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Effects of Failure on Subsequent Performance in the Bottlenose Dolphin (*Tursiops truncatus*)

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EFFECTS OF FAILURE ON SUBSEQUENT PERFORMANCE IN THE

BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*)

by

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ABSTRACT

EFFECTS OF FAILURE ON SUBSEQUENT PERFORMANCE IN THE BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*)

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The current study examined the immediate effects of two types of failure during operant-conditioning based training sessions in 11 bottlenose dolphins (*Tursiops truncatus*) at the U.S. Navy Marine Mammal Program in San Diego, CA. While learning a multi-faceted behavior not commonly found in nature, such as beaching, animals are likely to perform approximations of the behavior that are not successful and do not result in reinforcement. The effects of failure on beaching trials were systematically investigated over a three-month period by determining the mean failure rate and the probability of success after initial success, initial attempts, and initial no-attempts. This study, the first to analyze failure response types in bottlenose dolphins, showed that four subjects' mean performance decreased after either initial attempts or initial no-attempts when compared to initial success, and two subjects' mean performance was enhanced by either initial attempts or initial no-attempts when compared to initial success. Five subjects' mean performance was not affected by initial attempts and initial no-attempts. Both types of failure decreased performance. However, only initial no-attempts increased performance. In addition, several individuals had a mean failure rate that differed based on the trainer, time of day, criteria, mat type, number of sessions, and hand station requests. This study demonstrated that initial failure was not solely responsible for subsequent performance.

DEDICATION

I dedicate this thesis to my family: Debra Tullis, Jerry Lauderdale, Dr. Lindsey Lauderdale, and Teddy Lauderdale. Thank you for your unconditional love and continual support in all aspects of my life, especially during the pursuit of this degree. I cannot explain how incredibly grateful I am to have you. To my family, I thank you.

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I would like to extend my deepest thanks to the U.S. Navy Marine Mammal Program for accepting me as an intern several years ago and allowing me to return to collect my thesis data. My sincerest thanks to all of their trainers for answering my endless stream of questions about training and their invaluable assistance during data collection.

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Last, but certainly not least, I am indebted to the dolphins that participated in this study. Thank you for allowing me to uncover a clue to solving your great mystery. On to the next adventure!

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CHAPTER I

INTRODUCTION

In recent decades, the effects of error on learning have been widely explored in relation to memory performance in human subjects with memory impairments (see Clare & Jones, 2008, for a review), test taking (Kornell, Hays, & Bjork, 2009; Kornell, 2014; Metcalfe, Kornell, & Finn, 2009; Richland, Kornell, & Kao, 2009), and motor learning (Capio, Poolton, Sit, Eguia, & Masters, 2013; Maxwell, Masters, Kerr, & Weedon, 2001; Orrell, Eves, & Masters, 2006; Poolton, Masters, & Maxwell, 2007). These lines of inquiry focused on the influences of error on learning and behavioral robustness in humans. Results have supported both errorless and errorful learning, dependent upon the type of task and the methodology used. While study methods vary widely, the majority of studies contrasted errorful learning (E+) to errorless learning (E-). E+ conditions used techniques that encouraged error, supporting the view that errors enhanced learning (Ohlsson, 1996). E- conditions were designed to prevent error and/or limit incorrect responses, supporting the view that errors inhibited learning (Terrace, 1963).

Error Experience

Past research has provided little support for E+ in the motor learning domain; however, E+ was beneficial when taking tests and recalling test information (Hays, Kornell, & Bjork, 2013; Huelser & Metcalfe, 2012; Knight, Ball, Brewer, DeWitt, & Marsh, 2012; Kornell et al., 2009; Richland et al., 2009; Roediger & Karpicke, 2006), and E+ procedures either had no affect or increased learning in subjects with dementia, Korsakoff's syndrome, brain injuries, or in healthy adults (Anderson & Craik, 2006; Dunn & Clare, 2007; Evans et al., 2000; Kessels, van Loon, & Wester, 2007). When comparing E+ procedures to E- procedures over time, Squires and colleagues found that memory-impaired patients performed worse in E+ conditions on immediate verbal association tests than those in E- conditions, but had equivalent responses on delayed tests (Squires, Hunkin, & Parkin, 1997).

In recent decades, the effects of error on learning, while completing a motor task, have received increased attention. Masters (1992) addressed this topic by teaching subjects a golf-putting task and then tested them while under stress. Participants were placed in an explicit condition, in which they were given specific written instructions on how to putt, or an implicit condition, in which learned to putt without instruction. Individuals in the explicit condition generated more explicit knowledge than individuals in the implicit condition while learning the task. While under stress, the implicit group showed no degradation in performance, the performance of the explicit group was impaired. Masters suggested that, under stress, the processing of verbal knowledge accrued by the explicit group resulted in failure due to disruption in the automaticity of the skill. In contrast, the implicit group which acquired the skill with little corresponding knowledge of the rules were less likely to fail because they had less knowledge to reinvest while under stressful conditions.

Maxwell, Masters, Kerr, and Weedon (2001) expanded upon Masters' results by directly comparing an E- strategy to an E+ strategy. This study addressed how the number of errors made while learning a golf-putting task (in either an E- or an E+ condition) influenced the adoption of selective or unselective learning styles. According to Maxwell et al., a selective learning style involved the conscious processing of task-relevant information using a hypothesis-testing strategy and verbal rules. An unselective learning style required unconscious learning of the skill, allowing it to become automated, and verbal rules were no longer required. Reducing the number of errors committed during a learning period reduced the number of error-correcting hypothesis tests completed by the participant. Thus, skills acquired with few errors required less attention-demanding resources than skills acquired in an E+ environment.

Furthermore, the performance of E- participants was unaffected when placed under stress from a secondary task. The E+ participants had decreased performance under the secondary task load. Maxwell and colleagues concluded that an E- strategy increased the use of unselective learning processes and led to an increased resistance to breakdown when the skill was performed under a distracting or stressful situation (Maxwell et al., 2001).

Poolton, Masters, and Maxwell (2005) expanded upon this topic by showing that the E+ group were more likely to use a hypothesis testing strategy. Hypothesis testing behavior involved the production and assessment of movement strategies in working memory leading to explicit knowledge. When placed under a secondary task load, the performance of participants with explicit knowledge was impaired. Conversely, participants who completed fewer errors in the E- condition were less constrained by working memory control because they engaged in less hypothesis testing when initially learning the task. This group generated less explicit knowledge, and sustained their performance under a secondary task load, which required count the number of high frequency tones played from a computer. Further, tasks utilizing E- in the early stages were more likely to remain stable under physical fatigue (Poolton et al., 2007). E- also enhanced the performance of adults with transtibial amputations in a golf-putting task when compared to those who learned in E+ conditions (Donaghey, McMillan, & O'Neill, 2010).

Children have benefited from an E- style as well. While learning an overhand throwing task, fewer errors led to a more robust performance under a secondary task load (Capio, Poolton, Sit, Holmstrom, & Masters, 2013). Children with mild intellectual disabilities learning in an E- condition outperformed those in an E+ condition and were more successful under a secondary task load (Capio, Sit, Abernethy, & Masters, 2012).

Error experience also affected speech motor task learning and reaction times. Wong, Tse, and Ma (2013) concluded that participants in E- conditions more effectively learned and transferred a novel speech motor task than those in E+ conditions. Additionally, Koehn, Dickinson, and Goodman (2008) found that higher cognitive demands were associated with processing errors, which was reflected in participants' response times.

White, Spong, Cameron, and Bradford (1971) established that E- training procedures were more effective in training a visual discrimination task in orcas than E+ procedures (i.e., trial and error). The two subjects were unable to solve the visual task under trial and error training. However, when E- training was implemented, they learned the visual task in a relatively few number of trials. In addition, the reduced number of errors committed during E- training led to fewer emotional outbursts, characterized by increased response latencies and vocalizations. During one-trial learning in macaques, errors committed prior to a first correct response negatively affected performance on the second presentation of a stimulus (Brasted, Bussey, Murray, & Wise, 2005; Rupniak & Gaffan, 1987).

Individual Differences

Very few studies investigating error experience have given any consideration to individual differences. One exception, a study by Loh and colleagues, found that individual differences in ability level moderated the effects of training style in humans (Loh, Andrews, Hesketh, & Griffin, 2012). In contrast, individual differences in dolphin personality and cognition have been documented in several areas. Personality assessments of captive dolphins revealed stable individual personalities (Highfill & Kuczaj, 2007). Further, dolphins exhibited consistent differences in feeding behavior (Gazda, Connor, Edgar, & Cox, 2005), maternal style (Hill, Greer, Solangi, & Kuczaj, 2007), dominance level (Samuels & Gifford, 1997), and leadership (Lewis, Wartzok, & Heithaus, 2010).

Purpose of Study

No studies have examined how different types of failure (i.e., attempting and not attempting the behavior) affects future performance in a training session utilizing successive approximations. The present study explored responses to two types of failure, while learning a trained beaching behavior in the bottlenose dolphins (*Tursiops Truncatus*), by evaluating the changes in the rate of failure following initial success, initial attempts, and initial no-attempts.

The following research questions were examined: (1) Does failure increase or decrease the probability of subsequent success?; (2) Does failure increase or decrease the probability of subsequent attempts?; (3) Does failure increase or decrease the probability of continued participation in the training session?; (4) Do dolphins exhibit qualitative differences in their response to failure?

CHAPTER II

METHODOLOGY

Beaching Behavior

Beaching was a trained behavior used to transfer dolphins from the water to a cushioned transport mat onboard a boat. To perform this behavior, the subject was presented with the hand station discriminative stimulus (S^D) followed by the beach S^D (Figure 1, Appendix A). After the beach S^D was presented, the trainer moved backwards on the mat and repositioned their hand to indicate the distance the dolphin was required to beach (i.e., the target distance). The trainer's hand remained at this distance until the subject touched it with their rostrum. The distance the dolphin was required to beach varied across trials, and the farthest requested distance in each session increased as the dolphin became proficient at shorter distances. Four types of mats were used to facilitate training using successive approximations and included: full mat, half mat, scale mat, and split mat (Appendix B).

The beaching behavior was an ideal model to investigate error experience for several reasons. First, this behavior was difficult to learn, and dolphins regularly failed and occasionally stopped participating. Second, beaching was partitioned into specific criteria, which provided a clear distinction between success and failure. Lastly, unlike most challenging trained behaviors, beaching was generally practiced several days of the week. These qualities provided a unique opportunity to systematically explore the influence of failure on future responses.

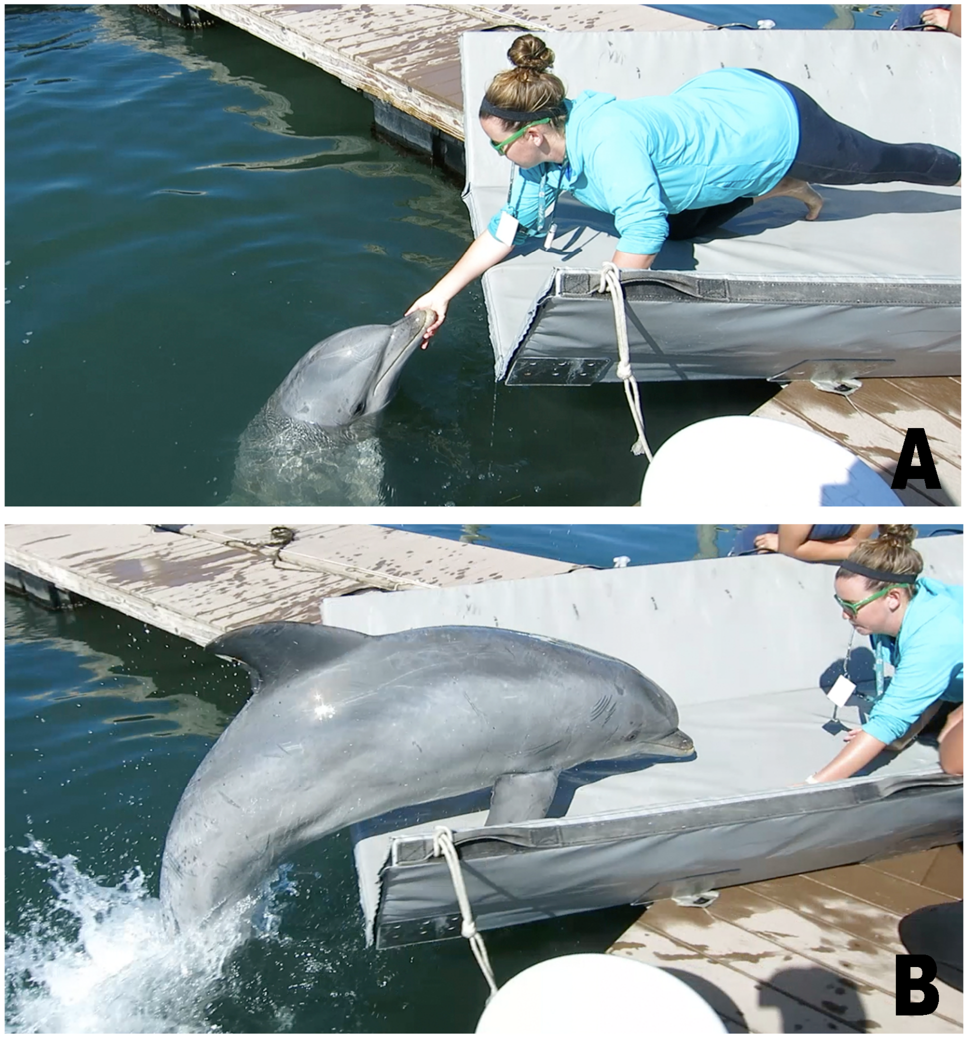

Figure 1. Photo A: Dolphin responds to the hand station S^D that precedes the beach S^D. Photo B: Dolphin beaches onto the half mat.

Subjects and Facility

The subjects consisted of 11 Atlantic bottlenose dolphins: nine males (two sub-adults, three juveniles, and four calves) and two females (both sub-adults) (Table 1). The subjects were housed in floating netted enclosures at the U. S. Navy Marine Mammal Program in San Diego Bay, California. The dolphins lived in a series of connecting 9m x 9m and 9m x 18m enclosures, which exposed them to natural tides and temperature changes as well as native flora, fauna, and human activities common in the bay. The subjects were selected because they regularly participated in beaching sessions, with beaching criteria requiring no less than one third of their body on the mat and completed no more than short transports (i.e., the boat is driven a short distance). Subjects began learning the initial approximations of the beaching behavior as calves, and therefore the length of prior experience varied for each subject.

Table 1

Study Participants

Dolphin	Gender	Age Class
Dolphin A	Male	Sub-Adult
Dolphin B	Female	Sub-Adult
Dolphin C	Male	Calf
Dolphin D	Male	Calf
Dolphin E	Male	Sub-Adult
Dolphin F	Male	Calf
Dolphin G	Male	Juvenile
Dolphin H	Male	Juvenile
Dolphin I	Male	Juvenile
Dolphin J	Male	Calf
Dolphin K	Female	Sub-Adult

General Procedure

The author collected the data using a Canon Powershot S110 video camera. Beaching sessions were recorded from May 2014 to August 2014, yielding a total of 42 hours and 24 minutes of video, which included 524 training sessions. Training sessions were recorded as part of the dolphins' normal training routine; therefore, failure was neither induced nor prevented. Before each session, an observation form was completed to note session information, including subject, session number, time of day, session goals and mat type (Appendix C). The number of sessions, session length, number of trials, time of day, and criteria (Appendix A) were at the discretion of the trainer.

Data Coding and Reliability

Each session was coded to identify the distance criterion, distance beached, and trial outcome (Appendix A). The outcome for each trial was coded as *success*, *attempt,* or *no-attempt*. The trainer determined the trial outcome based upon the extent to which the dolphin met the criterion set for each trial. The distance criteria were coded with respect to how much of the subjects' body was on the mat. To standardize the distance across individuals of different sizes, the body length of the dolphin was divided into 32 numbered units (Figure 2) to ensure the criterion and distanced beached could be reliably coded. In the event observers were unable to determine the distance criterion or distance beached, observers coded conservatively by indicating that the distance was unknown.

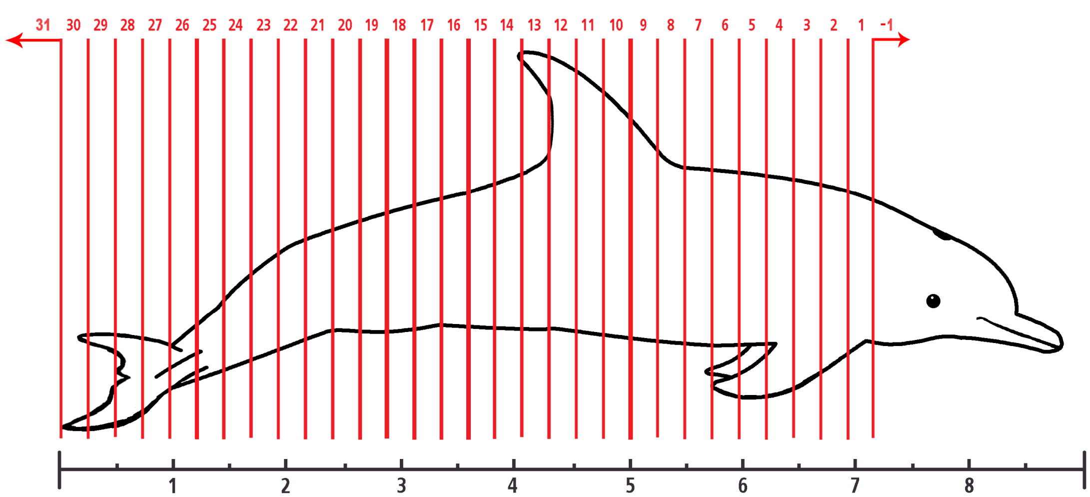

Figure 2. The location of each distance criterion in relation to the dolphin's body.

Inter-observer agreement (IOA) was evaluated for the distance criteria, distance beached, and trial outcome. IOA was achieved across subjects using 20% of the data with both coders reaching at least 80% reliability (Haidet, Tate, Divirgilio-Thomas, Kolanowski, & Happ, 2009). Cohen's Kappa was calculated to verify agreement, of at least 0.81, among raters on the trial outcome (Landis & Koch, 1977). Interrater reliability was found to be Kappa = 0.985 ($p < 0.001$), 95% CI (0.967, 1.002), indicating almost perfect agreement. A Pearson's correlation coefficient was calculated to measure pairwise correlation among raters for criteria on a continuous scale (Burghardt et al., 2012). There was a strong positive correlation on the distance criterion ($r = .999$) and distanced beached ($r = .998$).

Statistical Analysis

Statistical analyses were computed for within-session initial trial and outcome trial relationships. That is, the last trial of a session was not considered to be the previous trial for the next session. The mean rate of failure (i.e. attempt and no-attempt trials) was calculated by dividing the number of failed trials by the total number of trials.

The probability of a success outcome following an initial success was calculated by dividing the number of success outcomes after initial success by the total number of initial success trials. The probability of an attempt outcome following an initial success was calculated by dividing the number of attempt outcomes after initial success by the total number of initial success trials. The probability of a no-attempt outcome following an initial success was calculated by dividing the number of no-attempt outcomes after initial success by the total number of initial success trials.

The probability of a success outcome following an initial attempt was calculated by dividing the number of success outcomes after initial attempts by the total number of initial attempt trials. The probability of an attempt outcome following an initial attempt was calculated by dividing the number of attempt outcomes after initial attempts by the total number of initial attempt trials. The probability of a no-attempt outcome following an initial attempt was calculated by dividing the number of no-attempt outcomes after initial attempts by the total number of initial attempt trials.

The probability of a success outcome following an initial no-attempt was calculated by dividing the number of success outcomes after initial no-attempts by the total number of initial no-attempt trials. The probability of an attempt outcome following an initial no-attempt was calculated by dividing the number of attempt outcomes after initial no-attempts by the total number of initial no-attempt trials. The probability of a no-attempt outcome following an initial no-attempt was calculated by dividing the number of no-attempt outcomes after initial no-attempts by the total number of initial no-attempt trials.

Subjects were classified as being impaired by failure, not affected by failure, or enhanced by failure based on their response on each beaching mat to initial attempt and initial no-attempt trials. A 20% difference criterion was used to indicate a practical difference in performance. Subjects were classified as being impaired by failure when the probability of a success outcome after an initial success was 20% or greater than the probability of a success outcome after either an initial attempt or an initial no-attempt. That is, if there was an 85% chance that a successful trial was followed by another successful trial, and there was a 60% chance that an attempt or a no-attempt trial was followed by a successful trial, the dolphin's performance was impaired by failure. Subjects were classified as being not affected by failure when the probability of a success outcome after an initial success was within 20% of the probability of a success outcome after both initial attempt and initial no-attempts. Subjects were classified as being enhanced by failure when the probability of a success outcome after either an initial attempt or an initial no-attempt was 20% or greater than the probability of a success outcome after an initial success. That is, if there was a 60% chance that a successful trial was followed by another successful trial and there was an 85% chance that an attempt or a no-attempt trial was followed by a successful trial, the dolphin's performance was enhanced by failure. If the number of trials for either attempts or no-attempts accumulated to less than five percent of the total number of trials, the classification was solely based on the category that represented greater than five percent of the total trials.

CHAPTER III

RESULTS

A total of 2,671 trials collected over 524 sessions were included in the analyses. Of the three age classes, calves failed at the lowest rate (17%), while juveniles and sub-adults failed at higher rates, 32% and 34% respectively. Within the sub-adult class (the only class with both genders), females had a mean failure rate of 47% and the males had a mean failure rate of 20%. General session information and failure rates are displayed in **Error! Reference source not found.Error! Reference source not found.**

Session Information

Dolphin	Mean Failure Rate (%)	Number of Sessions	Number of Trials	Mean Number of Trials Per Session
Dolphin A	27.59	46	116	2.54
Dolphin B	50.36	41	419	9.68
Dolphin C	27.22	47	169	3.55
Dolphin D	20.28	38	143	3.69
Dolphin E	12.36	60	89	1.82
Dolphin F	9.59	43	219	4.96
Dolphin G	26.85	27	250	9.03
Dolphin H	33.87	26	248	8.67
Dolphin I	33.86	74	251	3.40
Dolphin J	10.12	64	242	3.39
Dolphin K	43.88	58	278	4.79

The results revealed three failure response types: (a) enhanced performance on the subsequent trial, (b) unaffected performance on the subsequent trial or (c) impaired performance on the subsequent trial. Dolphin A and Dolphin K's performance was enhanced by failure on the split mat and not affected by failure on the half mat. Dolphin C, Dolphin E, Dolphin G, Dolphin H, and Dolphin J's performance was not affected on all mats. Dolphin D, Dolphin F, and Dolphin I's performance was not affected on at least one mat and impaired on at least one other mat. Dolphin B was exclusively impaired by failure. Table *2* displays the number of successful, attempt, and no-attempt trials that followed a success trial. Table 4 displays the number of successful, attempt, and no-attempt trials that followed an attempt trial. Table 5 displays the number of successful, attempt, and no-attempt trials that followed a no-attempt trial.

Table 2

Number of Successful, Attempt, and No-Attempt Trials After Initial Success

Dolphin	Mat	Number of Successful Outcomes	Number of Attempt Outcomes	Number of No-Attempt Outcomes	Total
Dolphin A	Full	0	0	0	0
	Half	13	9	0	22
	Split	12	5	1	18
Dolphin B	Full	0	0	0	0
	Half	0	0	0	0
	Split	117	44	15	176
Dolphin C	Full	45	8	3	56
	Half	0	0	0	0
	Split	15	8	1	24
Dolphin D	Full	28	4	0	32
	Half	0	0	0	0
	Split	34	11	0	45
Dolphin E	Full	0	0	0	0
	Half	0	0	0	0
	Split	35	1	4	40
Dolphin F	Full	101	9	0	110
	Half	0	0	0	0
	Split	41	4	0	45
Dolphin G	Full	52	21	0	73
	Half	37	11	1	49
	Split	53	25	0	78
Dolphin H	Full	46	22	0	68
	Half	0	0	0	0
	Split	41	27	2	70

Table 3 (continued).

Dolphin	Mat	Number of Successful Outcomes	Number of Attempt Outcomes	Number of No-Attempt Outcomes	Total
Dolphin I	Full	13	7	1	21
	Scale*	7	2	0	9
	Split	47	22	1	70
Dolphin J	Full	28	2	0	30
	Half	0	0	0	0
	Split	102	4	5	111
Dolphin K	Full	0	0	0	0
	Half	25	7	4	36
	Split	40	30	6	76

*Dolphin I was the only subject that completed scale mat trials.

Table 3

Number of Successful, Attempt, and No-Attempt Trials After Initial Attempt

Dolphin	Mat	Number of Successful Outcomes	Number of Attempt Outcomes	Number of No-Attempt Outcomes	Total
Dolphin A	Full	0	0	0	0
	Half	7	3	2	12
	Split	6	3	0	9
Dolphin B	Full	0	0	0	0
	Half	0	0	0	0
	Split	54	113	4	171
Dolphin C	Full	14	3	1	18
	Half	0	0	0	0
	Split	8	3	1	12
Dolphin D	Full	6	3	0	9
	Half	0	0	0	0
	Split	14	5	0	19
Dolphin E	Full	0	0	0	0
	Half	0	0	0	0
	Split	1	0	0	1

Table 4 (continued).

Dolphin	Mat	Number of Successful Outcomes	Number of Attempt Outcomes	Number of No-Attempt Outcomes	Total
Dolphin F	Full	9	5	0	14
	Half	0	0	0	0
	Split	5	0	0	5
Dolphin G	Full	25	11	0	36
	Half	11	2	0	13
	Split	28	7	0	35
Dolphin H	Full	22	11	0	33
	Half	0	0	0	0
	Split	28	21	0	49
Dolphin I	Full	6	2	1	9
	Scale*	5	2	1	8
	Split	28	23	2	53
Dolphin J	Full	4	1	0	5
	Half	0	0	0	0
	Split	9	2	1	12
Dolphin K	Full	0	0	0	0
	Half	3	20	1	4
	Split	32	20	5	57

*Dolphin I was the only subject that completed scale mat trials.

Table 4

Number of Successful, Attempt, and No-Attempt Trials After Initial No-Attempt

Dolphin	Mat	Number of Successful Outcomes	Number of Attempt Outcomes	Number of No-Attempt Outcomes	Total
Dolphin A	Full	0	0	0	0
	Half	1	1	0	2
	Split	2	0	0	2
Dolphin B	Full	0	0	0	0
	Half	0	0	0	0
	Split	18	9	4	31

Table 5 (continued).

Dolphin	Mat	Number of Successful Outcomes	Number of Attempt Outcomes	Number of No-Attempt Outcomes	Total
Dolphin C	Full	2	1	0	3
	Half	0	0	0	0
	Split	2	1	6	9
Dolphin D	Full	0	0	0	0
	Half	0	0	0	0
	Split	0	0	0	0
Dolphin E	Full	0	0	0	0
	Half	0	0	0	0
	Split	4	0	1	5
Dolphin F	Full	1	0	0	1
	Half	0	0	0	0
	Split	1	0	0	1
Dolphin G	Full	0	0	0	0
	Half	0	0	0	0
	Split	1	0	0	1
Dolphin H	Full	0	0	0	0
	Half	0	0	0	0
	Split	2	0	0	2
Dolphin I	Full	0	1	0	1
	Scale*	1	0	0	1
	Split	2	0	0	2
Dolphin J	Full	0	0	0	0
	Half	0	0	0	0
	Split	5	1	0	6
Dolphin K	Full	0	0	0	0
	Half	10	3	6	19
	Split	16	3	1	20

*Dolphin I was the only subject that completed scale mat trials.

The following results are organized based on the subjects’ response type: progressing from dolphins enhanced by failure to dolphins impaired by failure. Within each subject, the mats are presented in alphabetical order: full, half, scale, and split. If the subject did not beach on a particular mat, the mat was not addressed.

Dolphin A

During half mat trials, there were no practical differences in the probability of a success outcome after initial no-attempts (*M* = 50.0%), initial attempts (*M* = 58.3%), and initial success (*M* = 59.1%). The probability of an attempt outcome differed between the two types of initial failure, attempts (*M* = 25.0%) and no-attempts (*M* = 50.0%), but was similar between initial success (*M* = 40.9%) and initial no-attempts. He never refused to participate in a trial after initial success and initial no-attempts but refused trials after initial attempts (*M* = 16.7%).

During split mat trials, Dolphin A showed no practical difference between the probability of a success outcome after initial attempts (*M* = 66.7%) and initial success (*M* = 66.7%). Dolphin A always responded with a success outcome after initial no-attempts (*M* = 100.0%). Dolphin A responded with attempt outcomes at similar rates after initial success (*M* = 27.8%) and initial attempts (*M* = 33.3%) and never responded with an attempt outcome after initial no-attempts. He never responded with a no-attempt outcome after initial attempts (*M* = 0.0%) and initial no-attempts (*M* = 0.0%) and rarely responded with a no-attempt outcome after initial success (*M* = 5.6%).

Dolphin A's half mat mean failure rate (*M* = 33.3%) was higher than his split mat failure rate (*M* = 22.0%). He was less likely to exhibit non-compliance to the HS S^D on the split mat (*M* = 9.15 seconds, range 0–100 seconds) than on the half mat (*M* = 19.29 seconds, range = 0–203 seconds). Dolphin A's average rate of failure varied across the three trainers who worked with him on the split mat despite asking him for the same average criteria. He failed at the highest rate with Trainer 1 (*M* = 33.3%), followed by Trainer 2 (*M* = 14.3%) and Trainer 3 (*M* = 6.7%).

Dolphin K

During half mat trials, there was no practical difference between the probability of a success outcome after initial success (*M* = 69.4%) and initial attempts (*M* = 75.0%). There was a practical difference between initial attempts and initial no-attempts (*M* = 52.6%). There was no practical difference between the probability of an attempt outcome after initial success (*M* = 19.4%), initial attempts (*M* = 0.0%), and initial no-attempts (*M* = 15.8%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 11.1%) and initial attempts (*M* = 25.0%) and between initial attempts and initial no-attempts (*M* = 31.6%). There was a practical difference between the probability of a no-attempt outcome after initial success and initial no-attempts.

During split mat trials, there was no practical difference between the probability of a success outcome after initial success (*M* = 52.6%) and initial attempts (*M* = 56.1%), but both initial success and initial attempts were practically different from initial no-attempts (*M* = 80.0%). There was no practical difference between the probability of an attempt outcome after initial success (*M* = 39.5%) and initial attempts (*M* = 35.1%), but both initial success and initial attempts were practically different from initial no-attempts (*M* = 15.0%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 7.9%), initial attempts (*M* = 8.8%), and initial no-attempts (*M* = 5.0%).

Dolphin K had a higher mean split mat failure rate (*M* = 45.9%) than half mat failure rate (*M* = 36.6%). Across all observations, she was least successful in the first beaching session of the day (*M* = 46.3%) and had lower rates of failure during subsequent sessions.

Dolphin C

During full mat trials, there was no practical difference between the probability of a success outcome after initial success (*M* = 80.4%), initial attempts (*M* = 77.8%), and initial no-attempts (*M* = 66.7%). Results showed no practical difference in the probability of an attempt outcome after initial no-attempts (*M* = 33.3%), initial attempts (*M* = 16.7%), and initial success (*M* = 14.3%). There was no practical difference between the probability that he refused to participate in a trial after initial no-attempts (*M* = 0.0%), initial attempts (*M* = 5.6%) and initial success (*M* = 5.4%).

During split mat trials, the probability of a successful outcome differed between the two types of initial failure, attempts (*M* = 66.7%) and no-attempts (*M* = 22.2%), but was similar between initial success (*M* = 62.5%) and initial no-attempts. There was no practical difference between the probability of an attempt outcome after initial attempts (*M* = 25.0%) and initial no-attempts (*M* = 11.1%). However, Dolphin C was most likely to respond with in an attempt outcome after initial success (*M* =33.3%). The probability of a no-attempt outcome differed between the two types of initial failure, attempts (*M* = 8.3%) and no-attempts (*M* = 66.7%), but was similar between initial success (*M* = 4.17%) and initial attempts.

Dolphin C had a higher mean split mat failure rate (*M* = 36.1%) than full mat failure rate (*M* = 22.2%). Dolphin C had a higher rate of failure during the second beaching session of the day (*M* = 46.7%) than the first beaching session of the day (*M* = 23.2%).

Dolphin E

During split mat trials, the probability of a successful outcome differed between the two types of initial failure, initial attempts (*M* = 100.0%) and initial no-attempts (*M* = 80.0%), but both were similar to initial success (*M* = 87.6%). There was no practical difference in the probability of an attempt outcome after initial no-attempts (*M* = 0.0%), initial attempts (*M* = 0.0%), and initial success (*M* = 2.5%). He was more likely to refuse a trial after initial no-attempts (*M* = 20.0%) than after initial attempts (*M* = 0.0%) or initial success (*M* = 10.0%).

Dolphin E failed the most the first beaching session of the day (*M* = 19.3%), followed by the third beaching session (*M* = 4.2%). He did not fail during his second or fourth beaching sessions of the day. His failure rates throughout the day indicated that Dolphin E performed better either later in the day and/or after he had several training sessions that did not include beaching.

Dolphin G

During full mat trials, the probability of a success outcome was similar after initial success (*M* = 71.2%) and initial attempts (*M* = 69.4%). Dolphin G never responded with a no-attempt outcome after initial success. The probability of an attempt outcome was similar after initial success (*M* = 28.8%) and initial attempts (*M* = 30.6%). Dolphin G never responded with a no-attempt outcome after initial attempts. There was no practical difference between the probability of a no-attempt outcome after initial success (*M* =

0.0%) and initial attempts (*M* = 0.0%). Dolphin G never responded with a no-attempt trial after initial no-attempts.

During half mat trials, the probability of a success outcome was similar after initial success (*M* = 75.5%) and initial attempts (*M* = 84.6%). Dolphin G never responded with a no-attempt trial after initial success. The probability of an attempt outcome was similar after initial success (*M* = 22.4%) and initial attempts (*M* = 15.4%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 2.0%) and initial attempts (*M* = 0.0%). Dolphin G never responded with a no-attempt outcome after initial no-attempts.

During split mat trials, there was no practical difference between the probability of a successful outcome after initial success (*M* = 67.9%) and initial attempts (*M* = 80.0%). There was a practical difference between the probability of a success outcome after initial success and initial no-attempts (*M* = 100.0%) and between initial attempts and initial no-attempts. There was no practical difference between the probability of an attempt outcome after initial success (*M* = 32.1%) and initial attempts (*M* = 20.0%). There was a practical difference between the probability of an attempt outcome after initial success and initial no-attempts (*M* = 0.0%) and between initial attempts and initial no-attempts. There was no practical difference in the probability of a no-attempt outcome after initial success (*M* = 0.0%), initial attempts (*M* = 0.0%), and initial no-attempts (*M* = 0.0%).

Dolphin G's mean split mat failure rate (*M* = 27.9%) was similar to his full mat failure rate (*M* = 30.0%) and half mat failure rate (*M* = 20.3%).

Dolphin H

During full mat trials, the probability of a success outcome was similar after initial success (*M* = 67.6%) and initial attempts (*M* = 66.7%). Dolphin H never responded with a no-attempt outcome after initial success. The probability of an attempt outcome was similar after initial success (*M* = 32.4%) and initial attempts (*M* = 33.3%). Dolphin H never responded with a no-attempt outcome after initial attempts. There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 0.0%) and initial attempts (*M* = 0.0%). Dolphin H never responded with a no-attempt outcome after initial no-attempts.

During split mat trials, there was no practical difference between the probability of a successful outcome after initial success (*M* = 58.6%) and initial attempts (*M* = 57.1%), but both were practically different from after initial no-attempts (*M* = 100.0%). There was no practical difference between the probability of an attempt outcome after initial success (*M* = 38.6%) and initial attempts (*M* = 42.9%), but both were practically different from after initial no-attempts (*M* = 0.0%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 2.9%), initial attempts (*M* = 0.0%), and initial no-attempts (*M* = 0.0%).

Dolphin H had a higher mean split mat failure rate (*M* = 38.1%) than full mat failure rate (*M* = 28.9%) and failed less during the first beaching session of the day (*M* = 33.5%) than in the second beaching session of the day (*M* = 41.7%).

Dolphin I

During full mat trials, Dolphin I showed no practical difference between the probability of a success outcome after initial success (*M* = 61.9%) and initial attempts (*M*

= 66.7%). Dolphin I never responded with a success outcome after initial no-attempts (*M* = 0.0%). There was no practical difference between the probability of an attempt outcome after initial success (*M* = 33.3%) and initial attempts (*M* = 22.2%), but both showed a practical difference from after initial no-attempts (*M* = 100.0%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 4.76%), initial attempts (*M* = 11.1%), and initial no-attempts (*M* = 0.0%).

During scale mat trials, there was no practical difference between the probability of a success outcome after initial success (*M* = 77.8%) and initial attempts (*M* = 62.5%), but both were practically different from after initial no-attempts (*M* = 100.0%). There was no practical difference between the probability of an attempt outcome after initial success (*M* = 77.8%) and initial attempts (*M* = 62.5%), but both were practically different from after initial no-attempts (*M* = 100.0%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 0.0%), initial attempts (*M* = 12.5%), and initial no-attempts (*M* = 0.0%).

During split mat trials, Dolphin I showed no practical difference between the probability of a success outcome after initial success (*M* = 67.1%) and initial attempts (*M* = 52.8%). Dolphin I always responded with a success outcome after initial no-attempts (*M* = 100.0%). There was no practical difference between the probability of an attempt outcome after initial success (*M* = 31.4%) and initial attempts (*M* = 43.4%), but both showed a practical difference from after initial no-attempts (*M* = 0.0%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 1.43%) and initial attempts (*M* = 3.8%), and initial no-attempts (*M* = 0.0%).

His highest mean failure rate was on the split mat (*M* = 36.7%) and he failed similar rates on the scale mat (*M* = 32.1%) and on the full mat (*M* = 31.9%). Non-compliance times were shortest during the fourth beaching session of the day (*M* = 9.55 seconds) and longest in the third beaching session (*M* = 24.82 seconds). Non-compliance to the HS S^D time was shortest on the split mat (*M* = 10.88 seconds) and longest on the scale mat (*M* = 24.57 seconds).

Dolphin J

During full mat trials, the probability of a success outcome was similar after initial success (*M* = 93.3%) and initial attempts (*M* = 80.0%). Dolphin J never responded with a no-attempt outcome after initial success. The probability of an attempt outcome was similar after initial success (*M* = 6.7%) and initial attempts (*M* = 20.0%). Dolphin J never responded with a no-attempt outcome after initial attempts. There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 0.0%) and initial attempts (*M* = 0.0%). Dolphin J never responded with a no-attempt outcome after initial no-attempts.

During split mat trails, there was no practical difference between the probability of a success outcome after initial success (*M* = 91.9%), initial attempts (*M* = 75.0%), and initial no-attempts (*M* = 83.3%). There was no practical difference between the probability of an attempt outcome after initial success (*M* = 3.6%), initial attempts (*M* = 16.7%), and initial no-attempts (*M* = 16.7%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 4.5%), initial attempts (*M* = 8.3%), and initial no-attempts (*M* = 0.0%).

He failed at similar rates on the split mat (*M* = 10.4%) and the full mat (*M* = 8.8%). It was possible that Dolphin J was able to learn with little to no failure since 49 of his 64 sessions had 0.0% failure rate and he made significant progress during the data collection period.

Dolphin D

During full mat trials, there was a practical difference between the probability of a success outcome after initial success (*M* = 87.5%) and initial attempts (*M* = 66.7%). Dolphin D never responded with a no-attempt outcome after initial success. There was a practical difference between the probability of an attempt outcome after initial success (*M* = 12.5%) and initial attempts (*M* = 33.3%). Dolphin D never responded with a no-attempt outcome after initial attempts. There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 0.0%) and initial attempts (*M* = 0.0%). Dolphin D never responded with a no-attempt outcome after initial no-attempts.

During split mat trials, there was no practical difference between the probability of a successful outcome after initial success (*M* = 75.6%) and initial attempts (*M* = 73.68%). Dolphin D never responded with a no-attempt outcome after initial success. There was no practical difference between the probability of an attempt outcome after initial success (*M* = 24.4%) and initial attempts (*M* = 26.3%). Dolphin D never responded with a no-attempt outcome after initial attempts. There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 0.0%) and initial attempts (*M* = 0.0%). Dolphin D never responded with a no-attempt outcome after initial no-attempts.

Dolphin D had a higher mean split mat failure rate (*M* = 23.8%) than full mat failure rate (*M* = 15.5%). Dolphin D failed more during the first beaching session of the day (*M* = 21.5%) than in the second beaching session of the day (*M* = 14.3%). He was more likely to fail when working with Trainer 4 (*M* = 23.4%) than with Trainer 5 (*M* = 0.0%), despite being asked for similar criteria (Trainer 4 = 17.15 units, Trainer 5 = 16.22 units).

Dolphin F

During full mat trials, there was a practical difference between the probability of a success outcome after initial success (*M* = 91.8%) and initial attempts (*M* = 64.3%), but there was no difference between initial success and initial no-attempts (*M* = 100.0%). There was a practical difference between the probability of an attempt outcome after initial success (*M* = 8.2%) and initial attempts (*M* = 35.7%) and a practical difference between initial attempts and initial no-attempts (*M* = 0.0%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 0.0%), initial attempts (*M* = 0.0%), and initial no-attempts (*M* = 0.0%).

During split mat trials, there was no practical difference between the probability of a successful outcome after initial success (*M* = 91.1%), initial attempts (*M* = 100.0%), and initial no-attempts (*M* = 100.0%). There was no practical difference between the probability of an attempt outcome after initial success (*M* = 8.9%), initial attempts (*M* = 0.0%), and initial no-attempts (*M* = 0.0%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 0.0%), initial attempts (*M* = 0.0%), and initial no-attempts (*M* = 0.0%).

He failed at similar rates on the split mat (*M* = 9.1%) and on the full mat (*M* = 9.8%). Dolphin F had a higher rate of failure during the first beaching session of the day (*M* = 10.20%) than during the second beaching session of the day (*M* = 4.35%). There was a downward trend in his rate of failure as the day progressed. This indicated that he performed better at the beginning of the day and may suggest a high food drive.

Dolphin B

During split mat trials, there was a practical difference between the probability of a success outcome after initial success (*M* = 66.5%) and initial attempts (*M* = 31.6%), but there was no difference between initial success and initial no-attempts (*M* = 58.1%). There was a practical difference between the probability of an attempt outcome after initial success (*M* = 25%) and initial attempts (*M* = 66.1%), but no practical difference between initial success and initial no-attempts (*M* = 29.0%). There was no practical difference between the probability of a no-attempt outcome after initial success (*M* = 8.5%), initial attempts (*M* = 2.3%), and initial no-attempts (*M* = 12.9%).

Dolphin B had a mean failure rate of 50.4%. In general, Dolphin B failed the least in the first beaching session of the day (*M* = 44.4%) and the most in the third session of the day (*M* = 90.6%). Her mean failure rate was much higher when working with Trainer 4 (*M* = 60.2%) than with Trainer 5 (*M* = 25.4%). This was expected, however, as Trainer 4 asked her to beach farther distances.

CHAPTER IV

DISCUSSION

The purpose of the present study was to assess the effects of two types of initial failure (i.e., attempts and no-attempts) on subsequent responses during the training of a motor task. The results demonstrated that not all subjects were affected by failure, but when they were affected, the subjects' performance was either enhanced or impaired by failure. While five subjects were not affected by failure, four were impaired by failure on at least one mat and two were enhanced by failure on one mat. Five subjects responded differently to the mat types, demonstrating that the response to failure was not always consistent across behaviors. Within some individuals, mean failure rates differ for variables other than initial failure, including trainer, time of day, criteria, mat type, number of beaching sessions, and hand station requests.

While five subjects were not affected by initial failure, six subjects were affected on at least one mat. Of those who were affected by initial attempts and initial no-attempts, more subjects were impaired by failure than enhanced by failure. The results that indicated a benefit to reduced errors are consistent with the affects of errors in macaques, in which errors committed prior to a first correct response negatively affected performance on the second presentation of a stimulus, in macaques (Brasted et al., 2005; Rupniak & Gaffan, 1987). Although several subjects demonstrated impairment after failure, others were not affected or even enhanced by failure. The variation in the results was consistent with previous studies outside of the motor learning domain, in which error as been shown to both impair and enhance performance (see Clare & Jones 2008 for a review). This diversity in response, both within and across subjects, highlights the importance on individualized training plans that focus on increasing the probability of successful criterion completion by integrating failure response types into training strategies.

Given a common goal, the path to success was unique to each individual dolphin. Each subject, at different stages of learning to beach, used different training criteria, which varied in beaching distance and levels of participation. Therefore, they cannot be compared quantitatively because subjects demonstrated improvement in different ways. Qualitatively, several subjects demonstrated similar rates of distance criterion acquisition over the data collection period, distance criteria for Dolphin A increased by roughly 4 distance units (Figure 2). Distance criteria for Dolphin F, Dolphin G, and Dolphin H increased by five units. Distance criteria for Dolphin C increased by nine units. Dolphin D's distance criteria increased 11 units, the farthest of all of the subjects. Dolphin I and Dolphin J's criteria extended beyond full beaches by completing multiple consecutive beaches, allowing the trainers to move their bodies while on the mat, and/or remaining calm while the boat was driven short distances. Dolphin B, Dolphin E, and Dolphin K's criteria focused on increasing their participation in the session. After training plan changes, Dolphin B's success rate increased at far distances. Dolphin E's hand station non-compliance preceding the beach S^D decreased. Finally, Dolphin K's rate of no-attempt trials decreased.

The results demonstrated that attempt, and no-attempt outcomes varied both within and across participants. Dolphin A, Dolphin B, Dolphin I, and Dolphin K showed a practical difference between the probability of a success outcome after initial attempts and initial no-attempts on at least one mat. Dolphin D, Dolphin G, Dolphin H, and

Dolphin J never completed initial no-attempts and Dolphin I was never successful after initial no-attempts. Dolphin B rarely responded with a no-attempt outcome after initial attempts and was rarely successful after initial attempts. Dolphin C was more likely to refuse to participate in a trial after initial no-attempts than after initial attempts on the split mat but never refused a trial after initial no-attempts. These variations indicated that the type of initial failure affected subsequent performance for some individuals.

Dolphins with higher failure rates were not more likely to have an impaired response type. For example, Dolphin B had the highest mean failure rate (M = 50.36%), and Dolphin F had the lowest mean failure rate (M = 9.59%), yet both were impaired by initial attempts. The tendency of the subjects to be impaired by failure was consistent with previous findings that error impairs learning (Capio, Poolton, Sit, Holmstrom, et al., 2013; Capio et al., 2012; Maxwell et al., 2001; Wong et al., 2013), but this does not explain why one dolphin with a relatively low failure rate would have the same failure response type as a dolphin with a relatively high failure rate. One explanation may be that Dolphin B's high rate of failure was a result of a confounding variable, such as longer training sessions, acting as a reinforcer, which would result in both a high failure rate and continued participation in the sessions. On average, Dolphin B completed the most trials per session of all of the subjects (Table 2). Before each session, the trainer determined the farthest distance criteria to be requested. Generally, trials ended after successfully completing the goal criteria. As a result of her failure at far distances, the trainers requested more trials, thereby increasing the length of her sessions.

While the mechanisms by which initial failure affects future success remain unclear, the results suggested that age, gender, and the type of beaching mat did not greatly influence the process. The subjects' age ranged from calves to sub-adults and there were no observable trends in response type or mean failure rate based upon age. Although the females had the highest mean failure rates, gender did not appear to influence response type, as the two female subjects exhibited different response types and males ranged across all response types. These results were consistent with similar findings by Wolff and Hausberger (1996), in which age and sex did not affect the learning and memorization of an motor task in horses. Moreover, the mat type did not influence response type. All subjects completed split mat trials, and all three response types were exhibited on the split mat.

Personality likely played a role in the subjects' response to failure. Highfill and Kuczaj (2007) showed that individual dolphins had distinct personalities that are stable over long time periods and in diverse situations. Differences in the affects of temperament on learning and behavioral responses to challenging situations have been well documented in rodents (Benus, Koolhaas, & Van Oortmerssen, 1987), horses (Heird, Whitaker, Bell, Ramsey, & Lokey, 1986), cattle (Webb, van Reenen, Jensen, Schmitt, & Bokkers, 2015), and pigs (Bolhuis, Schouten, Leeuw, Schrama, & Wiegant, 2004). Thus, certain individuals in the present study may have been more prone to frustration and therefore more likely to be impaired by failure, while other individuals' performance was not affected or enhanced by failure.

Several investigators (Demant, Ladewig, Balsby, & Dabelsteen, 2011; Meyer & Ladewig, 2008; Rubin, Oppegard, & Hindz, 1980) have suggested that the number of training sessions impacted the rate at which a trained behavior was acquired. For example, weekly training sessions for dogs and horses were more effective in completing shaping criteria than daily training sessions (Meyer & Ladewig, 2008; Rubin et al., 1980). In the present study, the number of training sessions and trials may have impacted speed at which the dolphin accomplished the criteria. The data precluded statistical analysis of the effects of number of sessions or trials on error experience as the data was collected opportunistically. However, the results may have been consistent with the findings of previous studies, as the participants with higher numbers of trials tended to have higher rates of failure (Table *1*).

The range of responses to the two types of failure signifies that variables other than initial failure affect future performance; therefore it cannot be assumed that one training model will be effective for all dolphins. Several dolphins had dissimilar failure rates to beaching requests from different trainers, despite, at times, the trainers requesting the same average distance criteria. Motivation to complete the requested criteria clearly impacts some dolphins. For example, Dolphin B's high rate of attempts and low rate of no-attempts was indicative that the food reinforcement allocated by the trainer for completing the criteria had a lower reinforcing value than continually attempting the behavior.

Limitations

Given the small sample size and individual differences in the results, the present study should be regarded as a pilot study to obtain basic information on the elements of error experience while learning a complex task in bottlenose dolphins. The trainers' experience level, training style, and relationship with the dolphins influenced their decisions to change criteria and select the magnitude of reinforcement. Furthermore, the animal's criteria, reinforcement history, and personality likely contributed to their response to both types of failure and level of persistence. Therefore, the results are only associations, and caution should be used in the interpretation of the results.

Future Research

While it appears that constraining errors may be beneficial to future success for some individuals, further research is needed to both investigate the individual differences that were clear amongst the results and confirm the advantage of reduced errors. As the subjects were learning different stages of beaching, progress cannot be directly compared across subjects. Therefore, results should not be generalized to other behaviors and dolphins until further research has been completed in those areas. The criterion for meaningful behavior change after initial success, initial attempts, and initial no-attempts should be investigated as the response types in the present study were a product of the 20% criterion. Future research should be conducted in experimental settings to determine what constitutes meaningful behavior change.

APPENDIX A

OPERATIONAL DEFINITIONS

Term	Definition
Hand Station	Animal places rostrum in trainer's upright palm held at water's surface. Animal assumes and maintains position perpendicular to deck, and is responsive to manipulation by the trainer. S^D: One slap of back of hand on water's surface, leave hand at surface palm up for duration of behavior. (U.S. Navy Basic Marine Mammal Systems Behaviors, unpublished)
Beach	Animal follows trainer's stationing hand as trainer moves rapidly from front to rear of transporter (i.e. mat), such that animal strands completely on transporter. Animal remains calm on transporter, and then maintains contact with trainer's hand when the trainer helps it to slide back into the water and re-establishes hand station. S^D: From hand station at end of open transporter, kneeling trainer retreats to rear of transporter, and presents stationing hand as a target or prepares to accept animal in hand station. After a variable delay, trainer hand stations animal with one hand, and places other hand on dolphin's back. Trainer helps to slide dolphin back into the water, and maintains hand station. (U.S. Navy Basic Marine Mammal Systems Behaviors, unpublished)
Session	Session begins with the trainer asking the animal to position heads-up in front of the trainer. Session ends with reinforcement of a final behavior and/or the trainer walking away from the pen.
Trial	Trainer presents the discriminative stimuli (S^D) for beaching to the subject.
Failure	Any response to the beach S^D that does not meet all of the predetermined criteria. Includes attempt and no-attempt trials.
Attempt	More than one third of the dolphin's body leaves the water with a forward trajectory but the animal does not meet all behavior criteria.
No-attempt	Less than one third of the dolphin's body leaves the water (includes the dolphin swimming away).
Success	Dolphin meets the predetermined behavior criteria after the S^D is presented.

Distance Criterion	The distance set by the trainer that specifies the how far the dolphin must beach onto the mat to be successful.
Distance Beached	The actual distance the dolphin beaches onto the mat during a trial.

APPENDIX B

BEACHING MAT DESCRIPTIONS

Mat	Descriptions
Full	A padded, folding mat that bridges a boat and a floating walkway.  
Half	A rigid tray that sits on a floating walkway. 
Scale	A rigid tray placed on a weight scale on a floating walkway. 
Split	A padded, L-shaped mat that bridges a boat and a floating walkway.  

APPENDIX C

SESSION OBSERVATION FORM

	Session 1				Session 2				Session 3			
Animal: ___________	Start time: ___________		End time: ___________		Start time: ___________		End time: ___________		Start time: ___________		End time: ___________	
Date: ____________	_____	Distance	_____	Rein on Mat	_____	Distance	_____	Rein on Mat	_____	Distance	_____	Rein on Mat
Trainer: ___________	_____	Duration	_____	Proximity	_____	Duration	_____	Proximity	_____	Duration	_____	Proximity
Observer: _________	_____	Calm	_____	Touching	_____	Calm	_____	Touching	_____	Calm	_____	Touching
Notes:	_____	Tail Up	_____	Flaps	_____	Tail Up	_____	Flaps	_____	Tail Up	_____	Flaps
	_____	Relaxed Pecs	_____	Deck Wash	_____	Relaxed Pecs	_____	Deck Wash	_____	Relaxed Pecs	_____	Deck Wash
	_____	Engines	_____	Other:	_____	Engines	_____	Other:	_____	Engines	_____	Other:

APPENDIX D

INSTITUTIONAL REVIEW BOARD NOTICE OF COMMITTEE ACTION

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI.

INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE
118 College Drive #5116 | Hattiesburg, MS 39406-0001
Phone: 601.266.4063 | Fax: 601.266.4377 | iacuc@usm.edu | www.usm.edu/iacuc

INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE NOTICE OF COMMITTEE ACTION

The proposal noted below was reviewed and approved by The University of Southern Mississippi Institutional Animal Care and Use Committee (IACUC) in accordance with regulations by the United States Department of Agriculture and the Public Health Service Office of Laboratory Animal Welfare. The project expiration date is noted below. If for some reason the project is not completed by the end of the three year approval period, your protocol must be reactivated (a new protocol must be submitted and approved) before further work involving the use of animals can be done.

Any significant changes (see attached) should be brought to the attention of the committee at the earliest possible time. If you should have any questions, please contact me.

PROTOCOL NUMBER:	**14061201**
PROJECT TITLE:	**Effects of failure on learning and persistence while learning a trained beaching behavior in the bottlenose dolphin (Tursiops truncates)**
PROPOSED PROJECT DATES:	**6/2014-9/2016**
PROJECT TYPE:	**New**
PRINCIPAL INVESTIGATOR(S):	**Stan Kuczaj**
DEPARTMENT:	**Psychology**
FUNDING AGENCY/SPONSOR:	
IACUC COMMITTEE ACTION:	**Full Committee Approval**
PROTOCOL EXPIRATON DATE:	**September 30, 2016**

Frank Moore, Ph.D. Date 6/13/14
IACUC Chair

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