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Dishabituation processes in height fear and dental fear: an indirect test of the non-associative model of fear acquisition

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Abstract

The fear dishabituation hypothesis described in the non-associative model of fear acquisition was tested in a longitudinal birth cohort study. Results were consistent with height fear and phobia dishabituation. That is, 're-emergence' of a fear of heights occurred between age 11 and 18 years among individuals who reported higher levels of non-specific stress at age 15. Interestingly, there was no evidence for dental fear dishabituation — a finding consistent with the non-associative model of fear acquisition. Strengths and weaknesses of the study were considered and the results discussed in relation to laboratory-based findings on (dis)habituation. \bigcirc 2000 Elsevier Science Ltd. All rights reserved.

1. Introduction

The non-associative model of fear acquisition maintains that certain cues (e.g. heights, separation) signaled a threat to human survival in pre-technical times. These cues are said to be pre-potent and can manifest at a young age in the absence of aversive conditioning experience (Rachman, 1978; Gray, 1982; Marks & Nesse, 1994; Menzies & Clarke, 1995a). It

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has been hypothesised that over time most individuals will grow out of these developmental fears via habituation processes providing they have sufficient safe exposure to the relevant stimuli. However, this does not occur in all cases. Specifically, poor habituators and those who do not have the opportunity for safe exposure are expected to retain their fear which, if persistent, may result in specific phobias in adulthood (Clarke & Jackson, 1983). Additionally, it was hypothesised that non-specific stress may lead to the return of previously habituated fear (Menzies & Clarke, 1995a; also see Jacobs & Nadel, 1985). These three mechanisms have been proposed to explain why not all adults report specific phobias. However, no data exist to support the two habituation hypotheses proposed by Clarke and Jackson (Merckelbach & de Jong, 1997) and only anecdotal evidence is available to support the fear dishabituation hypothesis proposed by Menzies and Clarke (1995a) (e.g. Harris & Menzies, 1996; also see Rachman, 1990).

Thus, the present study sought to provide empirical evidence for fear dishabituation following non-specific stress among members of a long-running prospective study. The longitudinal sampling frame allowed us to select those individuals who reported an onset of height fear or phobia between age 11 and 18 years. That is, at age 11 they did not report height fear but did so seven years later at age 18. In this context fear dishabituation was assumed to occur between 11 and 18 years because of findings and theory suggesting the majority of our cohort were likely to have been afraid of heights in infancy following self produced locomotion (e.g. Gibson & Walk, 1960; Marks, 1987; Menzies & Clarke, 1993a; Nesse & Abelson, 1995). The non-specific stress experienced by the height fear group was compared to a group of individuals who did not report height fear at either age (the control group). Further, the non-associative model only predicts fear dishabituation following nonspecific stress for evolutionary-relevant fears such as height. Thus, no relation between an evolutionary-neutral fear such as dental fear and non-specific stress was expected. To test this hypothesis we conducted the same analyses among study members who reported dental fear and phobia at age 18 only and compared their experience of non-specific stress to those without dental fear.

2. Method

2.1. Participants

The sample consisted of members of the Dunedin Multidisciplinary Health and Development Study, a longitudinal investigation of children born in Dunedin between 1 April 1972 and 31 March 1973 (see Silva & Stanton, 1996 for details). The sample has been assessed on a wide variety of psychological and medical measures at two year intervals from age 3 (n = 1037) to age 15 (n = 976), and subsequently at 18 (n = 1008), 21 (n = 992), and most recently at age 26. Of particular relevance to the present study are the data from assessments conducted at ages 11, 15, and 18.

2.2. Procedure

The health and development interviews were conducted within approximately one month of the study members 11th, 15th, and 18th birthdays. Testing occurred during one full day and typically took place at the Dunedin Unit. Those unable to attend the Unit were interviewed in their own home or where convenient. A mental health interview (a maximum of 50 min) at ages 11 (n = 792), 15 (n = 962), and 18 (n = 936) provided the information for the present report.

2.3. Fear assessment at age 11

As a part of the Diagnostic Interview Schedule for Children (DISC; Costello et al., 1982), study members were asked "Are you afraid of heights, and if yes, do you try to stay away from heights?" Study members who responded "sometimes" (coded 1) or "always" (coded 2) to this question were classified as height fearful at age 11 (n = 55, 6.9%). Later in the same interview Study members were asked the open ended question "In the last year, have you worried about things before they happened (like going to the doctor, or having a test at school)?" Study members who volunteered that they had sometimes or always worried about going to the dentist were classified as having a dental fear at age 11 (n = 99, 12.5%). The prevalence of dental fear in our sample was slightly higher than previously reported for this age group (e.g. Kent, 1997) which should have reduced the likelihood of false negative cases being included in the control group (also see Discussion for further explication of this point).

2.4. Fear assessment at age 18

At age 18, Study members were administered a modified version of the Diagnostic Interview Schedule (DIS; Robins et al., 1981) due to constraints on assessment time. The modifications consisted of: (1) including only those questions pertaining to the assessment of DSM-III-R criteria; (2) assessing only the symptoms that occurred within the past 12 months (rather than lifetime prevalence); (3) assessing only the more commonly occurring diagnoses for this age group; and (4) limiting response options to 'no', 'yes, sometimes' and 'yes, definitely' (also see Feehan et al., 1994).

During the DIS interview, study members were asked, "In the last year have you had a strong unreasonable fear of heights?" A response of 'yes, definitely' to this gate question resulted in the classification of a height fear (n = 107, 11.4%). Study members were also asked if, in the last year, they had had a strong unreasonable fear of going to the dentist. The ninety-six (10.3%) study members who responded 'yes, definitely' to this question were classified as having dental fear.

A positive response to these gate questions also led to four supplementary questions: (1) "Have you been very upset with yourself for having that fear of (e.g. heights)?"; (2) "Has an unreasonable fear of (e.g. heights) interfered with your ability to do your work?"; (3) "When you have to approach (e.g. height) does it almost always make you extremely nervous or panicky?"; and (4) "Has the unreasonable fear of (e.g. heights) kept you from going to a party, social events or meeting?" Those study members who also responded 'yes, definitely' to at least

| Stressors | % Moderate intensity $(n = 909)$ | % High intensity $(n = 746)$ | % Very high intensity $(n = 369)$ |
|--|----------------------------------|------------------------------|-----------------------------------|
| 1. Not spending enough time with mum or dad | 36.6 | 12.6 | 1.7 |
| 2. Having parents separate | 7.4 | 4.6 | 1.7 |
| 3. Moving from one place to another | 6.6 | 3.3 | 1.8 |
| 4. Fighting with your parents about house rules | 39.2 | 15.2 | 2.4 |
| 5. Being overweight or bigger than others for your age | 18.1 | 9.2 | 3.4 |
| 6. Having your parents argue in front of you | 38.9 | 22.0 | 6.6 |
| 7. Not having your homework done on time | 44.4 | 15.3 | 3.4 |
| 8. Not being good enough at sports | 27.6 | 10.9 | 3.5 |
| 9. Feeling pressured to get good marks | 37.5 | 16.6 | 5.3 |
| 10. Not getting along with your teachers | 29.5 | 10.9 | 2.6 |
| 11. Having nothing to do | 23.6 | 8.2 | 2.1 |
| 12. Being pressured to try something new | 13.2 | 6.3 | 2.3 |
| 13. Feeling like your body is changing | 13.3 | 3.1 | 0.7 |
| 14. Not being able to dress the way you want | 31.1 | 14.7 | 4.1 |
| 15. Feeling sick | 62.1 | 37.9 | 11.6 |
| 16. Changing schools | 6.4 | 4.0 | 1.4 |
| 17. Feeling left out of things | 40.2 | 21.6 | 7.1 |
| 18. Being smaller than others for your age | 12.8 | 5.7 | 2.2 |
| 19. Being late for school | 14.2 | 2.7 | 0.9 |
| 20. Not having enough money to spend | 33.9 | 13.4 | 4.8 |
| 21. Arguing with your friends or breaking up with them | 40.1 | 28.4 | 13.2 |

| Table 1 | | |
|---|--------------------------------------|---------------------------------|
| Frequency ratings (in %) for "feel bad" | ' items at age 15 among members of a | longitudinal birth cohort study |

two of these questions and reported that the fear had been present for at least 1 month or more were classified as having a phobia. These criteria led to the assignment of thirteen study members (1.4%) as height phobic and fourteen study members as dental phobic (1.5%) at age 18.

2.5. Stress assessment at age 15

As part of the mental health assessment at age 15, each study member (n = 945) was administered the "feel bad" scale (Lewis et al., 1984). This is a 20-item scale that was developed as a result of interviews with this age group (Lewis et al., 1984) and represents the events and situations that were most frequently reported as causing stress (McGee & Stanton, 1992; see Table 1). Each "feel bad" item was rated for frequency of occurrence over the past year on a 5-point scale: 0 = never, 1 = one or two times, 2 = sometimes, 3 = often and 4 = all the time. If an item was rated to have occurred (i.e. 1–4), the item was then rated for intensity of stress experienced ("how it made you feel") with: 0 = not bad, 1 = a little bad, 2 = pretty bad, 3 = really bad, and 4 = terrible.

In the present study, the stress ratings were categorised into three groups: (1) <u>Moderate</u> — study members who had experienced at least one of the items at an intensity rating of 1 or greater (n = 909; 96.2% of the sample); (2) <u>High</u> — those who had experienced at least one of the items at an intensity of 2 or greater (n = 746; 78.9%); and (3) <u>Very High</u> — at least one of the items was experienced at an intensity of 3 or 4 (n = 369; 39%).

2.6. Study design

To test the relation between non-specific stress at age 15 and adolescent onset fear and phobia, those study members classified as having a height or dental fear or phobia at age 18 only were included in statistical analyses. That is, we *excluded* from the final sample those who also had a fear at age 11 (see Section 2.3), resulting in the following groups: (1) No height fear at age 11 or 18 (n = 624, 89.1% of this sample); (2) Height fear at age 18, no height fear at age 11 (n = 76, 10.9%); (3) Height phobia at age 18, no height fear at age 11 (n = 9, 1.4%); (4) No dental fear at age 11 or 18 (n = 596, 90.2%); (5) Dental fear at age 18, no dental fear at age 11 (n = 11, 1.8%).

3. Results

Table 1 shows the percentage of study members at age 15 who experienced stress of at least moderate intensity, high intensity, and very high intensity separately, for each of the items on the "feel bad" scale. Study members reported experiencing approximately 6 stressors ($\underline{M} = 5.80$, $\underline{SD} = 2.7$) of at least moderate intensity, approximately 3 stressors ($\underline{M} = 2.66$; $\underline{SD} = 2.7$) of at least high intensity, and approximately one stressor ($\underline{M} = 0.83$, $\underline{SD} = 1.5$) at a very high intensity.

As shown in Fig. 1, study members with adolescent-onset height fear and phobia reported



Fig. 1. (i-iii). The relation between self-reported non-specific stress at age 15 and adolescent onset height and dental fear and phobia in a longitudinal birth cohort.

more stressors at age 15 at each intensity level (i–iii) relative to those with no height fear at 11 or 18 (control subjects). Additionally, study members classified as dental fearful or phobic at age 18 reported, on average, fewer stressors than those with adolescent-onset height fear and/ or phobia.

Separate MANOVAs were performed on the data, with mean number of stressors at each intensity level as the three dependent measures. Analyses revealed that study members with a height *fear* at age 18 reported significantly more moderately intense stressors at age 15 ($\underline{M}=6.7$, $\underline{SD}=3.8$) than study members with no height fear ($\underline{M}=5.7$, $\underline{SD}=3.9$), F(1, 698)=4.42, p = 0.036. Analyses also revealed that study members with a height *phobia* at age 18 were significantly more likely to report stressors of a very high intensity ($\underline{M}=1.7$, $\underline{SD}=2.3$) relative to those with no height fear or phobia ($\underline{M}=0.7$, $\underline{SD}=1.3$), F(1, 631)=4.57, p = 0.033. No further comparisons were statistically significant, notably those that included dental fear or phobia as independent measures.

4. Discussion

Dishabituation of height fear and phobia was evident among Study members experiencing high levels of non-specific stress at age 15. Further, and as predicted by the non-associative model, this finding was specific to height fear. That is, those reporting dental fear at age 18 did not differ from the no-fear group in their experience of non-specific stress. Interestingly, stress of at least moderate intensity was related to self-report of height fear whereas only very high stress levels were related to height phobia.

4.1. Habituation and dishabituation processes

Habituation is generally regarded as a transient state, and dishabituation occurs naturally after a sufficiently long time period. Thus, one might argue that dishabituation should be more likely to occur for dental fear, presumably because dentists are typically encountered less often than height situations — yet this was not the case. There has been considerable debate about what causes a habituated state to last, that is, to override the transient nature of habituation (for example, see Wagner, 1976, for a discussion of comparator models). More recently Mackintosh (1987) argued persuasively for a conditioning model — that the habituated state becomes conditioned to contextual cues — which is why dishabituation is more likely to occur if the stimulus is presented in a novel context. So, to suggest that some people habituate to evolutionarily potent stimuli and that habituation is the sole explanation for their lack of fears may not be sufficient — there must be an additional type of learning that takes place which results in long lasting habituation.

The specific hypothesis tested in this study was that dishabituation occurs due to non-specific stress. Support for this proposition comes from findings that dishabituation will occur if a novel or salient stimulus is presented before being re-exposed to the previously habituated stimulus (Thompson & Spencer, 1966; Groves & Thompson, 1970). However, the evidence shows that this effect only occurs when the novel or salient stimulus occurs just before re-exposure to the previously habituated stimulus (e.g. if a car accident occurs just before going

to the dentist). The effect of another sensitizing novel stimulus disappears with increased time before re-exposure to the previously habituated stimulus (see Groves & Thompson, 1970). It is unlikely that all of the stressors in the current data set occurred immediately before a visit to a dentist, or, for that matter, before exposure to heights. However, it is possible that it is the proximity to the experience of stress rather than stressors themselves that result in dishabituation outside the laboratory. In support, among people with a fear of heights at least some sufferers have retrospectively claimed that onset occurred (without conditioning trials) during a period of stress or depression (Menzies & Clarke, 1993a, 1995b). The effects of general anxiety and depression on subsequent fears could of course be due to factors other than dishabituation. For example, anxiety and depression may simply increase the likelihood of negative thoughts about going to the dentist or being in a high place — although this would not account for the differential relation between stressful life events and fears of dentists versus heights. Further research on habituation processes in naturalistic settings is required to resolve this issue.

4.2. Methodological issues

Strengths of the study included (i) the availability of prospective data from a relatively large general population sample which enabled us to define our groups carefully, and (ii) the use of an age-relevant stress measure that obtained information about the individuals perception of the stressor (i.e. "how bad" it was for the individual). This was important because it is the individuals perception of threat or difficulty associated with adverse life events that determines the level of stress experienced, not events per se (e.g. Paykel, 1983; Thoits, 1983). Further, as can be seen in Table 1, the stressors appear genuinely non-specific (e.g. not having done homework on time, arguing with your friends or breaking up with them) and therefore could not be viewed as height-related traumas leading to conditioning of height fear at age 18.

A potential weakness of the study involved the omission of a specific question about dental fear in the simple phobia section of the DISC age 11 interview. This required us to rely upon information obtained in another part of the interview in order to exclude those individuals in the age 18 dental fear group who were similarly fearful at age 11. Study members were asked an open-ended question regarding worrying about things before they happened. Importantly, dental fear was not prompted for (prompts included going to the doctor or having a test at school). Initially, we defined those who volunteered that they always worried about going to the dentist as dentally fearful at age 11 (3.3%) resulting in a lower prevalence rate than typically observed in this age group (Kent, 1997). Thus, by using this high threshold for inclusion in the dental fear group we risked including a number of false negatives in our control group (Type 2 error). This may have made differences between the control and dental fear groups more difficult to detect. To avoid this problem, we reanalysed the age 18 fear data excluding all study members who sometimes or always worried about going to the dentist at age 11 (n = 99, 12.5%). This more liberal criteria for defining dental fear at age 11 should have reduced the likelihood of Type 2 errors influencing our findings. However, it was notable that the results remained the same regardless of the threshold adopted for defining dental fear at age 11. Further, this issue was only relevant in comparisons between height and dental fear. That is, in the comparison with the control group (n = 624) Study members with height fear at age 18 reported significantly more non-specific stress.

It remains possible that height fear may have had an onset between age 11 and 15, prior to the assessment of stress levels. This may indicate a role for conditioning event(s), vicarious learning or the like in the genesis of height fear rather than the influence of non-specific stress. However, this argument would apply equally to dental fear for which no relation with non-specific stress was observed. One might also argue that the onset of height fear may have caused stress rather than vice versa but this seems unlikely judging by the nature of the stressors most commonly reported at age 15.

4.3. Summary

Overall, the results were consistent with the fear dishabituation hypothesis described in the non-associative model of fear acquisition promoted by Menzies and Clarke (1995a). However, we also acknowledge that these findings were more difficult to reconcile with habituation findings derived from experimental psychology. Clearly, further research is needed to understand dishabituation processes as they occur outside the laboratory.

Other support for the non-associative model has come from retrospective and prospective studies suggesting that evolutionary-relevant specific fears may be acquired without aversive conditioning experience (Menzies & Clarke, 1993a,b, 1995b; Poulton et al., 1998, 1999), whereas acquisition of evolutionary-neutral fears (e.g. fear of the dentist) is related to conditioning history (e.g. Davey, 1989; de Jongh et al., 1995; Milgrom et al., 1995; Poulton et al., 1997; see also Harris & Menzies, 1996) or other dispositional or cognitive factors (e.g. Locker et al., 1999). To our knowledge this is the first controlled prospective test of the fear dishabituation hypothesis examining both evolutionary-relevant and neutral fear. Findings were consistent with the non-associative theory, but alternative interpretations of the findings remain possible (e.g. see Chapter five, Craske, 1999). We hope these data serve to focus attention on ways to further explore the utility of the non-associative model of fear acquisition. For example, a major challenge for future research is to determine whether poor habituators and those receiving insufficient exposure to non-associative stimuli in childhood are at increased risk of reporting evolutionary-relevant phobias in adolescence or adulthood.

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