 percent of females reported remembering their training in the emergency. Eight-five percent made no panicked ascent, and only five percent of those who did reported DCI symptoms.

This supports current training protocols; panic arises when individuals lack solutions to a critical problem. One training goal is to provide responses; the survey indicates that most respondents drew upon their training.

The data suggest divers with a pre-dive panic history are about twice as likely to panic as those without. Those with a pre-dive panic history were also more likely to have more than one panic episode.

All divers benefit from repetitive skill practice. The more familiar divers are with skills, the more likely they are to respond appropriately to panic. Repeated practice in confined water, including spontaneous drills, raises the response availability level.

Student divers who show elevated stress may be more panic prone. This may be evident if they exhibit stress when unsuccessful with a new skill, like standing abruptly when mask clearing in shallow water. These individuals benefit from repetition, though the practice required may be higher than for other individuals.

Females were almost twice as likely to recognize help than males. The data don't show why, but cultural influence is a reasonable speculation. Male self-reliance is common in many cultures. Asking for help may threaten male esteem, or males may be conditioned to not readily look for assistance.

Emphasizing diving as a team activity may help make males more receptive to external assistance and may offset self-esteem issues by relating asking for and accepting help with the characteristics of a good diver.