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Water trauma and swimming experiences up to age 9 and fear of water at age 18: a longitudinal study

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Abstract

A small number of retrospective studies on the etiology of specific fears have obtained findings consistent with a biological (non-associative) explanation of fear acquisition. Unfortunately, reliance on imperfect memory to recall conditioning events which occurred many years earlier limits the conclusions that can be drawn from such data. The present investigation attempts to overcome this methodological shortcoming by examining the relationship between water trauma (i.e. conditioning) and water skills (e.g. swimming) before the age of 9 and the presence of water fear and phobia at age 18 in a longitudinal birth cohort. We found no evidence of a relationship between water confidence and water trauma up to the age of 9 and fear of water at age 18. Similar findings were obtained for water phobia at age 18 with the exception that study members who were less able to immerse themselves in water with confidence at age 9 were more likely to report water phobia at age 18. Associative and non-associative explanations of these findings were discussed.

1. Introduction

Fear of water is relatively common in childhood and, although less prevalent in adults, nonetheless can result in serious negative lifestyle consequences (Menzies, 1997). Recently, it has been suggested that the origins of fear of water can best be explained by non-associative

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processes (Menzies and Clarke, 1993a; Graham and Gaffan, 1997). This view is based on the purported survival relevance of certain stimuli for the species such as heights, water and separation from caregivers early in life (Clarke and Jackson, 1983). To date, however, all studies of water fear acquisition have used retrospective methodology to determine mode of fear acquisition. This is indicative of the field in general. For example, a number of influential retrospective studies of the origins of fear/phobia have shown that approximately two thirds of cases result directly from aversive conditioning experiences (e.g. Ost and Hugdahl, 1981, 1983, 1985; Ost, 1991). Yet, other studies have found (1) equal numbers of conditioning events in both fearful and non-fearful groups (e.g. DiNardo et al., 1988; Menzies and Clarke, 1993b) and (2) only a minority of cases attributed to Pavlovian conditioning events (Menzies and Clarke, 1993a; Jones and Menzies, 1995).

While useful, these findings may be confounded by difficulties in accurately recalling events occurring many years earlier (see Menzies and Clarke, 1994, for a fuller discussion). Further, studies with children have not revealed the extent to which experiences are causes or consequences of fear (Ollendick and King, 1991; Doogan and Thomas, 1992). Hence definitive statements regarding the origins of water fear are not possible.

The present study prospectively examined the influence of early swimming experiences on the development of water fear at age 18 in a large unselected birth cohort. Water fearful and non-fearful cohort members were compared on a number of water/swimming experiences derived from parental reports obtained when their children were aged 3, 5, 7 and 9. Information was also obtained about parental swimming ability during the age 9 assessment. In line with the non-associative position, no relationship between early water trauma and adult water fear was expected.

2. Method

2.1. Participants

The sample were members of the Dunedin Multidisciplinary Health and Development Study, a longitudinal investigation of young people's health, development and behaviour from birth to adulthood. The study and sample members have been described in detail elsewhere (Silva and Stanton, 1996). Briefly, the Dunedin sample has been assessed with a diverse array of psychological, medical and sociological measures with high rates of participation at age 3 (n = 1037), 5 (n = 991), 7 (n = 954), 9 (n = 955), 11 (n = 925), 13 (n = 850), 15 (n = 976), 18 (n = 1008) and, most recently, 21 (n = 992). The present data are from assessments conducted at ages 3, 5, 7, 9 and 18.

2.2. Procedure

The study members were seen within approximately one month of their 3rd, 5th, 7th, 9th and 18th birthdays. Testing occurred over one half day at ages 3 and 5 and during one full day at age 7, 9 and 18. A parent (usually mother) accompanied their child to the assessment unit at age 3, 5, 7 and 9.

2.3. Swimming experiences

At age 3 and 5, the study member's parent was asked to indicate if their child had swum or paddled at home in the 6 months prior to interview. At age 7, parents were asked (1) if their child could swim; (2) at what age their child had learnt to swim (in months); (3) if their child had ever been in deep water (i.e. 2.5 ft); (4) could the child put his/her head under water (either deliberately or accidentally), a measure of water confidence; (5) had their child got into difficulties in water and required help and (6) how many times their child had swum in the past year. At age 9, parents were asked if their child (1) could swim; (2) immerse him/herself in water with confidence (i.e. open eyes, exhale, relax?); (3) had ever got into difficulties and had to be 'rescued' and (4) how often their child had swum in the past year? Finally, each parent who accompanied their child to the assessment day was asked if they or their husband/wife could swim.

2.4. Water fear

Water fear was assessed at age 18 using a modified version of the Diagnostic Interview Schedule (DIS; Robins et al., 1981). The four modifications made to the DIS for the Dunedin study were: (1) to limit questions to the assessment of DSM-III-R criteria only, (2) to limit the assessment of symptoms to those occurring within the past 12 months only, (3) to limit assessment to only the more commonly occurring diagnoses for this age group and (4) to limit response options to 'no' coded 0; 'yes, sometimes' coded 1 and 'yes, definitely' coded 2 (Feehan et al., 1994).

At age 18, 936 study members were asked "In the last year have you had a strong unreasonable fear of water?". If a positive response was elicited to this gate question, the study members were then asked to respond 0, 1 or 2 to the following: (1) "Have you been very upset with yourself for having that fear of water?"; (2) "Has an unreasonable fear of water interfered with your ability to do your work?"; (3) "When you have to approach water, does it almost always make you extremely nervous or panicky?" and (4) "Has the unreasonable fear of water kept you from going to a party, social events or meeting?".

Study members who responded 'yes, definitely' to the gate question concerning the presence of a strong unreasonable fear of water were classified as having a fear of water at age 18 ($n = 44$, 4.7%). Those study members who responded with 'yes, definitely' to at least two of the four additional questions *and* reported that the fear had been present for at least one month or more were defined as water phobic ($n = 12$, 1.3%).

3. Results

When study members were aged 7, their parents were asked to indicate at what age they learnt to swim. There was no significant difference in age of learning to swim among those who were and were not fearful of water at age 18 (no water fear = 67.1 months versus water fearful, 69.0 months, $t = 0.67$, n.s.).

Table 1
The relationship between water experience up to age 9 years and self-reported water fear at age 18 in a longitudinal birth cohort

	Water fear at age 18				
	yes (n = 44)	no (n = 892)	p-value	Odds ratio	Exact confidence limits
Swum before age 3					
Yes	37 (5.0%)	704 (95.0%)	0.41	1.41	0.61–3.81
No	7 (3.6%)	188 (96.4%)			
Swum before age 5					
Yes	33 (4.7%)	662 (95.3%)	0.92	1.04	0.50–2.31
No	11 (4.6%)	229 (95.4%)			
Exposed to water age 7					
Yes	41 (4.8%)	811 (95.2%)	0.88	1.16	0.18–49.05
No	1 (4.2%)	23 (95.8%)			
Able to swim age 7					
Yes	20 (4.2%)	456 (95.8%)	0.35	0.74	0.38–1.46
No	21 (5.6%)	355 (94.4%)			
Water confidence age 7					
Yes	37 (4.7%)	755 (95.3%)	0.49	0.69	0.23–2.75
No	4 (6.7%)	56 (93.3%)			
Has experienced difficulties in water requiring help of others by age 7[a]					
Yes	0 (0.0%)	36 (100.0%)	0.19	0.00	0.00–2.47
No	20 (4.6%)	417 (95.4%)			
Regular swimmer age 7[b]					
Yes (50 + times past year)	6 (6.0%)	94 (94.0%)	0.35	1.72	0.45–6.63
No (< 20 times past year)	6 (3.6%)	162 (96.4%)			
Able to swim age 9					
Yes	33 (4.4%)	718 (95.6%)	0.07	0.51	0.24–1.21
No	10 (8.2%)	112 (91.8%)			
Immerse in water with confidence by age 9					
Yes	38 (4.6%)	790 (95.4%)	0.06	0.40	0.15–1.38
No	5 (10.6%)	42 (89.4%)			
Ever got into difficulties requiring rescue by age 9					
Yes	3 (3.3%)	87 (96.7%)	0.46	0.64	0.12–2.08
No	40 (5.1%)	745 (94.9%)			
Regular swimmer age 9[b]					
Yes (50 + times past year)	10 (4.5%)	211 (95.5%)	0.85	0.91	0.32–0.73
No (< 20 times past year)	6 (3.6%)	162 (96.4%)			
At least one parent could swim					
Yes	41 (4.8%)	812 (95.2%)	0.46	0.58	0.14–5.25
No	2 (8.0%)	23 (92.0%)			

The number of study members completing both the swimming questionnaires and the DIS at age 18 years differed slightly at age 3, 5, 7 and 9.

[a] Calculated for swimmers only.

[b] Individuals with 'intermediate' swimming experience (i.e. 20 to 50 times in the previous year) were omitted in this analysis.

As can be seen in Table 1, there were no significant differences in the probability of developing water fear at age 18 years between subjects who had or had not swum or paddled in water at home in the six months prior to the age 3 and age 5 assessment, or had been in water or were able to swim at age 7 or 9. Nor were there differences in the probability of developing water fear at age 18 among those who swum occasionally, (<20 times in the past year) versus frequently (>50 times in the past year) at age 7 or 9. Further, there was no significant relationship between confident immersion in water or having been rescued because of difficulties in water at age 7 or 9 and self-reported water fear at age 18. That is, there was no significant relationship between water confidence or water trauma up to the age of 9 and water fear at age 18. Finally, there were no significant differences in the probability of developing water fear at age 18 years among participants whose parents could or could not swim.

A similar pattern of non-significant findings were obtained when the relation between swimming experiences and the presence of water phobia at age 18 was examined (see Table 2). The only exception was that significantly more children who could not immerse themselves with confidence in water at age 9 reported water phobia at age 18.

4. Discussion

To our knowledge, this is the first study that has prospectively examined the relation between water exposure, water skills and water trauma between ages 3 and 9 and the development of water fear or phobia in late adolescence. It represents an attempt to overcome some of the problems associated with retrospective methodologies (e.g. Henry et al., 1994; Menzies, 1997) and can lead to more confident statements regarding the relative validity of conditioning, preparedness and non-associative accounts of the genesis of water fear/phobia.

Fear of water is relatively common in childhood and infrequent in adulthood (Menzies, 1997). However, a prevalence rate in this sample of 1.3% for water phobia at age 18 suggests this fear may be more prevalent than previously thought. We found no evidence of a relationship between swimming experiences (e.g. swimming ability, being rescued from water) up to the age of 9 and water fear at age 18. A similar finding was obtained for these childhood swimming variables and water phobia at age 18 with the exception that study members less able to immerse themselves in water with confidence at age 9 were more likely to report water phobia at age 18.

There are several possible interpretations of these data. First, consistent with Darwinian, non-associative models of fear acquisition, fear of water may reflect a biological fear that manifests without being paired with aversive experiences. These models differ from Seligman's (1971) earlier 'prepared learning' explanation in which at least one relevant CS-UCS pairing was required for fear acquisition. According to the non-associative position, most members of a species will show at least some fear to a set of evolutionary-relevant stimuli on their first encounter (a premise not tested in the current data set). This fear should diminish over time with repeated safe exposure to the feared stimuli, without which habituation may fail to occur (Clarke and Jackson, 1983).

Table 2
The relationship between water experience up to the age of 9 and self-reported water phobia at age 18 in a longitudinal birth cohort

	Water phobia age 18				
	yes (n = 12)	no (n = 918)	p-value	Odds ratio	Exact confidence limits
Swum before age 3					
Yes	10 (1.4%)	725 (98.6%)	0.71	1.33	0.28–12.59
No	2 (1.0%)	193 (99.0%)			
Swum before age 5					
Yes	9 (1.3%)	681 (98.7%)	0.95	1.04	0.26–6.02
No	3 (1.3%)	236 (98.7%)			
Exposed to water age 7					
Yes	10 (1.2%)	837 (98.8%)	0.59	undefined	
No	0 (0.0%)	24 (100.0%)			
Able to swim age 7					
Yes	4 (0.8%)	470 (99.2%)	0.31	0.52	0.11–2.22
No	6 (1.6%)	367 (98.4%)			
Water confidence age 7					
Yes	9 (1.1%)	779 (98.9%)	0.70	0.67	0.09–29.87
No	1 (1.7%)	58 (98.3%)			
Has experienced difficulties in water requiring help of others by age 7[a]					
Yes	0 (0.0%)	36 (100.0%)	0.56	0.00	0.00–18.69
No	4 (0.9%)	431 (99.1%)			
Regular swimmer age 7[b]					
Yes (50 + times past year)	1 (1.0%)	98 (99.0%)	0.88	1.00	0.01–16.38
No (< 20 times past year)	2 (1.2%)	165 (98.8%)			
Can swim by age 9					
Yes	7 (0.9%)	740 (99.1%)	0.03	0.28	0.07–1.31
No	4 (3.3%)	117 (96.7%)			
Immerse in water with confidence by age 9					
Yes	8 (1.0%)	816 (99.0%)	0.012[c]	0.14	0.03–0.86
No	3 (6.5%)	43 (93.5%)			
Ever got into difficulties requiring rescue by age 9					
Yes	1 (1.1%)	89 (98.9%)	0.89	0.87	0.02–6.21
No	10 (1.3%)	10 (98.7%)			
Regular swimmer age 9[b]					
Yes (50 + times past year)	2 (0.9%)	218 (99.1%)	0.65	0.49	0.64–4.30
No (< 20 times past year)	3 (1.9%)	159 (98.1%)			
At least one parent could swim					
Yes	10 (1.2%)	838 (98.8%)	0.21	0.29	0.04–12.94
No	1 (4.0%)	24 (96.0%)			

[a] Calculated for swimmers only.
[b] Individuals with 'intermediate' swimming experience (i.e. 20 to 50 times in the previous year) were omitted in this analysis.
[c] Fishers Exact Test was employed to calculate significance.

However, we cannot rule out the possibility that children had aversive experiences with water without their parents knowledge or that water may have been connected with aversive experiences in the years between ages 9 and 18 in this sample. Were this the case it may be fear of water at age 18 is attributable to conditioned associations (Rachman, 1978; Siddle and Bond, 1988). In this regard, it is important to note that current conditioning models (Mineka and Zinbarg, 1995) are more capable of explaining the complexity of human fear than original models that emphasised contiguity. For example, conditioned associations are not dependent solely on direct experience, but may arise from vicarious observation of others as well as informational transmission (Siddle and Bond, 1988). Despite the finding that parental swimming ability (a proxy for modelling of fearful behaviour) was unrelated to the development of water fear, we cannot rule out the possibility that other sources of modelling (e.g. siblings, friends or other relatives) played a role in the development of water fear in this cohort. It has also been argued that conditioned associations may develop insidiously, resulting from a series of experiences rather than a single traumatic event. In support, Kleinkneckt (1994) reported that 22.5% of an analog sample fearful of blood, injury and needles, reported a gradual onset of their fear from multiple experiences versus a single incident. However, given Kleinkneckt's (1994) results, one would expect multiple experience cases to report more traumatic incidents with water, not less. The failure to find any difference in the frequency of water trauma in the fearful and non-fearful groups is clearly not supportive of a multiple trauma onset account.

Aversive triggering experiences may also be obscured by processes of sensory preconditioning and unconditional stimulus inflation (Davey, 1992). In sensory preconditioning, fear may emerge in response to a particular stimulus not because of a direct traumatic association, but because that stimulus was previously associated with another stimulus with which there were traumatic associations. Certainly, at least some isolated cases of fear appear to begin in this way (see Davey et al., 1993). Unconditional stimulus inflation may occur with repeated negative re-evaluation of the UCS. "In particular, individuals may adopt generalised coping strategies that allow them to cognitively neutralise or devalue threats, with the implication that such individuals will be less likely to acquire durable anxiety-based disorders" (Davey et al., 1995, p. 424). In support, Davey et al. (1995) found that persons with more phobic fear cognitively devalued stressors *less* often than persons with less phobic fear. While such an explanation may account for some failures to acquire fear in some individuals following trauma, too few clinical studies exist to suggest that unconditional stimulus inflation can provide a comprehensive account of the lack of differences in the present study.

It must also be acknowledged that a multitude of factors can influence the impact of a given direct, vicarious or informational aversive event (Mineka and Zinbarg, 1995). Hence, a single traumatic incident or piece of information is often not considered sufficient to account for the development of phobias, given that experience must be placed within historical and circumstantial contexts. For example, previous experience with the to-be-feared stimulus may serve as a latent inhibitor of the expression of fear. In accord, Davey (1989) found that dental anxious individuals had histories of more painful dental treatments than non-anxious individuals and that those who did experience painful treatments but did not develop anxiety showed evidence of latent inhibition or a number of relatively painless treatments prior to the painful experiences. Similarly, de Jongh et al. (1995) found that those who had always been

fearful of dentists had relatively short durations between their first dental treatment and their first painful treatment, suggesting they lacked positive experiences to buffer against the development of long lasting fear when a painful treatment occurred. Because water fearful and non-fearful study members did not differ in the age at which they had learnt to swim, the amount of water exposure (i.e. the number of times swimming in the previous year) or the age at which water trauma first occurred, latent inhibition effects were less apparent in the present study. However, it is important to note that other types of experiences that may serve as latent inhibitors (e.g. a family member who was a competitive swimmer) were not investigated.

Yet another explanation for our findings is that fear itself, especially if it occurs unexpectedly, may serve as a traumatic or unconditional stimulus (Barlow, 1988). Forsyth and Eifert (1996) review the evidence for conditioning, and suggest that respondent conditioning, where there is a clear external UCS, is less important than conditioning via unexpected fear or panic. In support, Kleinkneckt (1994) divided traumatic experiences into those associated with pain versus those associated with fright, with respect to the onset of fears of blood, injury or needles. Frightening experiences were more frequently reported as unconditional stimuli (63.4%) than were painful experiences (40.9%). That lack of confidence for immersing oneself in water was predictive of later phobias, in the apparent absence of external aversive experiences with water (at least up to the age of 9), may reflect conditioning by fear itself. However, it is not clear why frightening episodes with water (as opposed to painful episodes) would not have been reported by parents in the present study. The failure to find a difference between groups in the number of children who 'got into difficulties in water' does not seem to be readily explained by the pain versus fear distinction.

5. Summary

In general, our findings support suggestions by other researchers, most notably Menzies and Clarke (1993a) and Graham and Gaffan (1997), that the acquisition of fear of water may be due to non-associative processes. The findings are consistent with a growing body of literature (e.g. McNally and Steketee, 1985; Menzies and Clarke, 1993b, 1995a,b; Poulton et al., 1998) suggesting acquisition of, at least some specific evolutionary-relevant fears (i.e. water and height fear) may be attributable to non-associative processes, not conditioning events. Interestingly, this possibility was first adumbrated 20 years ago by Rachman who suggested "Rather than assume that a significant proportion of the population *acquires identical fears*, we can entertain the view that the predisposition to develop the most common fears is innate and universal, or nearly so, and that what we learn is how to overcome our existing predispositions" (Rachman, 1978, p 255, italics original). This compares with prospective research on the acquisition of dental fear, an evolutionary-neutral fear, in which conditioning events between the age of 5 and 15 were related to the development of dental fear at age 18 (Poulton et al., 1997; see also Davey, 1989; Harris and Menzies, 1996; Menzies and Harris, 1997). It remains possible, however, that individuals in the present study who developed a fear of water by age 18 experienced traumatic conditioning events after the age of 9, or that Study members acquired fear via other 'less direct' conditioning processes as previously discussed.

Future research investigating associative and non-associative models of fear acquisition should use designs that permit evaluation of these alternative explanations.

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References

Barlow, D. H. (1988). *Anxiety and its disorders: the nature and treatment of anxiety and panic*. New York: Guilford Press.

Clarke, J. C. & Jackson, J. A. (1983). *Hypnosis and behavior therapy: the treatment of anxiety and phobias*. New York: Springer.

Davey, G. C. (1989). Dental phobias and anxieties: Evidence for conditioning processes in the acquisition and modulation of a learned fear. *Behaviour Research and Therapy, 27,* 51–58.

Davey, G. C. (1992). Classical conditioning and the acquisition of human fears and phobias: A review and synthesis of the literature. *Advances in Behaviour Research and Therapy, 14,* 29–66.

Davey, G. C., Burgess, I., & Rashes, R. (1995). Coping strategies and phobias: The relationship between fears, phobias, and methods of coping with stressors. *British Journal of Clinical Psychology, 34,* 423–434.

Davey, G. C., De Jong, P. J., & Tallis, F. (1993). UCS inflation in the aetiology of a variety of anxiety disorders: Some case histories. *Behaviour Research and Therapy, 31,* 495–498.

de Jongh, A., Muris, P., Ter Horst, G., & Duyx, M. P. M. A. (1995). Acquisition and maintenance of dental anxiety: The role of conditioning experiences and cognitive factors. *Behaviour Research and Therapy, 33,* 205–210.

DiNardo, P. A., Guzy, L. T., Jenkins, J. A., Bak, R. M., Tomasi, S. F., & Copland, M. (1988). Etiology and maintenance of dog fears. *Behaviour Research and Therapy, 26,* 241–244.

Doogan, S., & Thomas, G. V. (1992). Origins of fear of dogs in adults and children: The role of conditioning processes and prior familiarity with dogs. *Behaviour Research and Therapy, 30,* 387–394.

Feehan, M., McGee, R., Nada Raja, S., & Williams, S. M. (1994). DSM-III-R disorders in New Zealand 18-year-olds. *Australian and New Zealand Journal of Psychiatry, 28,* 87–99.

Forsyth, J., & Eifert, G. (1996). Systemic alarms in fear conditioning 1: A reappraisal of what is being conditioned. *Behavior Therapy, 27,* 441–462.

Graham, J., & Gaffan, E. A. (1997). Fear of water in children and adults: Etiology and familial effects. *Behaviour Research and Therapy, 35,* 91–108.

Harris, L. M., & Menzies, R. G. (1996). Origins of specific fears: A comparison of associative and non-associative accounts. *Anxiety, 2,* 248–250.

Henry, B., Moffitt, T. E., Caspi, A., Langley, J. D., & Silva, P. A. (1994). On the 'Remembrance of Things Past'. A longitudinal evaluation of the retrospective method. *Psychological Assessment, 6,* 92–101.

Jones, M. K., & Menzies, R. G. (1995). The etiology of spider phobia. *Anxiety, Stress and Coping, 8,* 227–234.

Kleinkneckt, R. A. (1994). Acquisition of blood, injury, and needle fears and phobias. *Behaviour Research and Therapy, 32,* 817–823.

McNally, R. J., & Steketee, G. S. (1985). The etiology and maintenance of severe animal phobias. *Behaviour Research and Therapy, 23,* 431–435.

Menzies, R. G. (1997). Water phobia. In G. C. L. Davey (Ed.), *Phobias: a handbook of theory, research and treatment*. John Wiley and Sons.

Menzies, R. G., & Clarke, J. C. (1993a). The etiology of childhood water phobia. *Behaviour Research and Therapy, 31,* 499–501.

Menzies, R. G., & Clarke, J. C. (1993b). The etiology of fear of heights and its relationship to severity and individual response patterns. *Behaviour Research and Therapy, 31,* 355–365.

Menzies, R. G., & Clarke, J. C. (1994). Retrospective studies of the origins of phobias: A review. *Anxiety, Stress and Coping, 7,* 305–318.

Menzies, R. G., & Clarke, J. C. (1995a). The etiology of acrophobia and its relationship to severity and individual response patterns. *Behaviour Research and Therapy, 33,* 795–805.

Menzies, R. G., & Clarke, J. C. (1995b). The etiology of phobias: A non-associative account. *Clinical Psychology Review, 15,* 23–48.
Menzies, R. G. & Harris, L. M. (1997). Mode of onset in evolutionary-relevant and evolutionary-neutral phobias: A critical test of two Darwinian models. *Anxiety* (In submission).
Mineka, S. & Zinbarg, R. (1995). Conditioning and ethological models of anxiety disorders: Stress-in-dynamic-context anxiety models. In D. A. Hope (Ed.), *Nebraska Symposium on Motivation, 1995: Perspectives on Anxiety, Panic, and Fear. Current Theory and Research in Motivation* (Vol. 43, pp. 135–210). Lincoln, NE: University of Nebraska Press.
Ollendick, T. H., & King, N. J. (1991). Origins of childhood fears: An evaluation of Rachman's theory of fear acquisition. *Behaviour Research and Therapy, 29,* 117–123.
Ost, L. -G. (1991). Acquisition of blood and injection phobia and anxiety response patterns in clinical patients. *Behaviour Research and Therapy, 29,* 323–332.
Ost, L. -G., & Hugdahl, K. (1981). Acquisition of phobias and anxiety response patterns in clinical patients. *Behaviour Research and Therapy, 19,* 439–447.
Ost, L. -G., & Hugdahl, K. (1983). Acquisition of agoraphobia, mode of onset and anxiety response patterns. *Behaviour Research and Therapy, 21,* 623–632.
Ost, L. -G., & Hugdahl, K. (1985). Acquisition of blood and dental phobia and anxiety response patterns in clinical patients. *Behaviour Research and Therapy, 23,* 27–34.
Poulton, R., Davies, S., Menzies, R. G., Langley, J. & Silva, P. A. (1998). Evidence for a non-associative model of the acquisition of a fear of heights. *Behaviour Research and Therapy, 36,* 537–544.
Poulton, R., Thomson, W. M., Davies, S., Kruger, E., Brown, R. H., & Silva, P. A. (1997). Good teeth, bad teeth and fear of the dentist. *Behaviour Research and Therapy, 35,* 327–334.
Rachman, S. (1978). *Fear and courage*. San Francisco: W.H. Freeman and Co.
Robins, L. N., Helzer, J. E., Croughan, J., & Ratcliff, K. S. (1981). National Institute of Mental Health Diagnostic Interview Schedule: Its history, characteristics and validity. *Archives of General Psychiatry, 38,* 381–389.
Seligman, M. E. P. (1971). Phobias and preparedness. *Behavior Therapy, 2,* 307–320.
Siddle, D. A., & Bond, N. W. (1988). Avoidance learning, Pavlovian conditioning, and the development of phobias. Special Issue: Issues in human Pavlovian autonomic conditioning: An interactive symposium. *Biological Psychology, 27,* 167–183.
Silva, P. A. & Stanton, W. R. (1996). *From child to adult: The Dunedin Multidisciplinary Health and Development Study*. Auckland: Oxford University Press.