Coping in the chair: A validation study of the Monitoring Blunting Dental Scale

A thesis presented in partial fulfilment of the requirements for the degree of

Master of Arts

in

Psychology

at Massey University, Wellington

New Zealand.

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2010

Abstract

The monitoring-blunting theory of coping in threatening situations (Miller, 1981, 1987) suggests that when faced with a threatening situation, individuals can respond either by attending to threatening information ("monitoring") or by avoiding threatening information ("blunting"). A valid and reliable measure of children's preferred coping styles in dental situations may assist dental staff in providing efficacious anxiety-reducing interventions to diverse groups of children. The current study sought to validate a scale of children's preference for monitoring or blunting in dental situations (the Monitoring Blunting Dental Scale or MBDS). The psychometric characteristics of the scale were assessed in a group of 240 eleven to thirteen year old New Zealand children. Internal consistency reliability was adequate for both the monitoring ($\alpha = .743$) and blunting ($\alpha = .762$) subscales. Convergent validity was indicated by strong correlations ($> .6$) between the MBDS monitoring and blunting subscales and those of an adapted version of the Child Behavioural Style Scale (CBSS-M). Discriminant validity with respect to dental anxiety was strong for the monitoring subscale, $r = .079$, $p = .221$, but not the blunting subscale, $r = .478$, $p < .001$. Confirmatory factor analysis of the MBDS indicated adequate fit for a two factor monitoring-blunting model (RMSEA = .079), but unacceptable fit for a one factor model (RMSEA = .095). A similar finding was observed when confirmatory factor analysis of the CBSS-M was conducted. These confirmatory factor analyses suggested that the monitoring and blunting theoretical constructs cannot be justifiably regarded as representing poles of a single underlying dimension, but are better regarded as distinct, related constructs. A content analysis of children's comments about the coping strategies they might adopt in several dental scenarios indicated that these strategies were largely classifiable within monitoring-blunting theory, with blunting-type strategies much more commonly mentioned. Given further validity evidence, the MBDS could be a useful measure when attempting to tailor anxiety-reducing interventions in dental settings to children with diverse coping preferences.

Acknowledgements

I would firstly like to thank my supervisor Linda Jones for her support, guidance and pragmatic advice. My thanks also to John Spicer, whose assistance with statistical issues was invaluable.

The support provided to me by Massey University in the form of a Masterate scholarship was very much appreciated, as was a grant to travel to the New Zealand Postgraduate Conference to present preliminary results of my study.

The friendliness and patience of the staff and students at the participating school made the data collection period a pleasure; without them, this project could not have happened. The generosity of Colgate-Palmolive in providing toothbrushes and pastes for study participants was also greatly appreciated.

My girlfriend Jessica has been a steady source of gentle encouragement and patience throughout this intense year. Thanks also to my brother Martin and sister Amy for being there to help when needed.

Finally, I would like to thank my parents, Anneke and David Williams. Your support and constant belief in me mean the world.

Approval was obtained for this study from the Massey Human Ethics Committee (MUHEC Southern A 09/37).

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Abbreviations

ADF   Asymptotically Distribution-free Estimator; a model estimation method (and discrepancy function) for estimating structural equation models.

AMOS   A computer program used to evaluate structural equation models; short for Analysis of Moment Structures (Arbuckle, 2008).

CBSS   Child Behavioural Style Scale (Miller, Roussi, Caputo, & Kruus, 1995). An adapted version of the CBSS was used in the current study (CBSS-M).

CBSS-M   Child Behavioural Style Scale – Medical situations (an adaptation of the CBSS for the current study).

CFA   Confirmatory Factor Analysis.

CFI   Comparative Fit Index, a measure of the goodness of fit of a given SEM model in comparison to a null model for the same dataset (usually an independence model, with zero population correlations between variables).

CFSS-DS Children's Fear Survey Schedule – Dental Subscale (Cuthbert & Melamed, 1982).

DAS   Dental Anxiety Scale (Corah, 1969).

DMFS   Decayed/Missing/Filled Surfaces (a "global" measure of oral health; the sum of a subject's decayed, missing and filled tooth surfaces).

DMFT   Decayed/Missing/Filled Teeth, a simpler and more commonly reported global oral health index; applies to whole tooth counts rather than tooth surfaces.

EFA   Exploratory Factor Analysis.

IRT   Item Response Theory, a paradigm for the design and analysis of psychometric tests.

KMO   Kaiser-Meyer-Olkin measure of sampling adequacy, a measure of the appropriateness of a correlation matrix for factor analysis.

MAR   Missing At Random, an assumption with regard to the process
           underlying the missing data in a dataset; missingness on a variable is
           assumed to be unrelated to the level of that variable after controlling
           for all other variables in the analysis (Allison, 2001).

MBSC   Monitoring and Blunting Scale for Children (Kliewer, 1991; Lepore &
           Kliewer, 1989).

MBSS   Miller Behavioural Style Scale (Miller, 1987), a general measure of
           monitoring and blunting coping preferences.

MCAR   Missing Completely At Random, a missing data assumption:
           probability of missingness is assumed to be unrelated to any study
           variable.

MCDAS   Modified Child Dental Anxiety Scale (Wong, Humphris, & G. T. Lee,
           1998).

MCI   Mainz Coping Inventory (Krohne et al., 2000).

MLE   MLE: Maximum Likelihood Estimation (used here with reference to
           the maximum likelihood estimator/discrepancy function for CFA/SEM
           models).

PCLOSE   The p value for the RMSEA test of close fit for a structural equation
           model (Browne & Cudeck, 1993).

RMSEA   Root Mean Square Error of Approximation, a measure of the goodness
           of fit of a structural equation model.

SEM   Structural Equation Modelling. CFA models are a subtype of SEM
           model.

SFPS   Smiley Faces Paper Scale, the dental anxiety measure utilised in the
           current study; adapted from the computerised Smiley Faces Program
           (Buchanan, 2005).

SRMR   Standardised Root Mean square Residual, a measure of the goodness of
           fit of an SEM model.

TMSI   Threatening Medical Situations Inventory, a scale measuring
           monitoring and blunting preferences in medical situations (van Zuuren,
           de Groot, Mulder, & Peter, 1996).

Introduction

Dental Anxiety: Definition

Some tortures are physical
And some are mental,
But the one that is both
Is dental.
 –Ogden Nash (1941)

      Dental anxiety is a serious phenomenon with serious negative oral health correlates (e.g. Doerr, Lang, Nyquist, & Ronis, 1998), widespread psychosocial effects (S. M. Cohen, J. Fiske, & Newton, 2000; McGrath & Bedi, 2004), and a strong association with avoidance of dental care (Schuller, Willumsen, & Holst, 2003; Sohn & Ismail, 2005). Despite the importance of the phenomenon, however, explicit definitions of the term "dental anxiety" are fairly rare: perhaps due to an assumption that the term is self-explanatory. In a rare study that did offer an explicit definition, Stouthard and Hoogstraten (1990, p. 140) defined dental anxiety as "the degree to which a person is apprehensive about the dental treatment, and the duration of and the reactions to these feelings". This definition seems to exclude anxiety in relation to dental assessment (e.g. checkups), and the term "reactions to these feelings" is rather ambiguous. Later, Ng, Stouthard, and Leung (2005, p. 107) defined dental anxiety as "a situation-specific trait anxiety... the disposition to experience anxiety in dental situations", avoiding the restriction in stimulus to dental treatment only. In most studies, though, complex definitions are eschewed and dental anxiety is viewed in simple terms, perhaps best epitomised by the popular one-item dental anxiety scale, the Dental Anxiety Question (Neverlien, 1990, p. 365): "Are you afraid of going to the dentist?"

      The term dental *fear* is also commonly used in the literature, often interchangeably with dental anxiety (Armfield, Spencer, & Stewart, 2006); some authors even choose to use both terms in the titles of their articles (e.g. Erten, Akarslan, & Bodrumlu, 2006; Locker & Liddell, 1991; E. Ragnarsson, 1998). Armfield and colleagues (2006, p. 78) point out that the terms are not strictly equivalent, however:

Dental fear may be distinguished from dental anxiety by the situational boundaries within which it occurs. Fear is generally regarded as a physiological, behavioural and emotional response to a feared stimulus whereas anxiety is a feeling of dread or worry focused on, yet temporally prior to, exposure to a feared stimulus.

In the general psychological literature, fear is generally defined as the simple emotional response to a threatening stimulus: the "immediate alarm reaction to danger" (Barlow & Durand, 2002, p. 114). On the other hand, anxiety is a more inclusive term that refers to a physiological and psychological state including cognitive, somatic, emotional and behavioural components (Seligman & Rosenhan, 1989). While clarification of the differences between the terms fear and anxiety is useful, Armfield and colleagues' (2006) definition would seem to suggest that anxiety or distress occurring while actually experiencing aversive dental care cannot be classed as dental anxiety. This implies a need to use different terms for fearful reactions occurring before and occurring during dental treatment, a perhaps unnecessary complication.

A small number of studies have used the term dental *phobia*. This term tends to be specifically used either when attempting to classify dentally fearful or anxious individuals according to formal diagnostic criteria (e.g. Roy-Byrne, Milgrom, Khoon-Mei, Weinstein, & Katon, 1994), or to refer to individuals with very high levels of dental anxiety, such as admissions or applicants to clinics specialising in the treatment of dental fear (e.g. Abrahamsson, Berggren, Hallberg, & Carlsson, 2002; De Jongh et al., 1998, 1995).

The term used in describing and discussing the current study itself is dental *anxiety*, given that this term is the most inclusive in terms of the situational parameters, level and breadth of the reaction to the feared situation that is encompassed. The following broad definition for dental anxiety is proposed: "anxiety occurring in relation to the experience or expectation of receiving dental care". Given that the terms dental fear and dental anxiety are used more or less interchangeably in the literature, however, studies in the following literature review are not differentiated on this basis. In general the term used in each cited study itself is used when describing the study's findings, resulting in the use of both terms somewhat interchangeably in this section.

Now that the phenomenon of interest has been defined, the following sections describe why dental anxiety is an important problem (namely, its high prevalence and problematic clinical correlates), along with a brief review of the evidence regarding its aetiology. These sections are followed by an examination of the relevance of individual coping styles to understanding how individuals cope with being at the dentist, and how knowledge about individual coping styles can inform anxiety-reducing interventions. This discussion paves the way for the premise of the current study: the validation of a scale measuring children's monitoring-blunting coping styles in dental situations.

Prevalence of Dental Anxiety

While numerous epidemiological studies of dental anxiety have been conducted (e.g. Doerr et al., 1998; C. Y. Lee, Chang, & Huang, 2007; Skaret, Raadal, Berg, & Kvale, 1998; Ten Berge, Veerkamp, Hoogstraten, & Prins, 2002; Vassend, 1993), large-scale investigations using specific diagnostic criteria to define presence of dental anxiety are rare (but see B. Ragnarsson, Arnlaugsson, Karlsson, Magnússon, & Arnarson, 2003). Most epidemiological studies have instead made prevalence estimates by selecting largely arbitrary cut-off criteria on psychometric scales to define presence of dental anxiety. Exacerbating the problem of the validity and comparability of such arbitrarily-defined criteria is the fact that a range of psychometric measures have been used to measure dental anxiety, often with different cut-off points used in different studies. For instance, cut-off points of both 13 points or more (e.g. Doerr et al., 1998) and 15 points or more (e.g. McGrath & Bedi, 2004) on the popular Dental Anxiety Scale (DAS; Corah, 1969) have been used to define presence of dental anxiety. Nevertheless, a brief review of the epidemiological literature is useful in order to obtain a rough picture of the proportion of the general population that is affected by reasonably distressing levels of dental anxiety.

International epidemiological studies with adult samples have generally found fairly high levels of dental anxiety. In a disproportionate probability sample of Detroit adults (Doerr et al., 1998), 10% of the 577 respondents met the aforementioned criterion of a score of 13 points or higher on the DAS. This is admittedly a relatively liberal criterion, effectively only requiring a score in the upper half of the possible score range on the DAS,

which ranges from no anxiety to very high levels of anxiety. In a similar study, Sohn and Ismail (2005) used the same criterion for dental anxiety in a representative sample of 630 Detroit adults, finding a prevalence rate of 12%. McGrath and Bedi (2004) evaluated 1800 randomly sampled British residents using the more stringent criterion of DAS scores of 15 or over. Despite the stricter criterion, the authors found a high prevalence rate of 11%, although Vassend (1993) found a prevalence rate of only 4.2% in a representative sample of 1288 Norwegians when using this criterion.

One large-scale epidemiological study that did use formal diagnostic criteria for dental phobia was conducted in Iceland (B. Ragnarsson et al., 2003), using diagnostic criteria for specific phobia based on the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994). The authors found a dental phobia prevalence rate of 1.8% in a stratified sample of adults between the ages of 27 and 29; a substantially lower prevalence than similar studies using more liberal psychometric scale criteria for dental fear or anxiety. For example, an earlier Icelandic study (E. Ragnarsson, 1998) had found that 15% of 1548 adults reported considerable or extensive fear in response to a modified version of Neverlien's (1990) Dental Anxiety Question (DAQ). Another study using criteria broadly based on the DSM-IV diagnostic criteria for specific phobia found a prevalence of 2.1% in a random sample of 704 Swedish adults (Fredrikson, Annas, Fischer, & Wik, 1996). The authors classified individuals as phobic when they responded positively to all of three questions asking whether their fear was greater than justified, uncontrollable, and resulted in behavioural avoidance. Clearly, the prevalence of dental phobia as assessed using formal diagnostic criteria requiring significant impairment tends to be lower than the prevalence of dental fear or anxiety as measured by popular cut-off points on psychometric scales. Nevertheless, moderate to high levels of dental anxiety are present in many adults, and this anxiety reaches diagnosable levels of significant impairment relatively frequently.

A number of studies have also evaluated the prevalence of dental anxiety in children. In these studies, it is the dental subscale of the Children's Fear Survey Schedule (CFSS-DS; Cuthbert & Melamed, 1982) that has been the most popular measure of dental anxiety, usually as filled out by a parent. A prevalence rate of 5.7% was found amongst all 1281 six to eight year old children in the Danish county of North Jutland (Wogelius,

Poulsen, & Sørensen, 2003), utilising a CFSS-DS score (as filled out by a parent) of or greater than 38 as the criterion for dental anxiety. This cut-off point was based on Cuthbert and Melamed's original suggestion for the CFSS-DS scale. This strategy was improved on in a study of 2144 four to eleven year old Dutch children (Ten Berge et al., 2002) by determining a cut-off of 39 points on the CFSS-DS via cross-validation with respect to dentists' ratings of children's observed fear. The authors found a dental anxiety prevalence of 6%. Similarly, a cut-off of 39 points was determined via receiver operating characteristic curve analysis with respect to observers' ratings of dental anxiety in a stratified sample of 3597 five to eight year old Taiwanese children (C. Y. Lee et al., 2007), finding a prevalence rate of 20.6%. This prevalence rate was substantially higher than that found by Ten Berge et al. (2002). Variations in cultural response styles might explain part of this difference: An international study by Harzing (2006) found a high level of acquiescent responding in Taiwanese individuals relative to members of other cultures. A Scottish study using the conventional adult DAS rather than the CFSS-DS and a stringent criterion for dental anxiety of scores of 15 or over found a dental anxiety prevalence of 7.1% in 1103 thirteen to fourteen year old children (Bedi, Sutcliffe, Donnan, & McConnachie, 1992). Clearly, dental anxiety is an issue for both adults and children, including very young children.

Most studies of dental anxiety in New Zealand have taken place using the Dunedin Multidisciplinary Health and Development study cohort, comprising just over 1000 individuals (see for example Poulton, Waldie, Thomson, & Locker, 2001; Thomson, Broadbent, Locker, & Poulton, 2009; Thomson, Locker, & Poulton, 2000). Using the popular criterion of scores of 13 or greater on the DAS, Thomson et al. (2009), found a prevalence rate of 10.4% in the sample at age 15, 12.7% at age 18, 20.8% at age 26, and 18.4% at age 32. Over thirty-five percent of the sample met the criterion for dental anxiety at least once over the four data collection points. In Australia, 11.3% of a representative sample of 7312 individuals over five years in age responded to the single item Dental Anxiety Question (Neverlien, 1990) by stating that they would feel "very" afraid when visiting the dentist, while a further 4.8% said that they would be "quite" afraid (Armfield et al., 2006, p. 80). Dental anxiety thus appears to be a local as well as an international problem.

Correlates of Dental Anxiety

Associations with oral health and dental avoidance.

Dental anxiety has been associated with a number of deleterious oral health correlates including avoidance of dental care (Sohn & Ismail, 2005), greater numbers of caries/decayed tooth surfaces (Klingberg, Berggren, Carlsson, & Noren, 1995), and increased post-operative morbidity (Hosey et al., 2006).

For example, dental anxiety as measured by a score 13 or greater on a revised DAS was associated with a greater number of decayed surfaces ($M = 5.29$ in the anxious group vs. 1.74 in the non-anxious group) and a smaller number of filled surfaces ($M = 14.00$ vs. 25.41 in the non-anxious group) in a study of 577 Detroit adults (Doerr et al., 1998). The smaller number of filled surfaces in dentally anxious respondents could be the result of dental avoidance in dentally anxious individuals. In another American study (Milgrom, Fiset, Melnick, & Weinstein, 1988), members of a large sample of Seattle adults with at least one oral problem were 1.6 times more likely to exhibit high dental fear than those without any oral problems. The aforementioned Icelandic survey of 1192 adults using DSM-IV criteria for dental anxiety (B. Ragnarsson et al., 2003) found that dentally anxious respondents had a significantly lower mean number of remaining teeth than the non-anxious respondents in both the upper jaw (12.8 vs. 14.2) and the lower jaw (13.1 vs. 14.1). Dental anxiety was also related to number of missing teeth, alveolar bone loss and prevalence of removable dentures in a sample of 784 women in Gothenburg (Hallstrom & Hailing, 1984).

A large sample Norwegian study (Schuller et al., 2003) found that the dentally anxious patients (DAS $\geq$ 13) in their sample had statistically and substantially higher numbers of decayed surfaces. A mean number of 1.5 decayed surfaces was found in the dentally anxious group as opposed to just 0.8 in the non-anxious group, with corresponding higher numbers of decayed teeth (1.2 vs. 0.7) and missing teeth (7.3 vs. 4.9). Lower numbers of filled surfaces (39.5 vs. 49.7), filled teeth (13.3 vs. 16.1), functional surfaces (91.6 vs. 103.5), and functional teeth (19.5 vs. 22.4) were also present in the dentally anxious group. Differences on the global decayed/missing/filled surfaces (DMFS) and decayed/missing/filled teeth (DMFT) indices were not statistically significant in this case,

however, showing how a focus on global oral health indices may obfuscate patterns apparent in the more specific oral health sub-indices. Similar results were found in a large Australian study (Armfield, Slade, & Spencer, 2009): Dentally fearful individuals had higher numbers of decayed teeth (mean 0.87 vs. 0.55 in the low fear group) and missing teeth (5.85 vs. 4.52). Interestingly, a curvilinear relationship between filled teeth and dental fear was observed, with the highest number of filled teeth observed in participants with moderate levels of dental fear.

While the majority of the studies discussed have dealt with adult populations, a handful of studies have examined the correlates of dental anxiety in children. In a sample of 3204 Swedish children (Klingberg et al., 1995), dental anxiety was significantly associated with missing appointments and dental caries, with children adjudged as dentally fearful having a mean of 2.1 carious/decayed tooth surfaces as opposed to a mean of 1.6 carious surfaces in the remainder of the sample. A surprising study by Hosey et al. (2006) suggested that dental anxiety may be associated with postoperative morbidity after dental procedures, based on a sample of children undergoing tooth extraction under general anaesthetic. The authors found a statistically significant but small association with level of postoperative morbidity both 24 hours after surgery ($r = .15$) and one week later ($r = .17$). These results should be interpreted with caution, however, given that the authors included primarily subjective experience factors such as "feeling sick" and "having bad dreams" (p. 41) in their measure of postoperative morbidity rather than objective morbidity measurements. As such the predictor variable (dental anxiety) and criterion variable (postoperative morbidity) may have been confounded, both arguably reflecting subjective distress associated with dental work.

An association between dental anxiety and avoidance has often been demonstrated, which may explain part of the association between dental anxiety and poorer oral health. For example, just 36% of the dentally anxious (DAS ≤ 13) members in a sample of 630 Detroit adults (Sohn & Ismail, 2005) regularly visited the dentist, as opposed to 67% of the non-anxious subsample. Similarly in the other cited Detroit study (Doerr et al., 1998), dentally anxious participants comprised 23.7% of those who had dental checkups less than once a year—but only 4% of those receiving checkups at least once a year. Large avoidance effects were also apparent in the abovementioned study by Schuller et al. (2003): Dentally

anxious individuals comprised 15.7% of participants visiting the dentist less than yearly, but just 5% of those who visited the dentist at least once yearly (in the last 3 years).

Associations with psychosocial variables.

Studies of the consequences and correlates of dental anxiety have not been limited to associations with objective dental pathology indices: Associations with oral health related quality of life and other psychosocial variables are apparent. For instance, Berggren (1993) found that a majority of his sample of 109 dentally phobic patients reported that they had to curtail their social relations, and many reported widespread negative life effects. For some participants this had even extended to loneliness and social isolation. A negative association between dental anxiety and oral health related quality of life is apparent: McGrath and Bedi (2004) found a correlation of .14 ($p <$.001) between DAS scores and their UK oral health related quality of life scale scores. Controlling for age, gender and social class, those experiencing high dental anxiety (DAS $\geq$ 15) were approximately twice as likely to experience oral health related quality of life below the population median. Dental anxiety was also strongly associated with oral health related quality of life in a sample of one thousand Hong Kong residents (Ng & Leung, 2008), with participants classified as suffering from high dental anxiety having a mean oral health impact profile score of 13.2, as opposed to mean scores of 8.1 and 4.0 in the medium and low anxiety groups respectively. In a rare qualitative study, S. M. Cohen et al. (2000) found that twenty patients of a dental sedation clinic reported a wide range of negative effects on their daily lives, including the fright response, negative thoughts, feelings and fears, avoidance, muscular tension, crying, aggression, sleep difficulties, and social impacts including interferences with work and personal relationships.

Correlates, consequences or causes? The causality problem.

A difficulty in attributing poor oral health and other outcomes to the causative effects of dental anxiety is that researchers cannot, of course, randomly assign participants to anxious and non-anxious groups. As such, the direction of causality is difficult to establish. Indeed, poor oral health is often cited as a likely cause of dental anxiety, albeit

usually re-labelled as traumatic dental experience! Therefore, negative dental outcomes such as greater numbers of caries and extractions might be the result of dental anxiety; or, negative dental experiences and poor oral health may themselves *cause* dental anxiety. Further, the association between dental anxiety and poorer oral health outcomes may sometimes be the result of associations with confounding third variables. For instance, the authors of a Scottish study (Bedi, Sutcliffe, Donnan, Barrett, & McConnachie, 1992) found that while the dentally anxious children in their sample had higher values for all components of the Decayed/Missing/Filled teeth index, only the missing teeth difference remained statistically significant after controlling for gender and social class.

One plausible explanation for the oral health/dental anxiety relationship, the "vicious circle" model (Armfield, Stewart, & Spencer, 2007; Berggren & Meynert, 1984) suggests causative influences in both directions: an influence of dental anxiety on oral health via avoidance, and an influence of poor oral health on dental anxiety via resulting traumatic dental experiences. The following section briefly reviews research addressing the aetiology of dental anxiety, with particular reference to this theory.

Aetiology and Age of Onset

While the aetiology of dental anxiety is not clearly understood, a number of retrospective studies have suggested that traumatic dental experiences in the childhood or teenage years may be implicated in the aetiology of dental anxiety. For example, Berggren and Meynert (1984) reported on a sample of 160 patients treated at a dental fear clinic, noting that fear of dental care seemed to have originated in childhood in 85% of the sample—seemingly usually due to early traumatic dental experiences. Dentally anxious members of a university student sample (De Jongh, Muris, Horst, & Duyx, 1995) were also more likely to report painful and traumatic dental experiences. Fifty-three percent of a sub-group of the study sample reporting that they had always been dentally anxious also stated that they had experienced many traumatic treatments, as opposed to just 12.3% of the group who reported always being relaxed about dental treatment. The authors also found that participants who had experienced their first painful dental experience at an earlier age were more likely to develop dental anxiety. In a large random sample of the general Canadian

population (Locker, Shapiro, & Liddell, 1996), participants who reported experiencing all of three types of negative dental experiences (painful, frightening and embarrassing experiences) were 22.4 times as likely to be dentally anxious as participants reporting no such experiences. Again, participants experiencing their first aversive dental experience in childhood were slightly more likely (15.6% prevalence) to experience dental anxiety than those experiencing their first aversive experience in adulthood (11.1%).

In another study by the Locker research group (Locker, Liddell, & Shapiro, 1999), the study authors noted that 50.9% of the dentally anxious participants (16.4%) of a random sample of 1420 Canadian adults reported onset of dental anxiety in childhood, as opposed to 22% in adolescence and 27.1% in adulthood. Aversive conditioning experiences (i.e. dental trauma) were also found to predict both early-onset and late-onset dental anxiety in the Dunedin sample (Poulton et al., 2001). Clearly dental anxiety can arise both early or late in life, although the weight of evidence in the above retrospective studies tends to suggest that onset in childhood is more common. This conclusion was echoed in a New Zealand longitudinal study using the Dunedin sample and examining trajectories of dental anxiety (Thomson et al., 2009). The authors found that 13.1% of the sample developed dental anxiety in childhood and adolescence, as opposed to just 7.7% developing dental anxiety in adulthood. Worryingly, only 1.6% of the sample fell into a recovery trajectory (experiencing dental anxiety in childhood/adolescence and subsequently becoming non-anxious), suggesting that once developed, dental anxiety is hard to eliminate.

Another longitudinal study utilising the Dunedin sample (Poulton et al., 1997), suggested that negative dental experiences in adolescence are particularly important in the development of dental anxiety. The authors found that DMFT oral health status level at age 5 was not predictive of dental anxiety at age 18, but DMFT status at age 15 was strongly and specifically predictive of dental anxiety at age 18. Those participants with caries experience at age 15 (DMFT > 0) were almost five times as likely to experience dental anxiety at age 18 (and not significantly more likely to experience *general* fearfulness). This study provided a strong insight into the role of dental experiences in adolescence in the development of dental anxiety—although the use of DMFT values as a proxy for traumatic dental experiences was a limitation of this study.

The longitudinal study mentioned above provides stronger evidence of a causal role of negative dental experiences than retrospective studies. In general, however, it is difficult to be sure whether negative dental experiences cause dental anxiety, dental anxiety results in poor dental health and negative dental experiences—or both. This latter reciprocal option was suggested in the "vicious cycle" model of dental anxiety, as coined by Berggren and Meynert (1984, p. 207) and expanded on by articles such as Moore, Brødsgaard, and Birn (1991) and Armfield et al. (2007). This theory suggests that people with high dental anxiety avoid treatment, resulting in dental problems, more traumatic symptomatic treatment, more fear, and more avoidance. Embarrassment in the dental situation may play an additional amplifying role in this cycle (Moore, Brødsgaard, & Rosenberg, 2004). Results consistent with this theory were found in a large Australian study (Armfield et al., 2007), with participants classified into several ascending fear groups having consistently higher levels of dental problems, and being more likely to usually visit the dentist with a specific problem rather than for preventative care. Similarly in another Australian study, Thomson, Stewart, Carter, and Spencer (2006) found higher levels of dental fear in individuals who had avoided the dentist for two years or more and who usually visited for a problem, results consistent with the model. The vicious circle theory appears promising, having the capability to explain the causal role of negative dental experiences on subsequent anxiety development seen in Poulton et al. (1997) while its amplifying circular model also explains the low frequency of dental anxiety recovery trajectories observed in Thomson et al. (2009). Further empirical evidence for the vicious circle theory is required, however.

In general, sufficient evidence for an increased likelihood of incidence of dental anxiety during childhood and adolescence appears to be present, suggesting that efforts to prevent and address dental anxiety in young people are of particular importance. This may especially be the case in New Zealand, where dental care is free until the age of 18, with regularly scheduled checkups offered in school hours. This period may perhaps be seen as a window of opportunity to develop positive attitudes toward dental care, before dental visits become more costly and less frequent in adulthood.

Coping Styles and Dental Anxiety

　　While the studies cited in the previous section demonstrate a moderate positive relationship between aversive dental experiences (especially in childhood and adolescence) and dental anxiety, it is also clear that many individuals experiencing negative or traumatic dental experiences do not go on to experience dental anxiety. For instance, much variation in dental anxiety was not explained by earlier DMFS status in Poulton et al. (1997), despite the positive relationship between the two variables. It is therefore important to examine how individuals do manage to cope with stressful visits to the dentist, and how consideration of individual variation in these coping styles can inform the professional management of dental anxiety.

　　Miller's (1981, 1987) theory of monitoring and blunting coping styles is a particular framework that has sparked strong interest and garnered demonstrations of relevance in the dental anxiety arena (e.g. Buchanan & Niven, 2003; Litt, Nye, & Shafer, 1995; Muris, De Jongh, van Zuuren, & Schoenmakers, 1996; Muris, De Jongh, van Zuuren, & Ter Horst, 1994; Muris et al., 1995; Muris, Merckelbach, & De Jongh, 1995). Miller's theory was initially termed "the blunting hypothesis" (Miller, 1981, p. 215), and arose from her attempts to reconcile the somewhat inconsistent evidence regarding the association between aversive event predictability and stress response. Miller (1981) noted that traditional theories of predictability and stress tended to suggest that increased predictability of a stressor always reduces anticipatory and impact stress response, but empirical evidence suggested that this was is not always the case. Miller (1981) therefore advanced the idea that in certain situations (especially those where the aversive threat is not controllable by the individual), attending to or "monitoring" threatening information in order to increase predictability is not useful, given that the increased information cannot be used instrumentally to control the stressor. Rather, increased information and predictability in such situations simply serve to maintain distressing arousal. Distraction and avoidance of threatening information ("blunting") in these situations then becomes a more useful strategy. Increased information about the stressor (i.e. increased predictability) may in fact increase distress when stressor controllability is low, given that this information interferes with the ability to blunt. This would explain the inconsistent effect of increased predictability observed in the experimental literature.

Miller (1981) went on to suggest that other situational characteristics (such as the invasiveness of the threat) and, crucially, individual variation in the ability and inclination to use distracting strategies can impact on whether blunting techniques are in fact utilised. This notion of individual variation in monitoring/blunting preference and ability was an important one: Miller suggested that a consistent minority of individuals (*monitors*) tend to use monitoring strategies even when situational characteristics favour blunting; and that a corresponding consistent minority also tend to use blunting strategies even when situational characteristics favour monitoring (*blunters*).

Miller's theory has important implications for the consideration of how individuals deal with threatening situations. On a general level, it serves as a reminder that individuals cope with threatening situations in different ways, and that the same anxiety-reducing interventions may be unlikely to work for all individuals. On a more specific level, the theory suggests that the quantity of information provided to an individual in a threatening situation (such as undergoing an aversive medical procedure) should be carefully considered with regard to its potential impact on the individual's ability to cope effectively. In fact, the theory has received a great deal of attention in terms of its applicability in medical contexts (Muris et al., 1995; Muris, van Zuuren, & De Vries, 1994; Rosenbaum & Piamenta, 1998; Shiloh, Mahlev, Dar, & Ben-Rafael, 1998; van Zuuren, De Jongh, Beekers, & Swinkels, 1999). Part of this attention may be due to the theory's salience in terms of the difficult question of how much information to afford to patients experiencing illnesses and stressful medical procedures. The theory also has the potential to guide the development of tailored intervention schemes that are effective with diverse ranges of individuals.

The congruency hypothesis.

A key to the usefulness of monitor/blunter coping theory in terms of its ability to guide the use of anxiety-reducing interventions is the notion of the congruency hypothesis: the hypothesis that interventions that are congruent with an individual's preferred coping style will be more effective in reducing distress (Christiano & Russ, 1998). A number of experimental and quasi-experimental studies have addressed this point.

An early study (Efran, Chorney, Ascher, & Lukens, 1989) provided participant groups with several different coping instruction sets before completing the cold pressor task. This task involves participants placing their hands in warm and then icy water, with experimenters noting when the participant first notices pain (threshold) and the length of time that they can withstand hand immersion in the icy water (tolerance). The authors noted that individuals tended to do better when the instructional set supported their habitual coping style, although the interaction was only significant for blunters and with threshold as the outcome variable. No statistically significant interaction between habitual and imposed coping style was detected by Muris, De Jong, Merckelbach, and van Zuuren (1994), but a very small sample size and a weak threat manipulation (aversive slides) would have seriously limited the statistical power of this study. Sparks (1989) conducted a study assessing the congruency hypothesis with a group of students selected specifically because their responses to a self-report scale indicated that they could be classified as either high monitors/low blunters (i.e. a high preference for monitoring and a low preference for blunting) or as low monitors/high blunters (a high preference for blunting and a low preference for blunting). Sparks showed participants a suspenseful film clip after being given either a small or large amount of information about the events in the film. High monitors/low blunters reacted more negatively to the low forewarning condition, while high blunters/low monitors reacted more negatively in the high forewarning condition. These effects appeared across all three reactivity measures in the study (self-reports, skin conductivity measures and thought listings).

Several studies have assessed the congruency effect in other medical situations. In a study with a somewhat more realistic threat than the above studies (childbirth), expectant mothers with a monitoring coping style experienced less labour pain when receiving more information (watching a contraction monitor), while blunters experienced *more* pain when watching the contraction monitor (Shiloh et al., 1998). The interaction effect was strong, explaining 27.2% of the variation in reported pain. In another study with pregnant mothers, this time focused on preterm labour symptom reporting (van Zuuren, 1998), interactions between coping style and intervention type (information, distraction or control) in predicting symptom reporting were in the directions suggested by a congruence effect. The small power of the study (just 20-21 patients in each condition, with large variations in pain

reported) meant that these interactions did not reach statistical significance, however. A randomised controlled trial of the efficacy of an informational brochure in reducing anxiety before a gastrointestinal endoscopy (van Zuuren, Grypdonck, Crevits, Walle, & Defloor, 2006) yielded a statistically significant interaction between blunting level (high or low) and the efficacy of the informational brochure. Low blunters in the experimental group experienced less than half the mean anxiety before the operation of those in the control group, while high blunters in the control and brochure groups experienced very similar anxiety levels. Interestingly, this meant that a blunting tendency reduced the efficacy of the informational brochure intervention, rather than making the intervention harmful. The interaction between monitoring level and intervention only approached significance, however.

The congruency effect has also been examined in dental situations, the context of the current study. A study by Muris et al. (1995) did not find strong evidence for an interaction between coping style and intervention (distraction, attention or self-efficacy intervention) in predicting distress and tension, but the small size of the condition sub-groups in this study render its findings ambiguous. In another study of coping in dental scenarios, Litt et al. (1995) randomised 231 patients requiring first-time third molar extractions to one of five intervention types: standard treatment, medication, relaxation, relaxation plus self-efficacy enhancement, and relaxation plus self-efficacy enhancement plus needle desensitisation. The authors found that the interaction between intervention type and blunting scores—but not monitoring scores—was significant in predicting pre-operative distress, observer ratings of distress during surgery, and patient-reported distress during surgery. The interaction effect explained between 25 and 40% in the variation in these variables. The reason for the lack of a significant interaction between monitoring scores and intervention in this study may be that the intervention types were not specifically designed to be congruent with either monitoring or blunting coping styles. Indeed, none of the interventions Litt et al. used are visibly congruent with a monitoring coping style.

Christiano and Russ (1998) conducted a study with children experiencing dental care using measurements of repression and sensitisation (a highly related typology to monitoring and blunting), randomising children to information, relaxation, or control conditions. The authors found significant support for the congruency hypothesis (i.e. an

interaction between intervention type and preferred coping style) in predicting self-reported distress after the intervention, although a contrary finding was present in predicting observer-reported behavioural distress.

In general, the present evidence suggests that a congruency effect does exist such that distress-reducing interventions are more effective when they are congruent with an individual's preferred coping style, although this effect is not always strong enough to reach statistical significance in small-sample studies. As such, consideration of individual monitoring-blunting coping styles appears to have the potential to be useful to dental staff and other professionals wishing to assist individuals in managing distress in threatening situations.

Monitoring, blunting, and anxiety-management techniques used by dentists.

A study asking paediatric dentists which techniques they most often use to manage children's dental anxiety (Buchanan & Niven, 2003) showed that monitoring-type interventions (especially those based on the Tell-Show-Do approach) were much more commonly used than blunting-type techniques such as distraction. For instance, all but one of the 102 dentists said that they would tell children what they were going to do step-by-step.

Similarly, a study of Australian dentists (Wright, Giebartowski, & McMurray, 1991) found that most of the 760 respondents never used TV or video-tape distraction strategies. Such interventions would be highly congruent with a blunting coping style, and evidence exists for the efficacy of various audiovisual distraction techniques in reducing dental anxiety, such as a video watched via audiovisual goggles (Frere, Crout, Yorty, & McNeil, 2001) or playing a video game (Corah, Gale, & Illig, 1979). These surveys suggest that the anxiety management techniques commonly used by paediatric and general dentists may often well suit individuals with a high inclination to monitor, but may be less effective or perhaps even harmful with those who prefer to blunt. Further, Miller (1981) suggested that when a threatening stressor is highly uncontrollable, blunting is the primary and most useful coping style, given that information obtained by monitoring cannot be used to control the stressor. Indeed, increased controllability of situations seems to result in

increased preference for monitoring behaviours and decreased preference for blunting behaviours (Voss, Müller, & Schermelleh-Engel, 2006). Dental care can probably be regarded as a fairly uncontrollable situation for children given that important decisions about dental care are likely to be taken by the dentist or a parent. As such, blunting may often be the more useful strategy for children in dental situations.

Applying an understanding of individual variation in monitoring-blunting coping styles and how these styles interact with anxiety-reducing interventions, requires, of course, reliable and valid measures of individual of coping style preference. The following section describes several of the existing scales, and provides a rationale for the validation of a scale specifically measuring children's monitoring-blunting coping styles in dental situations.

The Measurement of Coping: Scales Measuring Monitoring and Blunting.

A number of scales have been developed to measure habitual monitoring/blunting coping styles. Validation studies have typically reported Cronbach's alpha internal consistency reliability values, and assessments of scales' ability to predict actual coping behaviour in threatening situations have been reasonably common (e.g. Miller, 1987; Muris, van Zuuren, Merckelbach, Stoffels, & Kindt, 1994). Several validation studies have also assessed the convergent and discriminant validity of these scales. Campbell and D. W. Fiske's classic (1959) requirement that scales should correlate more strongly with other measures of the same trait than with measures of other traits makes the assessment of convergent and discriminant validity an important part of the validation of any psychometric scale.

The earliest monitoring-blunting scale was Miller's (1979, 1987) Miller Behavioural Style Scale (MBSS). The MBSS prompts respondents to imagine four threatening, largely uncontrollable scenarios: visiting a dentist, being held hostage by terrorists, being made redundant, and being on a turbulent flight. Respondents then select which of eight coping behaviours they would use in each scenario. Half of these options constitute monitoring behaviours, for example "I would carefully read the information provided about safety features in the plane", and half blunting behaviours, for example "I

would watch the in-flight film even if I had seen it before" (Miller, 1987, p. 347). A review of reported internal consistency reliability coefficients for the MBSS by Rees and Bath (2000) found much variation in reported reliability, although reliability levels for the monitoring subscale were generally fairly acceptable (between .6 and .8). The blunting subscale generally displayed lower reliability, with reported coefficients varying as low as .33. Moderate improvement in reliability was evident for studies utilising a 5-point Likert response format (e.g. Muris & Schouten, 1994; Muris, van Zuuren, De Jong, De Beurs, & Hanewald, 1994; van Zuuren & Wolfs, 1991). In her primary validation study of the MBSS, Miller (1987) reported that the scale predicted behavioural responses in two experiments involving physical (electric shock) and cognitive (aptitude test) threats. Subsequent small-sample experimental tests by the Muris group indicated that the predictive effect of the scale was not always strong enough to produce statistically significant associations with actual coping behaviour in situations such as working on an intelligence test (Muris et al., 1994) or viewing a film about brain surgery (Muris et al., 1994).

Some respondents in medical settings—the usual context for applied work and research with monitoring/blunting scales—can find the hypothetical and non-medical nature of scenarios such as the airplane and hostage scenarios in scales such as the MBSS irritating (van Zuuren, de Groot, Mulder, & Peter, 1996). Respondents may also find such scenarios insufficiently imaginable, and monitoring and blunting scales may vary by situation. For these reasons, van Zuuren et al. (1996) designed the Threatening Medical Situations Inventory (TMSI). The TMSI has four medical-threat scenarios (e.g. having a sudden appendicitis operation) each followed by three monitoring coping options (e.g. "I plan to ask the specialist as many questions as possible") and three blunting coping options (e.g. "For the time being I try not to think of unpleasant outcomes"; van Zuuren et al., 1996, p. 31). Response is measured on a 5 point Likert scale. Both the monitoring and blunting subscales had acceptable Cronbach's alpha reliability coefficients (above .7 for both subscales) in all four of the original study sub-samples. Convergent validity was adequate, with moderately strong relationships with related scales (including the MBSS), and discriminant validity with respect to variables such as dental anxiety was acceptable. The TMSI highlights the importance of using imaginal scenarios relevant to the context of a

study—both because it can be important to avoid frustrating participants with seemingly irrelevant questions, and because coping behaviours are likely to vary by situation.

An important scale that has been subjected to rigorous factorial validation in the field is the Mainz Coping Inventory (MCI; Krohne et al., 2000). The MCI is based on Krohne's (1989, p. 235) "vigilance" and "cognitive avoidance" coping schema rather than explicitly using the monitoring and blunting dimensions, although Krohne (2000) suggests that these two conceptualisations of coping with threatening information correspond closely. The MCI includes eight threatening scenarios (four representing ego threats and four physical threats), each followed by five vigilant and five avoidant coping strategies. In a sample of 384 students, both the avoidance and vigilance subscales had good reliability as indexed by Cronbach's alpha (.84 for each subscale), although the MCI's expansive length (80 items) make reliability comparisons with shorter scales such as the MBSS and TMSI difficult. Confirmatory factor analysis of the MCI (Krohne, Schmukle, Burns, Egloff, & Spielberger, 2001) yielded acceptable fit for a two factor solution in both the German and Austrian study subsamples, given the specification of two correlated error terms. This two factor structure displayed invariance in factor loadings, variances and covariances across the two study-subsamples.

Some effort has been dedicated to the development and validation of scales to measure monitoring and blunting in child populations. The Child Behavioural Style Scale (CBSS) was developed by Miller, Roussi, Caputo, and Kruus (1995), and is closely linked to the adult MBSS. The CBSS includes four stressful, relatively uncontrollable situations, including two medical threat scenarios (seeing a doctor and visiting the dentist). Each scenario is followed by four blunting and four monitoring coping options. The CBSS was designed to be administered verbally to account for differences in reading ability, with children being asked to state (yes or no) whether they would engage in each coping behaviour. Miller et al. (1995) validated the CBSS in a sample of 7 to 12 year old children attending a dental clinic, finding fairly acceptable internal consistency reliability for the monitoring subscale ($\alpha = .68$), but poor reliability for the blunting subscale ($\alpha = .48$). Similarly, Muris, Meesters, and Merckelbach (1996) found internal consistency reliability values of .73 for the CBSS monitoring subscale and .45 for the blunting subscale. In contrast, Bennett et al. (2008) calculated a somewhat more acceptable reliability alpha

value of .64 for the blunting subscale, with an alpha value of .79 for the monitoring subscale.

With regard to predictive validity of the CBSS, Miller et al. (1995) found that monitoring groups (high or low) showed moderate and expected differences in self-reported use of avoidance and vigilant coping strategies during an aversive dental treatment, although statistically significant differences were not apparent in videotape-observed coping behaviour. Discriminant validity of the scale is questionable, with CBSS-defined high monitors displaying moderately higher anxiety than low monitors (Muris et al., 1996; Miller et al., 1995), and substantial correlations of .42 between monitoring and trait anxiety and .28 between monitoring and depressive symptoms in the study by Bennett et al. (2008; correlations with blunting not significant).

Another measure of coping styles in children is the Monitoring and Blunting Scale for Children (MBSC: Kliewer, 1991; Lepore & Kliewer, 1989). The MBSC is a written scale designed for children aged nine and over that contains 56 items. The scale comprises 4 scenarios with 14 individual coping responses, and uses a dichotomous response format. The scenarios included are a vaccination by a doctor, a roller coaster that has broken down, a bad report card and a storm at school. Unlike the CBSS, the MBSC displays acceptable reliability for both the monitoring and blunting subscales: .71 for monitoring and .83 for blunting in Kliewer (1991) and .84 for monitoring in a Dutch study of 8 to 12 year old children (Muris, Merckelbach, Gadet, & Meesters, 2000). As is the case with the CBSS, a high monitor classification on the MBSC is associated with anxiety: Muris et al. (2000) found that high monitors as measured by the MBSC had a mean score of 41.4 on the Screen for Child Anxiety Related Emotional Disorders (Birmaher et al., 1997) as opposed to a mean of just 29.9 in the low monitor group.

Factor analysis and the dimensionality of coping.

A key question for the field has been whether monitoring and blunting can best be conceptualised as comprising a single bipolar construct or as two separate constructs. Bijttebier, Vertommen, and Steene (2001) claimed that Miller's (1980) comments were suggestive of a unidimensional conceptualisation. Most studies (see for example Ben-Zur, 2002; Kliewer, 1991; Phipps, Fairclough, & Mulhern, 1995; van Zuuren & Wolfs, 1991),

have tended to operationalise blunting and monitoring as independent constructs, however, although some studies have used a monitoring-blunting summary/difference score (e.g. Garvin & Kim, 2000). In agreement with the independent-constructs approach, a review of situation response inventories (Bijttebier et al., 2001) suggested that the calculation of a summary score (i.e. treatment of monitoring and blunting as a single bipolar construct) generally seems inappropriate.

Empirical measurements of the two constructs do tend to suggest that the independent constructs approach seems better justified: most studies have found small negative correlations between monitoring and blunting subscale scores (see for example Bar-Tal & Spitzer, 1999; Krohne et al., 2001; van Zuuren et al., 1996), and some (e.g. Muris & Schouten, 1994) have even found small to moderate positive correlations between monitoring and blunting. It has also been noted that some individuals seem to use neither strategy (termed "passive copers" by Phipps et al., 1995) while others ("active copers") tend to use a combination of both.

The bipolar unidimensional or independent monitoring and blunting constructs models are not the only possible factorial models for monitoring and blunting. Bijttebier et al. (2001) also developed a sub-categorisation scheme of monitoring and blunting item types, which could be used to develop more complex factorial models. The factorial validity of these sub-categories has not been formally evaluated as yet, however. Bijttebier et al. divided monitoring items into those pertaining to sensory vigilance and active information seeking (based on a categorisation initially offered by Miller, Roussi, Caputo, & Kruus, 1995). Sensory vigilance items relate to an attentional and cognitive focus on threat, while active information seeking involves behaviours like question asking, discussing the threat with others, or consulting other sources of information (e.g. reading pamphlets). Blunting items, on the other hand, were divided into avoidance, distraction, and emotion-focused blunting items. Avoidance items relate to "strategies serving to completely shut out stressful information from consciousness" (p. 93), while distraction items relate to behaviours involving "turning away from a salient unpleasant stimulus and focusing on incompatible thoughts or activities" (p. 92). Emotion-focused blunting items include items relating to reappraisal, comforting self-talk and tension reduction. Bijttebier

et al. further suggested that avoidance and distraction items can be further sub-divided into behavioural and cognitive sub-types.

Confirmatory factor analysis (CFA) may be an appropriate technique to provide strong evidence as to which factorial model best explains responses to monitoring-blunting inventories. Utilisation of CFA in the field has been reasonably rare, however. In the cases where CFA has been utilised to assess the factorial structure of scales measuring monitoring and blunting or the highly related dimensions of cognitive vigilance and avoidance (Krohne et al., 2000; Krohne et al., 2001; Voss et al., 2006) comparisons have not been made between various competing models. These studies have generally found acceptable fit for a two factor model (Krohne et al., 2000; Krohne et al., 2001); Voss et al. (2006) instead chose to evaluate a more complex model also including an adaptiveness dimension. Exploratory factor analyses of the MBSS (Muris & Schouten, 1994) and TMSI (van Zuuren et al., 1996) have also suggested a two-factor model for monitoring and blunting, but given the subjectivity involved in deciding how many factors to extract in exploratory factor analysis and pre-existing theoretical suppositions about the factor structure of the scale, confirmatory analyses are a more appropriate approach for addressing the factorial structure of such scales. The current study therefore utilises CFA in order to both examine the factorial validity of the MBDS scale and to shed light on the factorial structure of the monitoring and blunting constructs.

The factor analytic invariance studies previously performed in the monitoring-blunting scale arena (Voss et al., 2006; Krohne et al., 2001) have tested scale invariance across racial/ethnic groups. Such analyses are useful in that they can test whether a scale operates in a similar fashion across different populations that form possible audiences for the scale. Another important dimension to test invariance over may be the level of anxiety of distress participants experience in the situation or situations described in the scale. If a scale operates in a divergent fashion depending on the level of anxiety or distress respondents experience in the threatening situation, its use with heterogeneous with samples is questionable. Further, examinations of invariance by level of anxiety or distress allows the opportunity to confirm whether a scale has satisfactory properties when used with individuals experiencing higher levels of anxiety in the specified situation, an important analysis especially when validation studies are performed with individuals

displaying diverse levels of anxious reaction to the situation at hand. Such analysis would be especially useful when the intent is for a scale to be used to tailor interventions for anxiety in a given situation. In such cases, the scale's psychometric properties in individuals experiencing higher levels of anxious response is particularly important, and can be addressed via multiple group/invariance analyses.

Monitoring and blunting: A wide enough categorisation?

Given its relatively simple nature, it is worth questioning whether monitoring and blunting theory provides a sufficient framework to describe all (or even most) real-life coping behaviours. An exploratory factor analysis of the comprehensive 14-subscale Children's Coping Questionnaire has indicated that broad ranges of coping behaviour items can be summarised to some degree by the monitoring/blunting dichotomy (Fedorowicz, 1995), although monitoring and blunting factors were not the only latent constructs to emerge in factor analysis. A third factor, labelled as "venting" (e.g. "expressive feelings"; p. 77), was also extracted in the analysis. There are certainly other theories and categorisations of coping behaviour in the psychological literature. Some examples of these include Byrne's (1964) theory of repression and sensitisation, the process coping model as captured in the eight style/factor coping categorisation Ways of Coping Questionnaire (Folkman & Lazarus, 1988, as cited in Lazarus, 1993), and Carver and Scheier's (1981) model of behavioural self-regulation. In a qualitative study not restraining respondents to selecting coping behaviours from a set questionnaire, Ryan (1989) inductively identified 13 categories of behaviours in the general coping strategies of 103 eight to twelve year old children. Such qualitative studies are important in allowing an analysis of the degree to which monitoring-blunting theory can explain individuals' self-reported coping behaviours when not restrained to a particular set of options. Such analyses can also be useful in terms of possibly identifying particular behaviours and strategies for potential inclusion in closed-response coping questionnaires.

Situational variation in monitoring and blunting.

Most of the above scales focus on estimating individual's "general" coping dispositions, or coping responses within a broad sphere of situations such as medical-threat contexts. Miller (1981) noted, however, that situational variables such as the controllability of the stressor, invasiveness of information, and predictability of the situation influence whether or not blunting and monitoring are possible or useful. Previous research in the coping arena has certainly highlighted the powerful effects of situational factors on coping behaviours (Mattlin, Wethington, & Kessler, 1990; McCrae, 1984; Terry, 1994). When the practical purpose of the scale is to assess monitoring and blunting coping preferences with reference to a specific situation or set of situations (e.g. dental situations), it therefore makes sense to use a scale that uses the specific situation/situational set for its stimulus scenarios. In other words, a person's actual monitoring or blunting coping behaviour in dental situations is likely to be more strongly correlated with their responses to a coping scale using dental scenarios than one imaginally exposing them to a "turbulent flight". The development of a scale specifically designed to measure children's monitoring and blunting preferences in dental situations therefore seems appropriate, if measurement of such preferences is to be used to inform interventions.

The Study Scale: The Monitoring Blunting Dental Scale

While no scale specifically designed to measure children's monitoring or blunting tendencies in dental situations currently exists in the peer-reviewed literature, Buchanan and Niven (1996) proposed the Monitoring Blunting Dental Scale (MBDS) in a conference presentation. The MBDS includes four dental scenarios (having an appointment tomorrow, being in the dentist's waiting room, having a tooth drilled, and having an injection in your gum). Each scenario is followed by three monitoring coping options, and three blunting coping options. Psychometric data has not previously been collected for the scale. The current study seeks to validate this scale. Further information regarding the MBDS and revisions made from its initially proposed form are included in the method section.

Aim and Objectives of the Current Study

   Aim.

   To develop and validate a measure of children's preference for monitoring vs. blunting coping techniques in dental situations (the Monitoring Blunting Dental Scale or MBDS).

   Specific objectives.

   In order to assess the reliability and validity of the MBDS, several specific objectives were determined. These objectives were:

1. To examine the factorial validity of the MBDS scale using exploratory and confirmatory factor analyses.

Exploratory factor analysis (EFA) was used to provide a preliminary evaluation of the factor structure of MBDS responses, while confirmatory factor analysis (CFA) was used to make more detailed and specific comparisons between three competing model structures. The primary comparison was between a one factor model positing monitoring and blunting as a bipolar unidimensional construct, and a two factor model positing monitoring and blunting as separate related constructs. It was hypothesised that the two factor model would provide a statistically significant and substantial improvement in fit over the one factor model. Additionally, a four factor model based on the sub-categories of monitoring and blunting items suggested by Bijttebier et al. (2001) was examined on a more exploratory basis.

2. To assess the invariance of the MBDS scale structure across participants with higher and lower dental anxiety.

Invariance testing was used to determine whether the fit of the model selected in full sample analyses (the two factor model) was acceptable in both higher and lower dental anxiety sub-groups of the study sample. The invariance of item factor loadings (i.e., relationships between individual items and the underlying monitoring and blunting constructs) was also examined.

3. To examine the internal consistency reliability of MBDS monitoring and blunting subscale scores.

Reliability was examined using both Cronbach's alpha and Raykov's (2001b, 2004) composite reliability coefficient, a CFA-based reliability estimation method. Nunnally's (1978) criterion of a coefficient of .7 or higher for acceptable reliability was used to to interpret calculated reliability coefficients.

4. To identify specific MBDS items with poor psychometric properties.

Items that were identified as poor indicators of the monitoring and blunting constructs were identified based on poor performance in several areas. Qualities upon which items were judged were incidence of item missing data, size and significance of factor loadings in EFA and CFA, and contributions to subscale reliability.

5. To elucidate a simple classification scheme for interpreting individual MBDS subscale scores, and demonstrate the resulting classification of the study sample.

The manner of interpretation of individual scores on a particular scale or subscale is of key importance in developing a scale for applied usage. A rudimentary interpretation/classification scheme for individual MBDS subscale scores was suggested, with the potential for revision and modification in future validation studies.

6. To examine the factorial validity and reliability of the Child Behavioural Style Scale – Medical situations (CBSS-M) for use as a convergent validity criterion

The CBSS-M was revised from the original CBSS (Miller et al., 1995) to be used as a convergent validity criterion for the MBDS in the current study. Brief single-scale analyses of the CBSS-M were conducted in order to assess the psychometric properties of this scale. The comparative fit of one factor and two factor confirmatory factor analytic models for the CBSS-M was assessed, as was the reliability of the CBSS-M subscales.

7. To examine the factorial validity and reliability of the Smiley Faces Paper Scale (SFPS) for use as a discriminant validity criterion.

The SFPS is a 4-item pen-and-paper dental anxiety measure developed for the current study based on Buchanan's (2005) Smiley Faces Program. The factorial validity (one factor model) and internal consistency reliability of the SFPS were examined.

8. To examine the convergent validity of the MBDS with respect to a related scale (the CBSS-M) and its discriminant validity with respect to dental anxiety (as measured by the SFPS).

Campbell and D. W. Fiske (1959) suggested that scales should correlate more strongly with other scales measuring the same construct than with scales measuring different constructs. The correlations between the MBDS subscales and those of a related measure (the CBSS-M) were therefore evaluated, as were the subscales' correlations with a measure of an unrelated construct (dental anxiety as measured by the SFPS). Campbell and Fiske's requirement was expanded on slightly in requiring that convergent validity coefficients should be *statistically significantly* greater than discriminant validity coefficients. Further, it was hypothesised that convergent validity coefficients would approach the reliability values for the correlated subscales, given that reliability places an upper limit on validity (Feldt, 1997). J. Cohen's (1988, p. 80) criterion of .3 for a correlation of "medium" size was also used as an upper threshold for acceptable discriminant validity of subscale scores with respect to dental anxiety.

9. To use a qualitative content analysis to examine children's self-reported coping behaviours in dental situations (ancillary analysis).

A content analysis of children's' qualitative comments about the coping strategies they might use in dental situations was used in order to assess the degree to which these responses could be explained and classified within the taxonomy of monitoring and blunting theory, and highlight coping behaviours not covered by the MBDS or monitoring-blunting scales in general.

Method

Participants

Participants for the study were a convenience sample of intermediate school New Zealand children aged from 11 to 13 years old. The sample was drawn from a central Auckland intermediate school. Intermediate schools in New Zealand cater to two "year" groups: years 7 and 8 of the New Zealand schooling system. The associate principal at the school selected 11 of the 20 classes at the school on the basis of convenience to the school, comprising a mix of five year 7 and six year 8 classes.

Intermediate school students were selected for the study on the basis that children in this age group were considered to be old enough to read and complete the study survey with minimal assistance, while falling toward the midrange of the intended audience of the study scale (i.e., children and young adolescents). Children of this age were also thought likely to be able to produce useful qualitative remarks on their own preferred coping strategies without comprehensive one-on-one interviews, which indeed transpired to be the case. Demographic information for the study sample is provided in Table 1, and compared with information for all year 7 and 8 New Zealand students in 2009 (New Zealand Ministry of Education, 2009).

Table 1

Demographic information for study sample

Demographic item	Frequency	Sample %[a]	% of all year 7-8 NZ students
Age			
11	76	32.90	-
12	115	49.78	-
13	40	17.32	-
School year			
7	110	45.9	53.71
8	130	54.2	46.29
Sex			
Female	103	44.40	48.37
Male	129	55.60	51.63
Ethnicity			
European	154	66.38	55.79
Asian	27	11.64	8.81
Māori (NZ or Cook Island)	24	10.34	22.65
Pacific islander	24	10.34	9.50
Other ethnicities	3	1.29	2.43
Foreign fee-paying students	-	-	0.83

Notes. Distribution of student ages within years 7 and 8 not provided in Ministry of Education report.

[a]Sample % indicates the valid percentage: i.e. the percentage of respondents who responded to the given demographic item falling into the noted category.

In comparison with the Ministry of Education figures for year 7 and 8 students in 2009 (New Zealand Ministry of Education, 2009), males and Europeans were slightly over-represented in the study sample. Māori children were somewhat under-represented, forming 22.65% of the year 7 and 8 population but just 10.34% of the sample. The ethnic distribution was otherwise similar to the year 7 and 8 student population.

The school at which sampling took place had a decile 9 rating by the Ministry of Education, indicating that students from this school are generally from families of middle to higher socioeconomic status. This may explain in part the under-representation of Māori in the sample: In fact, the 2008 Education Review Office report for the school noted a proportion of Māori students of just 9%. Māori are known to be over-represented in low-income groups (e.g. Maani, 2000).

Of approximately 275 potential participants in the selected classes, questionnaires were collected from 244 children. Questionnaires from two children were discarded due to these two children having to leave very shortly after beginning the questionnaire due to other appointments. The questionnaires of a further two children were discarded due to displaying almost identical answers (including responses to open-ended questions). These two children appeared to have collaborated or copied each other's answers, and as such their responses could not be considered independent. The final sample size was therefore 240 participants.

Statistical power analysis was completed primarily with regard to planned confirmatory factor analyses (CFA), which were conducted using structural equation modelling (SEM). This focus on CFA/SEM when completing power analysis was due to the fact that SEM generally requires larger samples than the other analyses employed in the study (see Tanaka, 1987, for a review of the sample size issue in SEM). Statistical power analysis was performed using the method and SAS code suggested by MacCallum, Browne, and Sugawara (1996). This method is based on the power of a given analysis to reject specific hypotheses about the population level of the root mean square error of approximation (RMSEA) for the tested model, a measure of the goodness of fit of a CFA/SEM model. In general, researchers wish to achieve lower RMSEA levels. This power analysis method requires specification of alpha level (.05 in the current study), model degrees of freedom, and null and alternative hypotheses for the population RMSEA level.

MacCullum and colleagues (1996) suggested two pairs of null and alternative hypotheses for power analysis. The first pair is a null hypothesis of RMSEA = .05 (the conventional criterion for close model fit) and a population RMSEA level of .08. This power analysis examines the study's power to reject the test of close fit (i.e. a null hypothesis of population RMSEA < .05) given mediocre model fit in the population. The second pair is a null hypothesis of RMSEA = .05 and an alternative hypothesis of .01, representing the analysis's power to reject a null hypothesis of "not-close fit" given close fit in the population (MacCallum et al., 1996, p. 131). Sample sizes required in order to achieve statistical power of the conventional level of .8 for each of these sets of hypotheses were calculated for the primary tested model for the MBDS: a two factor model without

correlated error terms. The small difference in degrees of freedom between this and other models meant that separate power calculations for each model tested were unnecessary.

These power analyses indicated that a sample size of 73 was required for power of 0.8 to reject a null hypothesis of close fit given a population RMSEA of .08. Further, a sample size of 105 was required for power of 0.8 to reject not-close fit given a population RMSEA of .01. These results suggested that a total sample size of 210 participants or more would both satisfy full-sample power requirements for the MBDS and also allow median-split multiple-group analyses (i.e. splitting participants into high and low dental anxiety groups). Ultimately, with 240 valid questionnaires collected, statistical power to reject the null hypothesis in either of the two power scenarios when using the full sample was above .999.

Measures

Study scale: The Monitoring Blunting Dental Scale (MBDS).

The Monitoring-Blunting Dental Scale (MBDS) asks children about how they would respond in four dental scenarios. These four scenarios are:

1. having to go to the dentist the following day
2. sitting in the waiting room waiting to have a filling done
3. being about to have a tooth drilled
4. being about to have an injection in your gum.

Each scenario is followed by six coping behaviours, comprising three monitoring and three blunting behaviours. Responses are summed across monitoring and blunting items, resulting in two subscale scores (MBDS monitoring and MBDS blunting), each with a possible score range of 12 to 48. The items as used in the current study were modified slightly from those originally proposed by Buchanan and Niven (1996), based on attempts to make the scale's coping behaviours as relevant, comprehensible and attractive for New Zealand youth as possible. These changes were made in consultation with Dr. Buchanan.

A four-point Likert-style response format was utilised for the scale, with participants being asked to report how likely they would be to engage in each of the coping behaviours. The response scale had likelihood options of *definitely not*, *probably not*, *probably*, and *definitely* (coded from 1–4). A neutral response option was excluded in order to avoid the problem of acquiescent neutral responding, and the possibility of social desirability effects resulting in the selection of the neutral response where the negative option would otherwise be selected (Garland, 1991).

In terms of the sub-categorisation scheme offered by Bijttebier et al. (2001) for the items in monitoring-blunting scales, MBDS monitoring items primarily fall into the active information search category (ten items), with just two items falling in the sensory vigilance sub-category. Blunting items are more evenly split over categories, with four avoidance items (all cognitive in nature) and eight distraction items. Distraction items were not divided into behavioural and cognitive micro-categories for this study given the rather ambiguous distinction between these micro-categories for items such as "I would watch the TV on the wall, if there was one". A list of the MBDS items with coping style (monitoring or blunting) is shown in Table 2. The MBDS scenarios and items as they appeared in the study questionnaire are also available in Appendix 2.

Table 2

MBDS items and sub-categories

Item		Sub-category
Monitoring items		
1	I would think up questions that I might want to ask the dentist.	Active info search
2	I would want to talk to my family and friends about the appointment.	Active info search
5	If there was a programme about going to the dentist on the TV I would watch it.	Active info search
8	I would read the pamphlets on "Going to the Dentist" that were in the waiting area.	Active info search
9	If there was someone with me (like mum or dad) I would chat to them about the dental treatment.	Active info search
11	I would read all of the posters on the wall about tooth decay and dental treatment.	Active info search
13	I would watch all of the dentist's movements.	Sensory vigilance
16	I would listen out for the sound of the drill.	Sensory vigilance
17	I would want the dentist to tell me exactly what he or she was going to do.	Active info search
20	I would want the dentist to tell me when I would feel pain.	Active info search
23	I would want the dentist to tell me exactly what he or she was doing step-by-step.	Active info search
24	I would ask the dentist questions about the injection.	Active info search
Blunting items		
3	I would keep myself busy to take my mind off the appointment.	Distraction
4	I would not want to talk about the appointment with anyone.	Cog. avoidance
6	I would push all thoughts of the dentist out of my mind.	Cog. avoidance
7	I would watch the waiting room TV, even if I didn't much like the show that was on.	Distraction
10	I would read the magazines or books in the waiting room, whatever they were.	Distraction
12	I would try and think about something nice that might happen in the future.	Distraction
14	I would watch the TV on the wall, if there was one.	Distraction
15	I would sing a favourite song in my head.	Distraction
18	I would think about what I was going to do when I got home.	Distraction
19	I would close my eyes or look away so I couldn't see the needle coming towards me.	Cog. avoidance
21	I would try to push any thoughts about the needle or injection out of my head.	Cog. avoidance
22	I would try to think about nice stuff that's happened lately.	Distraction

Notes. Cog. avoidance = cognitive avoidance. Sub-categories based on Bijttebier et al. (2001).

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Convergent validity criterion: The CBSS-M.

The Child Behavioural Style Scale – Medical situations (CBSS-M) was adapted from the original CBSS (Miller et al., 1995) for the purposes of the current study, utilising only the two medical scenarios from the original CBSS. These two scenarios are sitting in the doctor's waiting room when sick, and being in the dentist's chair while the dentist has left the room to get something. This modification allowed a focus on the imaginal scenarios most relevant to the study context (i.e. medical scenarios), and assisted in keeping the length of the study questionnaire reasonably brief. Each scenario was followed by four monitoring coping options (e.g. item 4, "I would think about what the doctor might do") and four blunting coping options (e.g. item 13, "I would think about other things to get my mind off the dentist"). The scale was presented in a written format. As for the MBDS, response was measured on a four-point likelihood Likert scale, with options of *definitely not, probably not, probably,* and *definitely*. Subscale scores were obtained by summing responses across the eight monitoring and eight blunting coping items in the scale, resulting in two subscales (monitoring and blunting) with a possible score range for each subscale of 8 to 32. The CBSS was selected for adaptation and use in the current study rather than the MBSC (Kliewer, 1991; Lepore & Kliewer, 1989), the other monitoring-blunting scale for children used in the coping literature, given that the MBSC does not include any dental-situation stimulus scenarios.

Coping options were changed from the second person perspective in the original CBSS to a first person perspective in the CBSS-M in order to retain consistency of perspective with the MBDS scale. Some minor changes in the wording of the original CBSS items were also made in order to make the coping options more appropriate for the sampled age bracket. For example, in the doctor scenario, "play with other children in the waiting room" was changed to "talk to other children in the waiting room".

In terms of the sub-categorisation of monitoring and blunting items offered by Bijttebier et al. (2001), six CBSS-M monitoring items fell into the sensory vigilance category (e.g. item 6, "I would think about where in my body I feel sick") while just two monitoring items fell into the active information search category (e.g. item 15, "I would think of things to ask the dentist"). All blunting items fell into the distraction category.

Discriminant validity criterion: The SFPS.

It was important to assess whether responses to the MBDS were correlated with level of dental anxiety and thereby evaluate discriminant validity. Discriminant validity with regard to anxiety level has been a concern with some coping measures, such as the CBSS (see for example Bennett et al., 2008). Measurements of dental anxiety level were also useful in order to assess whether the MBDS scale functioned in a similar way across participants with varying levels of dental anxiety.

The Smiley Faces Program (Buchanan, 2005) is a computerised dental anxiety measure. For the purposes of the current study, the items from Smiley Faces Program were adapted for pen and paper administration. I named this version of the scale the Smiley Faces Paper Scale (SFPS). The scale contains four items asking participants to indicate how they would feel in four different dental scenarios used in the MBDS. These four scenarios are the same scenarios used in the MBDS (having to have dental treatment the following day, sitting in the waiting room, being about to have a tooth drilled, and being about to have a local anaesthetic injection).

Participants respond by selecting which of seven faces they would feel most like in the given scenario, with unhappier faces indicating higher dental anxiety. A total score is obtained by summing across the four items, with a possible score range of 4–28. The faces used in the response scale for the SFPS are displayed in Figure 1.
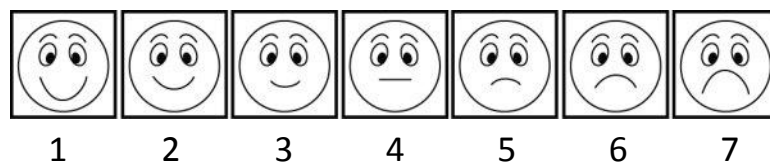
Figure 1. Response scale for the SFPS.

The Smiley Faces Program was initially validated in a sample of 464 British children (mean age 10.8 years), displaying highly impressive internal consistency reliability considering its short length ($\alpha = .8$). Test-retest reliability was also high, with a correlation of .8 between scores as measured two weeks apart in a subset of 100 of the children. The

Smiley Faces Program also displayed good convergent validity, with strong correlations *(r = .6* in both cases) with the Modified Child Dental Anxiety Scale (MCDAS; Wong, Humphris, & G. T. Lee, 1998) and the Dental Fear Survey Schedule (CFSS-DS; Cuthbert & Melamed, 1982). A revised Smiley Faces Program with slightly modified item wordings and the addition of a tooth extraction item has also been validated in a sample of New Zealand children (Jones & Buchanan, 2009). This revised version also displayed strong internal consistency and test-retest reliability along with a .67 convergent validity correlation coefficient with the MCDAS (Jones & Buchanan, 2009). The Smiley Faces Program's short length, strong psychometric properties, and use of the same stimulus scenarios as the MBDS (meaning that each scenario had only to be described once) led to its adaptation and use for the current study in the form of SFPS.

While the SFPS has not itself previously been specifically validated, responses to scales administered in computerised and pen and paper form tend to be highly similar (see for example Booth-Kewley, Edwards, & Rosenfeld, 1992; Potosky & Bobko, 1997; Vispoel, Boo, & Bleiler, 2001). As such, the validity evidence for the Smiley Faces Program can in large part be considered to extend to the SFPS. Further, a similar paper-based facial image scale measure of state anxiety in dental situations has shown strong convergent validity with respect to state anxiety as measured by the Venham Picture Test (Buchanan & Niven, 2002).

Demographic and general items.

Participants were asked to provide their age, gender, and ethnicity. Ethnic categories provided were chosen to be appropriate for the school based on the ethnic distribution of students listed in the 2008 Education Review Office report for the school. The ethnicity options provided were NZ European/Pākehā, Pasifika/Pacific Islander, Other European, NZ Māori, Cook Island Māori, Asian, Indian, and Other, with participants invited to select as many options as applicable. Responses to this item were subsequently recoded into the five broad categories used by the New Zealand Ministry of Education (2009), with participants allocated to a single primary ethnic category. Where participants indicated identification with more than one ethnic group they were allocated to the ethnic category occurring least frequently in the study sample.

Two oral hygiene practice items were also included in the study questionnaire, but not used for substantive analyses in the current study due to space limitations. The first asked participants how often they brushed their teeth (less than once a day, once a day, or more than once a day). The second asked participants how often they used dental floss (at least once a day, at least once a week, or rarely or never). These items were adapted from a study assessing the oral health habits of 11 year old schoolchildren in 22 European countries and Canada (Kuusela, Honkala, Kannas, Tynjala, & Wold, 1997).

Reading level of study questionnaire.

In order to ensure that the reading level of the study questionnaire was appropriate for the age bracket sampled, the questionnaire was informally piloted with two children slightly younger than the sample age bracket (aged 8 and 10 years). Feedback from these children was used to make minor modifications to the questionnaire. The Flesch-Kincaid reading ease statistic (Flesch, 1948) was 84.1 for the full final study questionnaire, indicating a low level of reading difficulty. The Flesch-Kincaid (US) grade level for the full questionnaire was 4.9, corresponding roughly to appropriate reading level for a year 6 student in New Zealand. The Flesch-Kincaid grade level further fell to 4.3 (closer to year 5 in NZ) when excluding the Massey University Human Ethics Committee approval statement at the beginning of the questionnaire. Given that the study sample was drawn from students in years 7 and 8, these reading level/ease statistics indicated that the questionnaire was sufficiently readable for the sampled age bracket.

Procedure

Organisational permission for the study was initially obtained from the school principal and associate principal. A passive parental consent procedure was utilised for the study due to concerns about obtaining a sufficiently large sample with an active parental consent procedure, and the increased paperwork required for teachers involved in an active parental consent procedure. A study by Anderman et al. (1995) also suggested that members of important minority groups tend to be under-represented in samples obtained via active parental consent.

Just over one week before data collection was due to commence, information and consent packs were handed out by teachers in the selected classes. These information packs included an information letter for children, an information letter for parents, and a consent form for parents to return if they did not wish their child to participate. Information sheets clearly outlined participant and parental rights, and parents were given a week to return non-consent forms to the school if they refused consent for their child to participate.

Just two parents in the current study refused parental consent. Another two children were identified by their teachers as not having been given information/consent packs due to absence in the week when these were handed out, and excluded from the study. Children were also given the opportunity to decline to participate themselves at the time of data collection; three children declined to participate and instead occupied themselves by reading or working on homework.

Classes were visited individually during "form class" at the beginning of each day over two consecutive weeks. The teachers of each class were asked to identify any children who had returned consent forms indicating parental refusal for participation: These children were then asked to occupy themselves via homework, silent reading or journal-writing. The purpose of the study and participant benefits and rights were explained to the schoolchildren, including the right not to participate, to stop filling out the questionnaire at any time or leave out any question, and the right to ask any questions about the study at any time. Participants were not asked for signed consent, but instead asked to either advise the researcher that they would not like to participate when surveys were handed out, or take a survey and simply not fill it out. This implied-consent procedure aided in maintaining participant anonymity.

Approximately 20 minutes was provided for the students of each class to complete the study questionnaire, depending slightly on class schedules. Virtually all students comfortably completed their questionnaire well within the available time period, with most students taking between 10 and 15 minutes to complete the questionnaire. Children generally seemed to have little trouble with reading the questionnaire, although a handful of children asked either their teachers or the researcher for assistance with some terms.

After data collection had been completed in each class, all children in the selected classes (including those not participating) were provided with a toothbrush and paste

donated by Colgate as a thank you for participation. The school was also provided with a $200 book voucher as thanks for participation.

Approval for the study was obtained from the Massey University Human Ethics Committee (MUHEC Southern A, application number 09/37).

Data Analysis

Analysis plan.

Data analysis: computation.

Analyses were performed using SPSS 17.0 for correlations, reliability, descriptive statistics and exploratory factor analyses, SAS 8.1 for statistical power analysis and generation of polychoric correlation matrices, AMOS 17.0 (Arbuckle, 2008) for confirmatory factor analyses, and the SISA correlation analysis online calculator (Uitenbroek, 1999) for correlation coefficient confidence intervals.

Single scale analyses.

In the first set of analyses the three main scales used in the study (MBDS, CBSS-M, SFPS) were examined individually, with the greatest focus on the MBDS. The following analyses were completed.

- Calculation of descriptive statistics for items and scales/subscales (mean, median, mode, standard deviation, range, skewness and kurtosis)
- The assessment of demographic differences in subscale means/distributions using one-way ANOVAs and the difference in mean scores between monitoring vs. blunting subscale scores using a paired *t*-test (MBDS and CBSS-M only).
- Exploratory factor analysis with principal axis factoring (MBDS and CBSS-M scales only).
- Confirmatory factor analyses using maximum likelihood estimation. A comparative approach was used for the MBDS (comparing one factor, two factor and four factor solutions) and the CBSS-M (one and two factor solutions), while only a one factor model was assessed for the SFPS.

- Invariance testing across dental anxiety level of the selected (two factor) confirmatory factor analysis model (MBDS only), along with respecifications necessary to achieve acceptable fit across both higher and lower dental anxiety participants. Attention was limited to invariance of two key aspects: the factor structure of the scale, and the relationship between items and the underlying latent constructs.

- An assessment of the reliability of the MBDS and CBSS-M monitoring and blunting subscales and SFPS scale using both Cronbach's alpha and Raykov's composite reliability coefficient.

Multiple scale analysis.

The convergent and discriminant validity of the MBDS (and to a lesser extent, CBSS-M) subscales were then examined using Pearson product-moment correlation coefficients. Discriminant validity was examined both with respect to dental anxiety and with respect to monitoring-blunting constructs, although the primary focus was on discriminant validity with respect to dental anxiety.

Ancillary analysis – content analysis.

The study questionnaire included four open-ended items asking what behaviours (other than those suggested in the MBDS items) they might use to cope in the four MBDS situations. These responses were content-analysed with the unit level being each individual item response.

Distributional assumption checking and management strategies.

The following section describes the efforts made to check and account for violations of the principal distributional assumptions of the statistical analyses employed in the results section. A focus is made here on discussing those assumptions where violation was present or suspected, rather than all applicable distributional assumptions. This discussion has been located in the method section to allow a detailed discussion of these issues—especially in terms of their impact on structural equation modelling analyses—without too heavily interrupting the narrative of the results section.

Bivariate statistics: Demographic group differences, subscale mean differences, correlations.

Demographic group differences in scale and subscale scores were examined using one-factor ANOVAs, while differences in means subscale scores were examined using paired *t*-tests, and convergent and discriminant validity were assessed using Pearson product-moment correlation coefficients. These analyses require similar assumptions, including a continuous interval-level normally distributed dependent variable (or both variables, for correlations and *t*-tests) and homoscedasticity (Garson, 2008, 2009). While the use of summated subscales meant that the continuous data assumption was approximated, mild normality breaches were present (e.g. statistically significant kurtosis of .667 for the MBDS blunting subscale). The findings of these bivariate tests were therefore cross-checked against their non-parametric rank-based analogues (the Kruskal-Wallis test, the Wilcoxon signed-rank test, and Spearman's rho correlation), generally resulting in similar statistic/coefficient values. Where the substantive conclusion of a parametric test and its non-parametric analogue differed, the results of both tests were reported.

Exploratory and confirmatory factor analysis.

In factor analysis, the extent and nature of the distributional assumptions required are largely dependent on the nature of estimation process (for CFA) or extraction type (for EFA) used to estimate the factor model. Principal axis factoring was used for exploratory factor analysis, while maximum likelihood estimation (MLE) was used for confirmatory factor analysis. Both processes assume linear relationships and continuous interval-level data. MLE further requires multivariate normality of input variables, whereas PAFA does not.

The continuous data assumption was breached in the current study, with item responses for the MBDS and CBSS-M measured on a four-point Likert response scale. Interval properties for the Likert response data could be justified, however given the use of Likert response points that were equidistant on the page, used equally-spaced numerical labels (1, 2, 3, 4), and had symmetrical labels (*definitely not, probably not, probably, definitely*) that were chosen to imply broadly equal separating distances. To assess the impact of the lack of continuous data on the correlation input matrix, a comparison was

made between Pearson's correlation matrices (assuming continuous data) and polychoric correlation matrices (wherein ordinal data points are considered to represent categorisations of an underlying continuous variable). This comparison showed that the coefficients in the two matrices were highly similar, with Pearson's coefficients only very slightly lower than their polychoric counterparts (mean .025 difference for the MBDS, .028 for the CBSS-M). The use of polychoric correlation matrices as input for factor analysis has been recommended when ordinal data is being analysed (e.g. Holgado–Tello, Chacón–Moscoso, Barbero–García, & Vila–Abad, 2010), but SPSS and AMOS do not permit the use of polychoric correlation matrices for EFA and CFA respectively. The finding of strong similarity between the Pearson's and polychoric correlation matrices suggested that the ordinal nature of the response scale did not too severely attenuate inter-item correlations, and that the use of a polychoric correlation matrix as input for these scales would have been unlikely to produce substantively different conclusions. For the SFPS scale, the 7-point response scale more closely approximated the continuous data assumption, making the consideration of polychoric coefficients less relevant.

Maximum likelihood estimation for CFA also requires the assumption of multivariate normality, which was violated for the MBDS and CBSS-M (multivariate kurtosis = 78.904 for the MBDS, 66.921 for the CBSS-M), although multivariate kurtosis for the SFPS was not statistically significant. Maximum likelihood estimation for CFA has been shown to be reasonably robust to normality violations (Chou & Bentler, 1995) but such violations can still be expected to result in inflated model chi-square statistics (i.e., spurious rejections of well-fitting models), underestimated parameters, and underestimated standard errors (Flora & Curran, 2004). As such, a number of steps were taken to analyse and address the consequences of these violations.

Firstly, bootstrapping[1] was used to determine which of the available estimation methods in AMOS performed best in terms of minimising the mean discrepancy between sample and model-implied variance-covariance matrices across 2000 bootstrapped samples drawn with replacement from the study sample. This method is described in Arbuckle (2008). The models tested were two factor models for the MBDS and CBSS-M and a one

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[1] Bootstrapping is a resampling method wherein the original study sample forms a "population" from which a number of sub-samples are drawn with replacement.

factor model for the SFPS. The estimators available in AMOS 17.0 are maximum likelihood (MLE), asymptotically distribution-free estimator (ADF), generalised least squares, scale-free least squares, and unweighted least squares. For every model estimated by each estimator (over the 2000 bootstrapped samples), discrepancies were calculated using both the discrepancy calculation of the estimator itself and the other model estimators. Of the three estimators in common use (MLE, ADF, generalised least squares) MLE was the most effective estimator in terms of minimising the discrepancy between sample and model-implied covariance matrices. Unweighted least squares performed very slightly better than MLE for the MBDS and scale free least squares slightly better for the SFPS, but the lack of goodness of fit criteria and significance tests available for these rarely-used estimators meant that they were not considered for applied use in the study. It was notable that the ADF failed to outperform MLE when used for the CBSS-M and SFPS despite theoretically not requiring multivariate normality and as such appearing potentially useful for the current study. The ADF's demanding sample size requirements relative to model complexity also meant it could not be implemented for use with the longer MBDS. Perhaps explaining this finding, a simulation study (Olsson, Foss, Troye, & Howell, 2000) has indicated that very large samples (>2000 cases) are required for the ADF estimator to outperform parametric estimators such as ML; with smaller samples ADF tended to give unreliable parameter estimates and overly optimistic fit statistics.

The second strategy used to assess the impact of normality violations was to compare maximum likelihood estimated parameters with those estimated using the Bayesian estimation protocol in AMOS. Bayesian estimation allows the nature of ordered-categorical data to be taken into account by treating the response points on such scales as representing a categorisation of an underlying normally distributed continuous variable, for which values are partially unknown. Parameters are then estimated using a Markov chain Monte Carlo resampling procedure. Regression weight parameters (i.e. factor loadings) as calculated using maximum likelihood were both very similar to parameters estimated using the Bayesian approach (e.g. correlation between Bayesian and MLE parameters above .95 for the MBDS two factor model). Unfortunately, just one goodness of fit statistic (the posterior predictive p value) is currently available for Bayesian in AMOS when using ordinal data, limiting its usefulness as a complete strategy.

Finally, model parameters and standard errors reported in the results section were estimated via bootstrapping over 2000 samples drawn with replacement from the original study sample. While having a trivial impact on actual parameter estimates, this allowed for a more accurate assessment of the size of parameters' standard errors and statistical significance. Bootstrapped standard errors are calculated by drawing a number of samples with replacement from the original study sample (which serves as the "population" for resampling); the standard error is then the actual standard deviation of the parameters over the drawn samples. These standard errors were larger than those calculated under the normal theory approach, and provided a safeguard against Type 1 errors for parameter estimates.

While these measures addressed the issues of inaccuracies in the estimation of parameters sizes and standard errors, no simple adjustment was available to account for the probable inflation of the model chi-square by the lack of sample data normality. The evaluation of model fit therefore focused on a comparison of model fit between various competing models, rather than an absolute interpretation of the model chi-square and other fit statistics.

Reliability.

While not assuming continuous data, the conventional Cronbach's alpha reliability calculation has three important assumptions relevant to the current study: scale unidimensionality, tau-equivalence of items, and absence of correlated measurement error. Tau-equivalence is present when all the items in a subscale or scale are equally related to the underlying latent construct, while correlated errors occur when measurement error for a pair of items is correlated. All of these issues can be examined explicitly in CFA. Tau-equivalence was not present in any of the three study scales, and strong evidence was also present for incidences of correlated measurement error.

Raykov (2001b, 2004) has described a CFA-based model for estimating scale reliability where tau-equivalence is violated and/or correlated errors are present, and these values (usually referred to as *composite scale reliability* values) were also reported in the current study. This model is closely linked to Lord and Novick's (1968) definition of reliability, wherein:

$$\rho \text{ (reliability)} = \frac{\text{True score variance}}{\text{True score variance} + \text{error variance}}$$

Similarly, in Raykov's model for estimation scale reliability, for models without correlated error terms:

$$\rho = \frac{\text{Squared sum of factor loadings}}{\text{Squared sum of factor loadings} + \text{sum of error variances}}$$

Or where correlated error terms are present, reliability is equal to:

$$\rho = \frac{\text{Squared sum of factor loadings}}{\text{Squared sum of factor loadings} + \text{sum of error variances} + 2 * \text{sum of error covariances}}$$

This model can be applied to one factor scale models or applied individually to multiple factors/subscales of a measure with a multiple-factor structure. The formula above applies to cases where latent factor scaling has been accomplished by setting factor variances to 1; where marker variables are used, the squared sum of factor loadings must be multiplied by the estimated factor variance in both the numerator and denominator. Identical reliability values were calculated using both scaling methods.

Outliers.

The restricted length of the MBDS, SFPS and CBSS-M response scales meant that univariate outliers were not present in individual item scores. Inspection of subscales scored indicated a roughly normal distribution of responses ranging the entire length of the possible score ranges for all subscales, with no clearly apparent univariate or bivariate outliers. Multivariate outliers (within each scale) were screened for using the Mahalanobis distance (distance from the multivariate centroid) calculated in AMOS, ranking observations by distance, and visually inspecting responses for outlying cases.

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For the MBDS, two cases were identified as possible outliers: one with a Mahalanobis distance of 68.683, and one with a distance of 57.885. After these cases, the next highest value was 51.284, with a gradual decline in distance values. Two potential outliers were identified for the CBSS-M, and three for the SFPS. The deletion of any or all of these potential outliers for any individual scale resulted in negligible differences in confirmatory factor analytic solutions (regression parameters correlated above .99 with full sample parameters for all tested models). The full sample was therefore retained for all analyses.

Missing data.

Of a total of 11,760 possible quantitative data points (49 quantitative variables multiplied by 240 participants), 195 data points were missing—just 1.66% of the possible data points. The item with the highest number of missing data points (10 cases or 4.2%) was the item asking participants how frequently they flossed their teeth: probably due to a combination of this item being on the last page of the questionnaire, and some students being unfamiliar with the word "floss". Of the MBDS items, only two had five or more missing data points: item 2 ("I would want to talk to my family and friends about the appointment") and 5 ("If there was a programme about going to the dentist on the TV I would watch it."

The SPSS expectancy maximisation imputation approach was used to impute missing data for the MBDS, CBSS-M and SFPS. Expectancy maximisation imputation requires the "missing at random" (MAR) data assumption, but not the "missing completely at random" (MCAR) assumption, which was violated in the current study (Little's MCAR $\chi^2 = 2916.6$, $p < .001$). While the MCAR assumption requires that data are missing completely at random without any relation to study variables, the missing at random (MAR) assumption entails assuming that missingness may be related to the level of the variable on which missingness occurs, but not after controlling for other variables in the analysis (Allison, 2001). It is logically impossible to statistically test the validity of the MAR assumption (Allison, 2001). However, substantive reasons to suspect that the levels of unmeasured variables might influence the relationship between the level of the missing

variable and the level of other measured variables would mean that the MAR assumption might be violated. Little reason to suspect such a process was present, and given the minimal degree of missing data any such assumption breaches would seem likely to have had negligible effects on the analysis.

Results

The results section proceeds first with single-scale analyses for the three scales used in the current study (MBDS, CBSS-M, and SFPS). The results presented for each scale include descriptive statistics, the assessment of demographic group differences, exploratory and confirmatory factor analyses, and reliability analyses. The coverage of analyses reported is most comprehensive for the MBDS, being the primary focus of the current study, also including invariance testing and the provision of a simple scheme for the interpretation of individual subscale scores.

These single-scale analyses are followed by multi-scale analysis of the convergent and discriminant validity of the MBDS scale. Finally, an ancillary content analysis examines participants' responses to open-ended items asking them about additional coping strategies they might use in dental situations. Throughout these analyses an alpha level of .05 is used as a threshold for statistical significance, and J. Cohen's (1988, pp. 79-80) criteria are used for the descriptive interpretation of correlation coefficients. These criteria suggest that .1 is a "small" correlation, .3 is a correlation of "medium" magnitude, and .5 is a "large" correlation.

Single-Scale Analyses for the MBDS

Descriptive statistics and demographic differences.

Table 3 provides descriptive statistics for the MBDS monitoring and blunting subscales. With just one exception (item 5, $M = 1.93$), all individual MBDS items had a mean falling between 2 and 3 on the item response scale; that is, a mean near the midpoint of the possible range. This is a desirable property for scale items (DeVellis, 2003), improving the potential for substantial variation and normal distribution of item responses. Medians and modes were either 2 or 3 in almost all cases, indicating roughly symmetric item distributions. Individual item standard deviations indicated meaningful variation in responses for all items, and ranged from 0.71 to 1.03. Scores ranged across the entire available range (1-4) for all items. Mild to moderate skewness and kurtosis values were

present for most items, and present in both negative and positive forms, although kurtosis was primarily negative (item skewness range -0.57–0.62; kurtosis range -1.14–0.75).

Summated subscale scores were approximately normal in distribution, although moderate and statistically significant kurtosis was present for the blunting subscale (kurtosis = 0.67, p = .047). The mean of the blunting subscale was larger than that of the monitoring subscale with a mean difference of 2.03, paired t = 4.96, p <.001. The Cohen's d effect size for this difference was 0.375, indicating a small to moderate effect.

Table 3

Descriptive statistics for MBDS subscale scores

	Mean	Median	Mode	SD	Skew (*SE* = .16)	Kurtosis (*SE* = .31)	Min	Max
Monitoring	29.59	29.73	30	5.46	.12	.10	15	45
Blunting	31.62	32.00	31	5.37	-.29	.67	12	46

Mean MBDS monitoring and blunting subscale scores were generally highly similar across participant year, age, sex and ethnicity. The most substantial group difference was that the 11 year olds in the group (i.e. the youngest students) exhibited a higher mean blunting score than the older children. The mean blunting score for 11 year olds was 33.31 as opposed to 30.56 for 12 year olds and 30.82 for 13 year olds, ANOVA $F(2)$ = 6.78, p <.001. Mean subscale scores were highly similar across males and females (differences insignificant for both subscales). A 2-tailed ANOVA suggested significant ethnic differences in means on the monitoring subscale, $F(4)$ = 2.62, p = .036, although the non-parametric Kruskal-Wallis test statistic for group differences on this subscale fell just outside significance, $\chi^2(4)$, = 9.20, p = .056. Ethnic differences on the monitoring subscale were certainly small, with the European and Other ethnic groups having the lowest mean monitoring scores (M = 28.76 and 28.67 respectively) and the Māori group having the highest (M = 31.74). Ethnic differences in blunting subscale means were well outside significance, ANOVA $F(4)$ = .133, p = .970.

Exploratory factor analysis.

Exploratory factor analysis (EFA) was completed in order to provide a preliminary examination of the latent factor structure of the MBDS scale. Factor analysis allows the derivation of underlying latent factors which predict responses on groups of items. In exploratory factor analysis, all items are permitted to load on all extracted factors. The purpose of performing EFA in the current study was to highlight possible factor structures for the scale not suggested by theory, and in order to provide a preliminary examination of the viability of the hypothesised 2 factor solution.

Factor extraction was completed via principal axis factoring, a "true" factor analysis in which only the variable covariance or correlation matrix is analysed. A true factor analysis allowed for a focus on the internal structure of the scale rather than an attempt to explain all item variance (as would be the case with a principal components analysis). A correlation matrix was used as input for factor analysis. Correlations between items were small to medium in size for both item pairs within the monitoring subscale (mean off-diagonal coefficient = .193) and the blunting subscale (M = .207), while correlations between cross-subscale item pairs were smaller (M = .083). The mean off-diagonal coefficient represents the mean correlation between items excluding the correlation between each item and itself. A table displaying the MBDS correlations and item standard deviations is presented in Appendix 3. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .750 for the total scale, indicating that a high quantity of inter-item covariation could potentially be explained on the basis of underlying factors. KMO values for individual items ranged from .559 to .833. Items 4 ("I would not want to talk about the appointment with anyone") and 16 ("I would listen out for the sound of the drill") had the lowest individual KMO values (both < 0.6), and these items later transpired to be poorer contributors to scale reliability.

An exploratory search for factor models (and particularly non-hypothesised models) was made on the basis of examination of a scree plot and searching for the point at which the variance explained by successive factors began to level off (as described in Cattell, 1966). The variation in the values of the input variable matrix explained by a single factor is also referred to as an *eigenvalue*. The scree plot suggested a strong first factor explaining

18.7% of total item variance, followed by weaker second and third factors explaining 9.9 and 7.6% of total variance respectively.

These three extracted factors were rotated via direct oblimin rotation in order to produce a simpler structure for interpretation. Factor rotation allows for the explication of clearer factor structure than factors obtained from initial extraction by relaxing the constraints imposed on the initial extraction (e.g. orthogonal factors, consecutively reducing eigenvalues). Direct oblimin is an oblique factor rotational method which allows underlying factors to be correlated. The pattern matrix for this three factor solution suggested a primary blunting factor, and two secondary factors which in essence divided monitoring items into those of the third and fourth MBDS scenarios (second factor), and those of the first and second scenarios (third factor). Given that the distinction between these second and third factors seemed better accounted for as a method effect (i.e. due to the influence of scenario effects) than as genuine distinction in underlying latent constructs, this three factor solution was rejected. This issue was however noted as a matter of concern, given that it suggested that variation in the scenarios provided in the MBDS produced meaningful method variance.

A two factor solution was also examined closely in order to assess the viability of the hypothesised model for the scale. This two factor solution showed fairly good ability to reproduce the original correlation matrix, with a mean absolute residual of .055 (correlation residuals ranging from -.19 to .26). A pattern matrix after direct oblimin rotation for the two factor solution is presented in Table 4, indicating the unique relationships between items and factors (i.e. factor loadings) while controlling for the relationship between the two factors. The sample-size based criteria suggested by Stevens (2002) were used in order to determine significant loadings of an item on a factor. Using Stevens' system and given the study sample size, a cut-off point for loading on a factor of .33 was utilised and shown in bold in Table 4. Items with borderline loadings (.25 < .33) are noted in italics, given that Stevens' heuristic scheme is rather conservative, relying on a worst-case scenario of factor loading standard errors being double the standard error for a correlation of the same size.

Nine of the twelve designated blunting items loaded on the first factor (labelled "blunting"), with borderline loadings for two other items (items 10 and 18). Eight of the twelve designated monitoring items loaded on the second factor (labelled "monitoring"),

with a tenth item (11) having a borderline loading. Items 2, 4 and 5 were highlighted as problematic, each loading on neither factor. No cross-loading items were noted.

Table 4

MBDS pattern matrix displaying factor loadings for 2 factor EFA model

		Factor	
Item	Intended subscale	Blunting	Monitoring
22	Blunting	**.660**	-.007
21	Blunting	**.589**	-.037
12	Blunting	**.533**	.105
14	Blunting	**.515**	-.008
15	Blunting	**.502**	-.019
19	Blunting	**.494**	.025
7	Blunting	**.476**	-.048
6	Blunting	**.447**	.134
3	Blunting	**.427**	.053
10	Blunting	*.316*	.135
18	Blunting	*.275*	-.048
17	Monitoring	-.015	**.721**
24	Monitoring	-.083	**.698**
23	Monitoring	-.060	**.683**
20	Monitoring	.098	**.431**
13	Monitoring	.086	**.429**
1	Monitoring	.035	**.381**
8	Monitoring	.082	**.368**
16	Monitoring	-.142	**.346**
9	Monitoring	-.022	*.328*
11	Monitoring	.105	*.289*
2	Monitoring	.204	.247
4	Blunting	.124	-.011
5	Monitoring	.130	.170

Note. Factor loadings greater than .33 are noted in **bold**; loadings between .25 and .33 in *italics*.

Given the two factor solution's reasonable ability to reproduce the input correlation matrix and a pattern matrix in close accordance with the intended construction of the scale, this exploratory analysis provided preliminary evidence that the internal structure of the MBDS scale was coherent with its theoretical basis. Confirmatory factor analysis was

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required, however, to provide stronger evidence for the factor structure of the scale and in order to provide a more objective comparison of competing factor models.

Confirmatory factor analysis.

Unlike exploratory factor analysis, confirmatory factor analysis (CFA) allows the researcher to specify and test models where the relationships between scale items, underlying latent factors, and measurement error terms are all explicitly specified. Hypotheses and questions about such models can then be examined: For instance, the researcher can determine whether a particular factor model provides a better explanation for the observed item variances and covariances than a competing factor or model, or whether a particular item is significantly related to an underlying factor. CFA models are usually estimated and tested using structural equation modelling (SEM), which is a broader modelling technique that also allows for the analysis of non-CFA models (e.g. "structural" models, where causal relationships between latent factors are specified).

Goodness of fit indices utilised.

A large number of goodness of fit indices are available for CFA and SEM. No single one of these has been established as a "gold standard" of model fit (R. B. Kline, 2004, p. 134) and the examination of multiple fit indices of various types is usually recommended (e.g. Brown, 2006). The fit indices selected for the current study and displayed in Table 5 are based on the minimum set recommended by Kline (2004). The concept of degrees of freedom in SEM models is important to the understanding of these indices: Model degrees of freedom represent the number of estimated parameters in a model less the number of elements in the input variance-covariance matrix. The greater the number of degrees of freedom, the greater the simplicity of the factor model as compared to the input matrix.

Table 5

Goodness of fit indices used for evaluating confirmatory analytic models

Measure	Interpretation
Chi-square (χ^2)	Chi-square is the classic goodness of fit index in SEM (Brown, 2006). The chi-square value and its associated *p* value indicate the confidence that the researcher can have in rejecting the null hypothesis of perfect fit of the model to the population variance-covariance matrix. MacCullum et al. (1996, p. 132) stated that this "is a stringent null hypothesis...[that] is always false to some degree for any overidentified model". Chi-square is also inflated by larger sample sizes and non-normal data (Brown, 2006). Chi-square can be used to test for statistically significant differences in fit between two nested[a] models.
Standardised Root Mean square Residual (SRMR)	The SRMR represents the average standardised difference between the sample covariance matrix and that implied by the CFA model. It can be thought of as the mean absolute difference between the sample correlation matrix and the model-implied correlation matrix (Brown, 2006). Values close to or under .08 are preferred (Hu & Bentler, 1998).
Comparative Fit Index (CFI)	The CFI is a comparative or incremental (rather than absolute) fit index that varies from 0 to 1, with values closer to 1 being preferred. The CFI evaluates the fit of the examined model against a null model, which is usually (and in this study) an "independence model" which posits no relationships whatsoever between the analysed variables. Cut-off points for acceptable fit of .9 (Bentler & Bonett, 1980) and .95 (Hu & Bentler, 1999) have been suggested. However, Marsh, Hau, and Wen (2004) argued that these criteria may be too strict when researchers wish to specify more than 2-3 items per factor, as is usually the case in scale development contexts.
Root Mean Square Error of Approximation (RMSEA)	The RMSEA estimates the degree of error involved in approximating a variance-covariance matrix using the selected factor model. This model error is reported per degree of freedom in the model, meaning that the RMSEA favours simpler models. Unlike the CFI and SRMR, the RMSEA has a known sampling distribution (non-central χ^2), and as such confidence intervals for the quantity of error in the population can be calculated (a 90% confidence interval is used by convention). RMSEA values are generally interpreted as such (Browne & Cudeck, 1993; MacCallum et al., 1996):

Value < .05 = close fit; value .05 < .08 = reasonable fit; value .08 < .10 = mediocre fit; value >.10 = unacceptable fit.

A test of close fit for the RMSEA was also developed by Browne and Cudeck (1993), representing the likelihood of observing an RMSEA as large as that observed given a population RMSEA of under .05. This value is labelled as "PCLOSE" in AMOS and the current study. A test of not-close fit for the RMSEA is also available (MacCallum et al., 1996), testing a null hypothesis that the population RMSEA is greater than .05. The test of not-close fit was not reported in the current study, however, given that the point estimate of the RMSEA was greater than .05 for all full-sample analyses, directly implying non-rejection of this test's null hypothesis.

Note. [a]Two models are considered nested when the second model can be produced by adding or removing parameters from the first model.

No single goodness of fit index was selected as a primary fit measure, although the known sampling distribution and informative criteria available for the RMSEA meant that this index was given the greatest focus. The fact that the RMSEA reflects fit relative to model complexity was also a desirable property for the current study. In general, the information gleaned from various fit indices was used to make decisions about the fit of various models and make comparisons with competing models. It was important to note that the substantial violation of multivariate normality for the MBDS and CBSS-M can be expected to result in inflated model chi-square values (Brown, 2006; Flora & Curran, 2004) and therefore also result in deterioration of the RMSEA and CFI statistics which are closely linked to the model chi-square. This expected effect made a focus on model comparisons and reasonably liberal interpretation of fit criteria particularly important.

Single-group CFA: Comparative confirmatory factor analyses.

Three competing factor models were compared for the MBDS: a simple one factor model, a two factor monitoring and blunting model, and a four factor model based on Bijttebier and colleagues' (2001) sub-categories (the four sub-categories represented in the MBDS being distraction, cognitive avoidance, sensory vigilance and active information search). In these analyses all error terms (unique item variances not explained by the underlying factor structure) were not permitted to correlate. In other words, any covariance

between items was presumed to be explainable purely on the basis of the hypothesised factor structure. Latent factors, on the other hand, were free to covary with each other. Path diagrams for the three models are presented in figures 2 and 3. In these diagrams, large ovals represent latent factors, rectangles represent observed items, small circles represent error terms, single-headed arrows represent "causal" regression paths (i.e. factor loadings), and double-headed arrows represent covariances. Latent factor scaling was accomplished via the use of marker variables which linked the scaling of the latent factors to the scaling of the item response scales. Marker variables were selected by using the item with the highest item-total amongst the items loading on a given factor as the marker variable for that factor. Model estimation was accomplished via maximum likelihood with bootstrapped model parameters and standard errors; the assumptions of this approach and the usefulness of bootstrapping are described in the method section. Fit statistics for the competing factor models are displayed in Table 6.
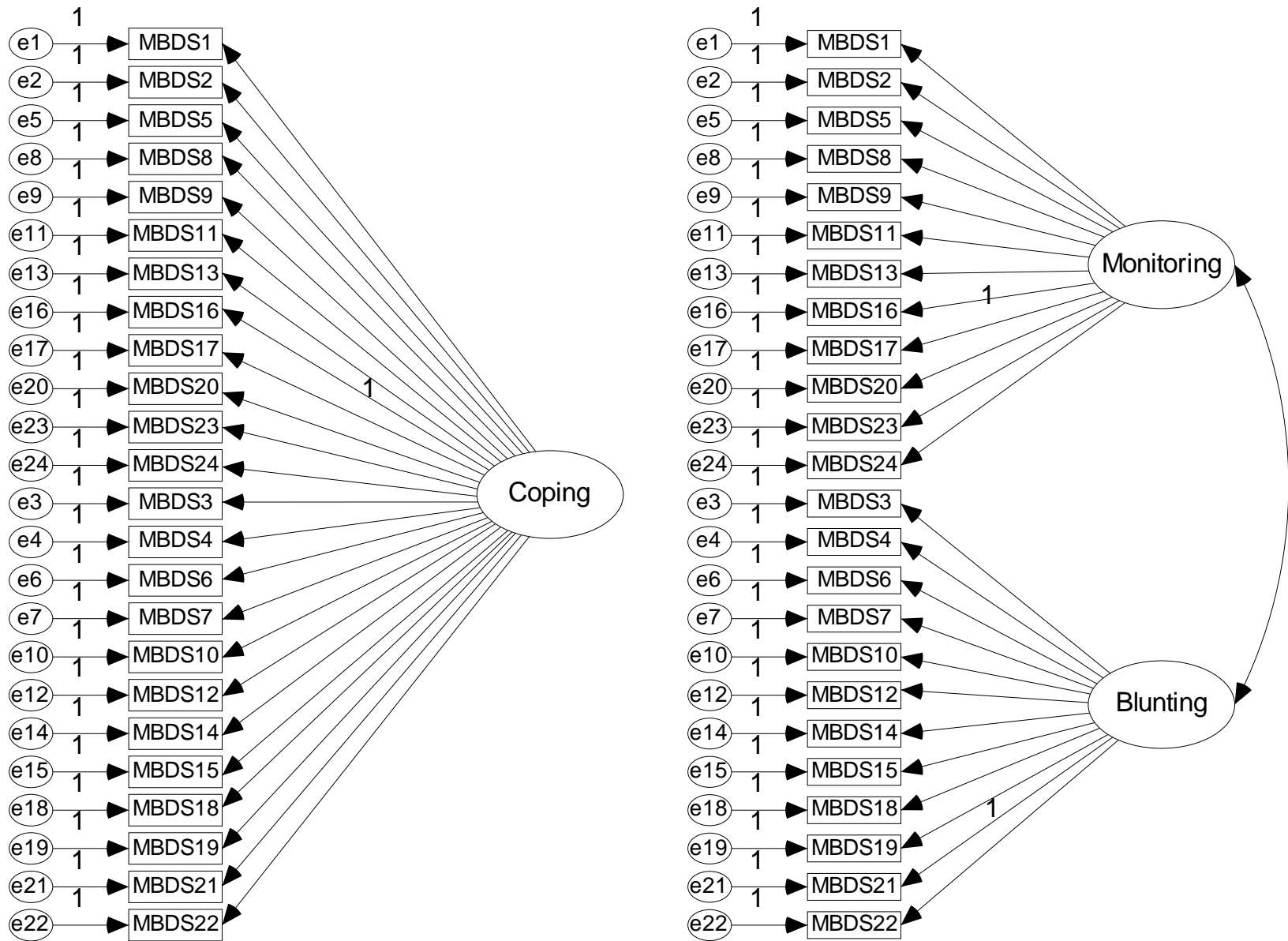
Figure 2. Path diagrams for MBDS 1 factor model (left) and 2 factor model (right).
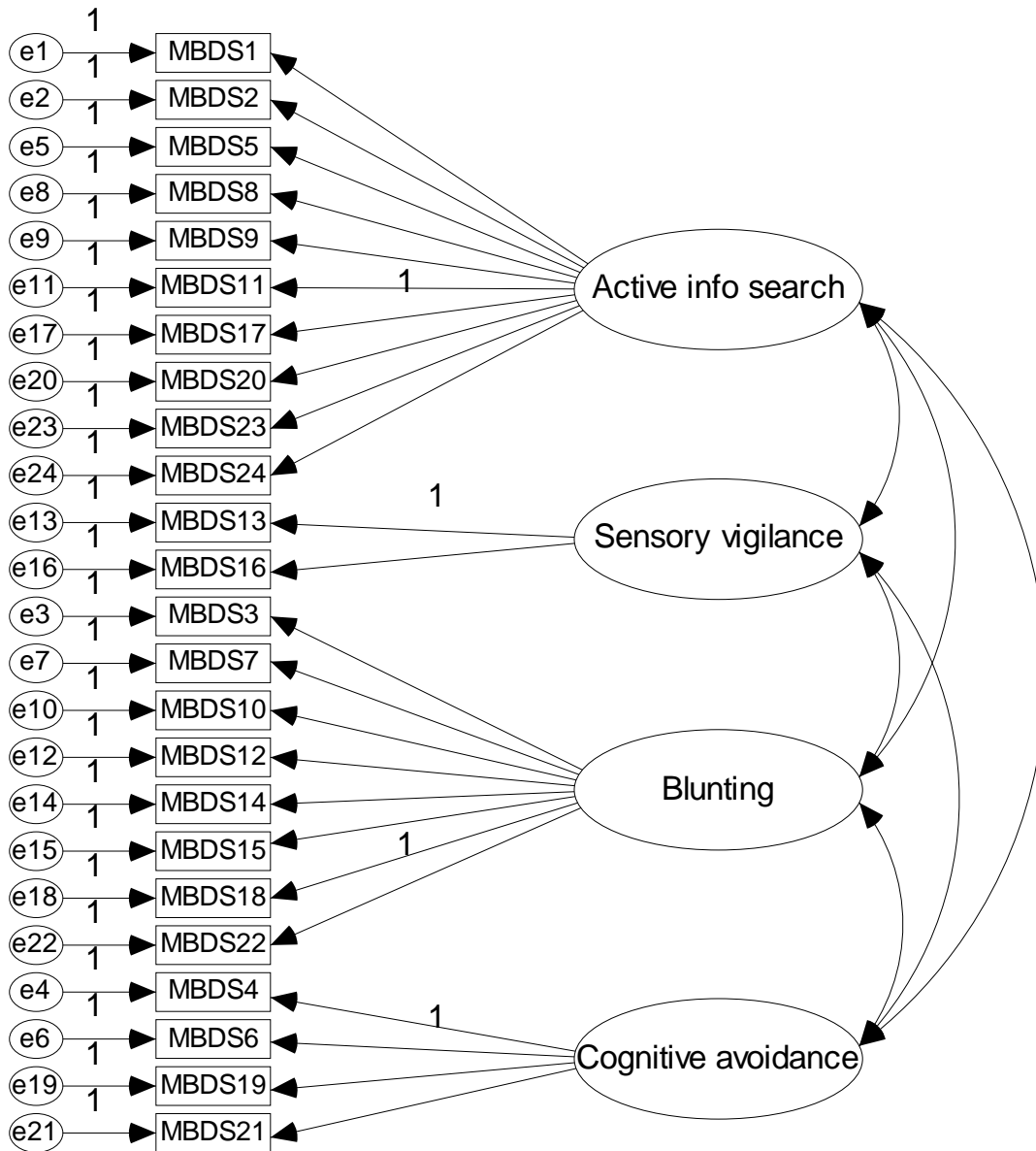
Figure 3. Path diagram for MBDS 4 factor model.

Table 6

Goodness of fit of competing MBDS factor models

Fit measure	1 factor	2 factor (Monitoring & Blunting)	4 factor (Bijttebier et al. sub-categories)
Chi-square	798.1 (*df* 252, *p* <.001)	579.0 (*df* 251, *p* <.001)	548.8 (*df* 246, *p* <.001)
SRMR	.096	.078	.077
CFI	.498	.699	.722
RMSEA [90% CI]	.095 [.088-.103], PCLOSE <.001	.074 [.066-0.082], PCLOSE <.001	.072 [.064-0.080], PCLOSE <.001

By all indications, the fit for the one factor model was poor (the single factor in this model was labelled as "coping"). The chi-square value for this model was large and statistically significant, $\chi^2(252) = 798.1$, $p = .001$. The SRMR and RMSEA for this model were also both above .08, indicating large amounts of model error, and the CFI indicated only a slender improvement over an independence (zero population covariances) model. Individual item parameters for the one factor model were also all positive (as opposed to positive for monitoring and negative for blunting or *vice versa*), further weakening the notion of a bipolar unidimensional conceptualisation for monitoring and blunting.

The two factor model showed a large improvement in fit over the one factor model. The chi-square value decreased by 219.1 units (*df* 1, *p* <.001), indicating substantively and statistically significantly improved fit over the one factor model. The RMSEA and SRMR values also both fell to within acceptable ranges (< .08).

A further increase in model complexity to a four factor model produced a much smaller improvement in fit, however. The reduction in model chi-square over the two factor model was statistically significant, $\chi^2_{diff}(5) = 30.2$, $p <.001$, but small in size. The SRMR, CFI and RMSEA values were also only trivially improved over the two factor model, and the slight reduction in model RMSEA was not statistically significant (as indicated by overlapping confidence intervals). These findings suggested that the hypothesised two factor model was the most appropriate factor model for the MBDS, with the slightly improved fit of the four factor model not sufficiently justifying its substantially greater complexity. The two factor model was therefore retained for further analyses. Parameter estimates for the two factor model are presented in Table 7.

Table 7

Parameter estimates for MBDS 2 factor model

			Unstandard-ised estimate	*SE*	*p*	Standardised estimate	Error variance[a]
Regression weights							
MBDS1	<---	Monitoring	0.391	0.095	<.001	0.378	0.426
MBDS2	<---	Monitoring	0.338	0.107	<.001	0.304	0.520
MBDS5	<---	Monitoring	0.241	0.114	.022	0.199	0.643
MBDS8	<---	Monitoring	0.445	0.121	<.001	0.364	0.601
MBDS9	<---	Monitoring	0.348	0.103	<.001	0.305	0.553
MBDS11	<---	Monitoring	0.365	0.109	<.001	0.307	0.592
MBDS13	<---	Monitoring	0.595	0.118	<.001	0.443	0.679
MBDS16	<---	Monitoring	0.439	0.126	.002	0.294	0.957
MBDS17	<---	Monitoring	1.000	-	-	0.731	0.413
MBDS20	<---	Monitoring	0.722	0.103	<.001	0.491	0.774
MBDS23	<---	Monitoring	0.968	0.091	<.001	0.685	0.501
MBDS24	<---	Monitoring	0.925	0.114	<.001	0.656	0.531
MBDS3	<---	Blunting	0.679	0.153	<.001	0.453	0.570
MBDS4	<---	Blunting	0.198	0.121	.088	0.149	0.547
MBDS6	<---	Blunting	0.781	0.163	<.001	0.523	0.516
MBDS7	<---	Blunting	0.583	0.143	<.001	0.444	0.440
MBDS10	<---	Blunting	0.533	0.154	<.001	0.360	0.609
MBDS12	<---	Blunting	0.908	0.108	<.001	0.596	0.486
MBDS14	<---	Blunting	0.670	0.130	<.001	0.488	0.463
MBDS15	<---	Blunting	0.763	0.127	<.001	0.473	0.654
MBDS18	<---	Blunting	0.343	0.113	.004	0.245	0.603
MBDS19	<---	Blunting	0.809	0.157	<.001	0.477	0.714
MBDS21	<---	Blunting	0.919	0.124	<.001	0.584	0.527
MBDS22	<---	Blunting	1.000			0.651	0.446
Factor variances							
Monitoring			0.482	0.078	<.001	-	-
Blunting			0.333	0.063	<.001	-	-
Covariances							
Monitoring <--> Blunting			0.148	0.042	<.001	0.376	-

Notes. The regression weights to items 17 and 22 were constrained to 1 as these items were selected as marker variables with which to set the scaling of of the monitoring and blunting latent factors.

[a]Technically, error variances apply to items, not regression paths. They are displayed alongside the regression paths in these tabulated parameter estimates to save space given the lack of cross-loading items.

The regression weights shown in these tabled estimates are also referred to as factor loadings, and represent the relationships between the latent factors in the model and observed scores for the individual items. Unstandardised regression weights indicate these relationships with both the items and the latent factors scaled on the item response scale (i.e. 1–4). Standardised regression weights, on the other hand, reflect regression weights with both the individual item and the latent factor scaled to a mean of zero and variance of one. All items were measured on the same response scale in the current study, meaning that unstandardised regression weights are comparable between items. The parameter estimates showed statistically significant regression weights (factor loadings) for all items at the .05 alpha level, except item 4 ("I would not want to talk about the appointment with anyone"). Item 5 ("If there was a programme about going to the dentist on the TV I would watch it") also had relatively small standardised (.199) and unstandardised (.241) regression weights. The monitoring and blunting factors covaried together quite substantially, with a standardised covariance (i.e. correlation) of .376.

Inspection of areas of localised strain was completed via the use of modification indices. Modification indices provide a conservative estimate of the decrease in model chi-square that would occur as the result of freeing specific constrained parameters in the model. These modification indices indicated that allowing correlated error terms between several pairs of items would improve model fit, with ten suggested correlated error terms with modification indices of over 10 units in size. Four of the five error covariance terms with the highest modification indices related to items loading on the same factor (i.e. monitoring or blunting) within the same scenario, possibly reflecting scenario method effects. The remaining covariance pathways with high modification indices tended to relate to items with that were particularly similar in terms of their wording or content (e.g. a modification index of 28.9 for items 14 and 7, which both related to watching TV if available in dental situations). Item 2 was the only item with a statistically significant modification index suggesting a cross-loading (on the blunting construct), although this modification index was small (modification index = 5.6).

Multiple-group CFA: Invariance of the two factor model across level of dental anxiety.

The following section describes an examination of the invariance of the MBDS across higher and lower dental anxiety groups in order to determine whether the internal structure of the scale operated in a similar fashion for higher and lower dental anxiety participants. Invariance testing took place specifically with respect to invariance of the general factor model (i.e. fit of the model in each subsample), and the relationships of items to the monitoring and blunting latent constructs (i.e. invariance of regression parameters). Defining groups higher and lower dental anxiety groups was accomplished by a simple median split, allocating participants with SFPS scores below the median of 19.5 points to the lower dental anxiety group and those with scores of above 19.5 to the higher anxiety group. No participants fell on the median itself. The two factor model utilised in the previous section was used for invariance testing; goodness of fit indices for this model in the lower and higher dental anxiety groups are presented in Table 8.

Table 8

MBDS 2 factor model: Goodness of fit in lower and higher dental anxiety sub-samples

	Lower anxiety	Higher anxiety
Chi-square	387.1 (*df* 251, *p* <.001)	456.4 (*df* 251, *p* <.001)
SRMR	.084	.105
CFI	.717	.647
RMSEA [90% CI]	.067 [054-.080], PCLOSE = .019	.083 [.071-.095], PCLOSE <.001

Note. n = 120 for each sub-sample.

While the two factor model fit reasonably well in the lower dental anxiety group, fit in the higher anxiety group was poorer, with an SRMR above .1 and RMSEA just outside the reasonable fit range (i.e. >.08). Given that the appropriateness of the MBDS with more dentally anxious participants was of primary focus, inspections of areas of localised strain were made in order to determine particular problematic areas of the two factor model and make modifications to improve model fit.

Modification index output was primarily suggestive of the specification of several pairs of correlated error terms. Modification indexes suggesting statistically significant improvements in model fit for allowing cross-loadings of specific items were also present in four cases, but the estimated improvement for these changes was small (the largest modification index, 6.8, was for a loading of item 5 on the blunting factor). The modifications made were therefore only in the form of allowing correlated error terms. These correlated error terms were only specified where both empirical evidence and substantive reasoning suggested correlated measurement error between a pair of items. The empirical criterion selected for the freeing of an error correlation was an improvement in model chi-square of 10 units or more. The substantive criteria for the specification of correlated errors were the presence of highly similar item content, evidence for influence of scenario method effects (i.e. items within the same scenario measuring the same construct), or the presence of highly *oppositional* item wordings.

Six correlated error terms met these criteria, and are displayed in Table 9 along with the actual chi-square reduction as a result of their specification. One of these terms related to two items (7 and 14) with similar content, both relating to watching TV in dental situations. Four terms related to pairs of items in the same scenario and measuring the same construct (i.e. monitoring or blunting). These correlated error terms presumably reflected scenario method effects in terms of particular characteristics of individual scenarios making certain clusters of behaviours more likely. The correlated error term between items 2 and 4 was unique in that it represented the only supported modification resulting in a *negative* correlation between the two error terms; it was also the only error correlation reaching across items measuring different constructs. The apparent reason for this (negatively) correlated error term was the oppositional wording of the items: "I would want to talk to my family and friends about the appointment" and "I would not want to talk about the appointment with anyone" for items 2 and 4 respectively.

Table 9

Correlated error terms freed in model respecifications: item pairs

First item	Second item	Chi-square change
19. I would close my eyes or look away so I couldn't see the needle coming towards me.	21. I would try to push any thoughts about the needle or injection out of my head.	25.3
3. I would keep myself busy to take my mind off the appointment.	6. I would push all thoughts of the dentist out of my mind.	16.1
8. I would read the pamphlets on "Going to the Dentist" that were in the waiting area.	9. If there was someone with me (like mum or dad) I would chat to them about the dental treatment.	15.2
7. I would watch the waiting room TV, even if I didn't much like the show that was on.	14. I would watch the TV on the wall, if there was one.	13.9
13. I would watch all of the dentist's movements.	16. I would listen out for the sound of the drill.	12.2
2. I would want to talk to my family and friends about the appointment.	4. I would not want to talk about the appointment with anyone.	11.6

Goodness of fit indices for the respecified model are presented in Table 10. The model respecifications undertaken were successful in improving the model RMSEA to within acceptable bounds for the higher anxiety subsample, RMSEA = .063, PCLOSE = .062, although the SRMR remained somewhat large. As such, fit of the respecified two factor model in the higher dental anxiety group was still somewhat borderline.

While these modifications were performed specifically with a focus on the higher anxiety group, they also resulted in substantial increases in fit for the lower anxiety and full samples, as also displayed in Table 10. Acceptable fit was also present when the model was assessed simultaneously over both sub-groups. For the full sample, the total reduction in chi-square over the simple two factor model was significant, $\chi^2_{diff}(6) = 153.8$, $p < .001$, and the RMSEA decreased from .074 to .059. Given that this model displayed acceptable fit across dental anxiety sub-groups, essential invariance of the general factor model over dental anxiety level appeared to be present.

Table 10

Model fit for respecified model across dental anxiety groupings

	Higher anxiety	Lower anxiety	Simultaneous estimation across both groups	Full sample
Chi-square	362.0 (*df* 245, *p* <.001)	348.3 (*df* 245, *p* <.001)	710.2 (*df* 490, *p* <.001)	452.2 (*df* 245, *p* <.001)
SRMR	.096	.081	.089	.072
CFI	.799	.785	.793	.810
RMSEA [90% CI]	.063 [.049–.077], PCLOSE = .062	.060 [.045–.073], PCLOSE = .139	.043 [.036–.050], PCLOSE .941	.059 [.051–.068], PCLOSE .036

Parameter estimates for the higher and lower dental anxiety subgroups are displayed in Table 11. Interestingly, the correlation between the monitoring and blunting latent constructs was substantially lower ($r = .133$, $p = .365$) in the higher anxiety group than in the lower anxiety group ($r = .582$, $p = .004$). Latent factor variances were slightly larger in the higher dental anxiety group (.535 monitoring and .431 blunting) than in the lower dental anxiety group (.371 monitoring and .364 blunting), suggesting greater variation in coping preferences in the higher anxiety group.

Moderate differences between the freely estimated regression weights for the higher and lower dental anxiety groups are apparent in Table 11. Holding unstandardised regression weights to equality across the high and low dental anxiety groups when estimating the model simultaneously across both groups resulted in a statistically significant increase but reasonably moderate increase in model chi-square over the model with weights free to vary between groups, $\chi^2_{diff}(22) = 52.0$, $p = .007$. The RMSEA also deteriorated very slightly (.043 to .045), as did the CFI (.793 to .765).

Table 11

Estimated parameters for respecified MBDS 2 factor model across dental anxiety groups

			Higher dental anxiety			Lower dental anxiety		
			Estimate	*SE*	*p*	Estimate	*SE*	*p*
Unstandardised regression weights								
MBDS1	<---	Monitoring	0.278	0.111	.002	0.697	0.209	<.001
MBDS2	<---	Monitoring	0.123	0.109	.223	0.731	0.194	<.001
MBDS5	<---	Monitoring	0.205	0.131	.094	0.376	0.286	.085
MBDS8	<---	Monitoring	0.257	0.142	.048	0.780	0.382	.002
MBDS9	<---	Monitoring	0.255	0.127	.043	0.559	0.188	.003
MBDS11	<---	Monitoring	0.304	0.136	.015	0.400	0.257	.054
MBDS13	<---	Monitoring	0.623	0.152	<.001	0.539	0.249	.013
MBDS16	<---	Monitoring	0.552	0.165	.002	0.224	0.210	.252
MBDS17	<---	Monitoring	1.000	-	-	1.000	-	-
MBDS20	<---	Monitoring	0.657	0.138	<.001	0.781	0.227	<.001
MBDS23	<---	Monitoring	1.157	0.116	<.001	0.816	0.207	<.001
MBDS24	<---	Monitoring	1.114	0.160	<.001	0.767	0.256	.002
MBDS3	<---	Blunting	0.374	0.200	.043	0.409	0.195	.012
MBDS4	<---	Blunting	0.034	0.180	.875	0.156	0.179	.349
MBDS6	<---	Blunting	0.323	0.226	.063	0.777	0.209	<.001
MBDS7	<---	Blunting	0.419	0.184	.013	0.367	0.210	.067
MBDS10	<---	Blunting	0.409	0.212	.029	0.622	0.274	.007
MBDS12	<---	Blunting	0.756	0.218	<.001	0.930	0.155	<.001
MBDS14	<---	Blunting	0.581	0.174	<.001	0.455	0.190	.012
MBDS15	<---	Blunting	0.803	0.172	<.001	0.545	0.222	.005
MBDS18	<---	Blunting	0.467	0.179	.009	0.307	0.173	.059
MBDS19	<---	Blunting	0.471	0.175	.013	0.634	0.313	.017
MBDS21	<---	Blunting	0.594	0.129	.002	0.786	0.204	<.001
MBDS22	<---	Blunting	1.000	-	-	1.000	-	-
Correlations								
Monitoring	<-->	Blunting	0.133	0.150	.365	0.582	0.135	.004
e2	<-->	e4	-0.312	0.106	.006	-0.027	0.108	.819
e6	<-->	e3	0.362	0.105	.003	0.297	0.113	.018
e9	<-->	e8	0.348	0.102	<.001	-0.035	0.125	.772
e14	<-->	e7	0.354	0.089	.002	0.387	0.089	<.001
e16	<-->	e13	0.320	0.103	.005	0.198	0.105	.076
e21	<-->	e19	0.456	0.094	<.001	0.247	0.130	.085

Note. "e" denotes an error term. For example, e21 represents the error term for item 21.

Reliability (monitoring subscale α = .743; blunting subscale α = .762).

Assessment of internal consistency reliability was performed using both Cronbach's alpha and Raykov's (2001b, 2004) composite scale reliability coefficient. Both provide estimates of the true score reliability of a measure, or the degree to which item variation can be accounted for by a single, underlying factor as opposed to measurement error unique to individual items.

Cronbach's alpha was .743 for the monitoring subscale, and .762 for the blunting subscale. For the monitoring subscale, deletion of item 5 ("If there was a programme about going to the dentist on the TV I would watch it"), would increase the monitoring subscale alpha to .745. Deletion of item 16 ("I would listen out for the sound of the drill) would also increase alpha slightly (to .747). For the blunting subscale, removal of item 4 would increase alpha slightly to .772, while deletion of item 18 ("I would think about what I was going to do when I got home") would also increase alpha slightly to .765. Cronbach's alpha values were similar in the higher dental anxiety (monitoring α = .751, blunting α = .717) and lower dental anxiety groups (monitoring α = .739, blunting α = .735.

Cronbach's alpha assumes that items are tau-equivalent (i.e. equally related to the underlying latent factor), and that measurement errors for specific items are uncorrelated. Where tau-equivalence does not hold, alpha underestimates reliability (Lord & Novick, 1968; Raykov, 1997), whereas correlated measurement error can lead to either over- or underestimation of reliability (Raykov, 2001a).

Tau-equivalence holds when the unstandardised factor loadings for the items loading on a factor are equal: in other words, items have the same level of true score variance. Tau-equivalence was clearly not present for a simple two factor model utilising all items in the MBDS: constraining factor loadings to equality resulted in a substantial degradation in model chi-square over the unconstrained model, $\chi^2_{diff}(22) = 148.7$, $p < .001$. The situation was similar for the respecified model with correlated errors, where holding items to tau-equivalence resulted in a large and significant increase in model chi-square, $\chi^2_{diff}(22) = 159.6$, $p < .001$. Six pairs of correlated error parameters were also included in the respecified model, of course, a further violation of the assumptions for Cronbach's alpha.

Raykov's composite reliability coefficient can be used to calculate reliability (using CFA model parameters) when tau-equivalence and/or absence of correlated errors do not

hold (Raykov, 2001b, 2004). Its formula is presented in the method section. Reliability was assessed for two key models: a simple two factor model with no correlated error terms, and the respecified 2-factor model with six correlated error parameters. These reliability coefficients are presented in Table 12, and were similar to the Cronbach's alpha reliability estimates of reliability for the two subscales. For the original two factor model with all items, accounting for the lack of tau-equivalence resulted in a trivial increase over the Cronbach's alpha estimate for both subscales. The addition of correlated error terms in the respecified model, on the other hand, resulted in slightly lower reliability estimates. In general, Cronbach's alpha appeared to have offered a fairly accurate assessment of the MBDS subscales' reliability, given that these coefficients did not diverge substantially from their alpha estimates.

Table 12

Raykov's composite reliability coefficients for MBDS 2 factor models

Model	Monitoring	Blunting
Simple 2 factor	.751	.767
Respecified 2 factor with 6 correlated error terms	.739	.737

Note. Full sample used.

Items with poorer psychometric properties: a summary.

The various single-scale analyses of the MBDS fairly consistently highlighted three items that were poor indicators of their intended constructs: items 2, 4 and 5. Item 4 was from the blunting subscale, while 2 and 5 were from the monitoring subscale.

Items 2 and 5 were the only MBDS items with five or more missing data points, perhaps due to their relative length and use of long words (appointment, programme). Descriptive statistics indicated that items 4 and 5 were the two items with the lowest items means (2.01 and 1.93 respectively), with mean responses close to the *probably not* response option, suggesting little attractiveness of these coping options to participants.

Table 13

MBDS items identified with poor psychometric properties

Item number	Subscale	Item wording
2	Monitoring	I would want to talk to my family and friends about the appointment.
4	Blunting	I would not want to talk about the appointment with anyone.
5	Monitoring	If there was a programme about going to the dentist on the TV I would watch it.

Exploratory factor analysis highlighted these three items as not loading on either the monitoring or blunting factors. In the full sample two factor CFA, item 4 was the only item without a statistically significant loading on its designated factor, and items 5 and 2 followed with the lowest regression loadings of the remainder of the items; modification index output also suggested a cross-loading of item 2 on the blunting construct. In the higher dental anxiety subgroup, none of these three items had statistically significant loadings on their respective factors and again had the three smallest unstandardised regression weights, with modification index output suggesting a cross-loading of item 5 on the blunting construct.

In reliability analysis using Cronbach's alpha, item 5 contributed negatively to the monitoring subscale reliability. Item 2 did make a slight positive contribution to monitoring subscale reliability, however (α if deleted .737, full sample $\alpha = .743$). For the blunting subscale, removal of item 4 would increase alpha slightly to .772.

In general, removal of all or combinations of these three items would not substantially improve the fit of factor models. For instance, fit of a simple two factor model without correlated errors as measured by the RMSEA was .074 with all items and .073 with these three items deleted. As noted in the preceding paragraphs the impact of their deletion on reliability alpha would also be fairly small. All items were therefore included in all analyses in the current study, but the replacement of these items in future studies could potentially improve the psychometric properties of the MBDS.

Interpretation of individual MBDS scores.

A key question for applied usage of any scale is how individual scores on the scale or its subscales should be substantively interpreted. In general, such interpretations can be made with reference to a norm group (i.e., the classical test theory approach), or with reference to the items of the measurement scale itself (the item response theory approach). Given that the current study is an early analysis of the MBDS using a non-representative sample, insufficient data is currently present to provide a scoring scheme for applied usage. However, elucidation of a rough interpretation scheme that could subsequently be replaced or revised may be useful in order to set the groundwork for the future interpretation of individual MBDS scores.

Before describing such a scheme, it is worth noting that the finding of no tau-equivalence for the MBDS scale gives grounds for reservations about whether creating subscale scores via the simple summation of items would be appropriate (given that the MBDS's items are not equally related to the underlying monitoring and blunting constructs). The correlations between subscale scores obtained by simple summation and factor calculated using more sophisticated factor score weights for both the simple and respecified two factor models were very strong, however: above 0.9 in all cases. As such, the use of simple summated or average subscale scores seems reasonably well justified for practical purposes, although there may be some loss of reliability involved in the use of simple summated (or average) summary subscale scores.

With this caveat, the following interpretation scheme is suggested. First of all, scores should be converted to an average score over the monitoring and blunting subscales, producing scores directly linked to the response options of the scale items (i.e., 1 = *definitely not*, 2 = *probably not*, 3 = *probably*, 4 = *definitely*). Thereupon the intervals described in Table 14 can be utilised for interpreting scores on each individual subscale.

Table 14

Suggested interpretation scheme for MBDS monitoring and blunting average scores

Score range	Percent of sample in range		Interpretation
	Monitoring	Blunting	
≤ 2.33	43	25	Low monitor/blunter
>2.33 < 2.67	24	24	Ambivalent
≥2.67	33	51	High monitor/blunter

This provides an intuitive interpretation of individual scores: for example, individuals with an average score close to or higher than 3 (*probably*) are classified as having a high preference for the given coping style (monitoring or blunting). Cut-off points for high and low preference of 2.33 and 2.67 were selected given that individual participants with mean scores greater than 3 or less than 2 were fairly rare, probably a result of the constrained response range making very high or low mean scores unlikely. Scores from both categories can be combined to form the categories in Table 15. Clearly, a number of participants seem to favour a combination of coping strategies (i.e., "ambivalent" copers) rather than falling clearly into high monitor or high blunter categories. Some combination of strategies was favoured by most participants.

Table 15

Classification of sample into scoring categories across monitoring and blunting scores

Category	Percentage of sample
Passive coper (low blunter, low monitor)	14
Ambivalent coper (either ambivalent for both categories or ambivalent for one and low for the other)	22
High monitor/ambivalent blunter	8
High blunter/ambivalent monitor	13
High monitor/low blunter	5
High blunter/low monitor	18
Active coper (high monitor and high blunter)	20

Single-Scale Analyses for the CBSS-M

The following section describes the results of psychometric analyses for the Child Behavioural Style Scale – Medical situations (CBSS-M), which formed the convergent validity criterion in the current study.

Descriptive statistics and group differences.

Descriptive statistics for the monitoring and blunting subscales of the CBSS-M are presented in Table 16. Responses to the majority of individuals items showed moderate kurtosis (range -0.85 to 0.70) and skewness (range -0.65 to 0.90). Sufficient variability in item responses was present, with item standard deviations ranging from 0.73 to 0.94. Means for the 16 items were fairly similar, with means between 2 and 3 for all but one of the variables (item 3). Distribution across the full range of possible summated scores (8 to 32) was evident for both of the subscale scores, and skewness values were small and insignificant for both summated subscales. Substantial kurtosis (1.20) was present for the blunting subscale, however.

Table 16

Descriptive statistics for CBSS-M subscales

	Mean	Median	Mode	SD	Skew ($SE = .16$)	Kurtosis ($SE = .31$)	Min	Max
Monitoring	19.83	20.00	19	3.92	-0.08	0.50	8	32
Blunting	20.22	20.00	21	3.46	-0.06	1.20	8	32

Ethnic and age differences in CBSS-M subscale scores were not statistically significant. There were also no statistically significant differences between male and female mean scores on the monitoring subscale, although slight sex differences were present on the blunting subscale, ANOVA $F(1) = 7.23$, $p = .008$. Males had a slightly lower mean blunting score (19.67) than females (20.90). Mean scores on the monitoring and blunting subscales were not significantly different, paired $t(239) = -1.55$, $p = .123$. Correlations

between the CBSS-M items were small to medium in size, with a mean off-diagonal coefficient of .256 within the monitoring subscale, .175 within the blunting subscale, and .138 between cross-subscale item pairs. A correlation table displaying the CBSS-M inter-item correlations and individual item standard deviations is presented in Appendix 3.

Exploratory factor analysis.

Exploratory factor analysis (EFA) was completed using principal axis factoring. Examination of the scree plot indicated one dominant factor explaining 23.2% of item variance with a second weaker factor explaining an additional 10.5% of variance, followed by a levelling off of factor eigenvalues. These two factors were extracted using direct oblimin rotation.

Examination of the resulting pattern matrix indicated that the first (strong) factor could be described as "monitoring", with six of the eight items intended to capture monitoring behaviour loading on this factor (loadings > .33). Of the remaining items intended to measure monitoring, one item (item 2) fell just below the .33 criterion for loading on the monitoring factor, while item 15 ("I would think of things to ask the dentist") was in fact the item loading most strongly on the second factor. In fact, only four items in total loaded on the second factor, which was tentatively labelled as "blunting"; aside from item 15, these were all items intended to measure blunting. The remaining five items in the scale (all designated as blunting items) loaded weakly on both factors. These EFA results suggested rather weak psychometric properties for the CBSS-M blunting subscale. In order to clarify the factor structure of the scale further, confirmatory factor analyses were completed.

Confirmatory factor analysis.

Confirmatory factor analysis was completed in AMOS utilising maximum likelihood estimation. Two competing factor models were compared: a one factor model and a two factor monitoring and blunting model. Error terms were not permitted to correlate in these models, and latent factor scaling was accomplished using marker variables selected for having high within-factor item-total correlations. Path diagrams are not presented for these models due to space limitations and the simplicity of the tested

models. Goodness of fit indices for the one and two factor models are presented in Table 17. A model based on Bijttebier and colleagues' (2001) sub-categories for monitoring and blunting items was not attempted for the CBSS-M given insufficient coverage of the range of sub-categories in the scale. All eight of the blunting items in the CBSS-M comprise distraction type items, and all but two items of the monitoring scale comprise sensory vigilance items.

Table 17

CBSS-M: model fit for comparative confirmatory factor analyses

Fit measure	1 factor model	2 factor model
Chi-square	269.5 (*df* 104, *p* <.001)	194.9 (*df* 103, *p* <.001
SRMR	.079	.070
CFI	.706	.837
RMSEA [90% CI]	.082 [.070-.094], PCLOSE <.001)	.061 [.048-.074], PCLOSE .082)

Fit for the two factor model was reasonable, with RMSEA and SRMR values in the acceptable range (well below .08) and a CFI above 0.8. The one factor model showed substantially poorer fit, however, with significantly larger model chi-square, $\chi^2_{diff}(1) = 74.5$ *df* 1, p <.001, a substantially lower CFI value, and a RMSEA value in the mediocre fit range. The two factor solution was therefore accepted. Parameter estimates for this model are displayed in Table 18.

Table 18

CBSS-M 2 factor model: parameter estimates

Regression weights			Unstandard-ised estimate	*SE*	*p*	Standardised estimate	Error variance
CBSS-M2	<---	Monitoring	1.196	0.328	<.001	0.447	0.513
CBSS-M4	<---	Monitoring	1.493	0.427	<.001	0.561	0.424
CBSS-M6	<---	Monitoring	1.380	0.390	<.001	0.537	0.412
CBSS-M8	<---	Monitoring	1.618	0.523	<.001	0.558	0.500
CBSS-M9	<---	Monitoring	1.428	0.415	<.001	0.525	0.471
CBSS-M10	<---	Monitoring	1.655	0.528	<.001	0.586	0.452
CBSS-M11	<---	Monitoring	1.487	0.466	<.001	0.478	0.651
CBSS-M15	<---	Monitoring	1.000	-	-	0.372	0.601
CBSS-M1	<---	Blunting	0.556	0.168	.008	0.277	0.803
CBSS-M3	<---	Blunting	0.251	0.143	.081	0.161	0.515
CBSS-M5	<---	Blunting	0.347	0.175	.050	0.201	0.594
CBSS-M7	<---	Blunting	1.031	0.212	<.001	0.589	0.411
CBSS-M12	<---	Blunting	0.580	0.182	<.001	0.356	0.476
CBSS-M13	<---	Blunting	1.112	0.219	<.001	0.633	0.380
CBSS-M14	<---	Blunting	1.155	0.199	<.001	0.586	0.529
CBSS-M16	<---	Blunting	1.000	-	-	0.564	0.459
Factor variances							
Monitoring			0.102	0.042	<.001	-	-
Blunting			0.220	0.059	<.001	-	-
Covariances							
Monitoring <--> Blunting			0.078	0.032	>.001	0.516	-

A large correlation ($r = 0.516$, $p <.001$) was present between the monitoring and blunting factors, as for the MBDS. Regression weight parameters were statistically significant in all but one case: item 3 ("I would talk to other children in the waiting room"), which also subsequently performed poorly in reliability analysis. Item 3 was also the only CBSS-M item with a mean below 2 (1.72) suggesting that this item was unattractive to participants. Interestingly, a relatively clear split was clear between four blunting items with relatively high regression weights (items 7, 13, 14 and 16), and four blunting items with lower weights (items 1, 3, 5, and 12). Three of the four blunting items with lower weights were from the first (doctor) scenario. In general, blunting items had smaller regression weights/factor loadings (mean regression weight = 0.754) than did monitoring items ($M = 1.407$), suggesting lower levels of true score variance for the blunting subscale items.

One notable area of localised strain was present, with the model not sufficiently reproducing the covariance between items 9 and 12. The standardised residual covariance between these two items was 3.765, with an outlying modification index of 19.3. Freeing this error correlation would produce a statistically significant decrease in model chi-square, $\chi^2_{\text{diff}}(1) = 20.2$, $p < .001$, with the RMSEA decreasing to .055 and CFI improving to .871, improving model fit considerably. The two items were in the same scenario (dentist), with item 9 being a monitoring item ("I would look around to see what tools the dentist will use") and item 12 a blunting item ("I would keep looking at the pictures on the wall"). The correlation between the measurement error for these two items when freely estimated was .147, $p < .001$.

Reliability.

Reliability estimates for the monitoring and blunting subscales are presented in Table 19. Tau-equivalence for the CBSS-M two factor model was not present, with a moderate deterioration in model fit as a result of factor loadings being constrained to equality, $\chi^2_{\text{diff}}(14) = 52.6$, $p < .001$). Reliability was therefore estimated using both Cronbach's alpha and Raykov's composite reliability coefficient. Reliability was acceptable for the monitoring subscale, but poorer for the blunting subscale. Alpha-if-deleted statistics did not suggest any deletions for the monitoring subscale. For the blunting subscale, the deletion of item 3 ("I would talk to other children in the waiting room") would increase alpha slightly to .643. The Spearman-Brown prophecy formula was also used to predict the increase in reliability of the CBSS-M subscales that would result from increasing their length to that of the MBDS subscales (12 items), in order to provide for a comparison between scales: The predicted reliability values for the CBSS-M subscales under this condition were .804 for the monitoring subscale and .719 for the blunting subscale.

Table 19

Reliability values for CBSS-M Monitoring and Blunting subscales

Reliability index	Monitoring	Blunting
Cronbach's alpha	.732	.630
Raykov's composite reliability coefficient	.763	.658

Single-Scale Analyses for the SFPS

The following section describes the psychometric and factorial properties of the paper version of the Smiley Faces Program, which formed the discriminant validity criterion in the current study.

Descriptive statistics and demographic group differences.

Table 20 provides descriptive statistics for the four SFPS items and the summated scale score. Responses were largely on the high end of the scale for both the third and fourth items, with the modal response for both items being the most extreme dental anxiety rating (7). This censoring at the upper endpoint of the scale was reflected in fairly large negative skewness for these two items; negative skew to a smaller degree was present in both the first and second items. The range of all items encompassed the entire available response range (1-7).

Table 20

Descriptive statistics for SFPS items and summated scale

Item	Mean	Median	Mode	*SD*	Skew (*SE* = .16)	Kurtosis (*SE* = .31)	Min	Max
1	3.62	4	4	1.48	-0.07	-0.36	1	7
2	4.46	5	5	1.71	-0.32	-0.64	1	7
3	5.29	6	7	1.60	-0.67	-0.41	1	7
4	5.15	5	7	1.75	-0.64	-0.52	1	7
Total	18.52	19.50	21	5.41	-0.49	-0.38	4	28

Interestingly, only very small and statistically insignificant gender differences in SFPS total score were observed. The mean scale score was 18.26 and 18.6 for females (*t* for difference .485, *p* = .701). Significant age and ethnic group differences were not present. Items means were significantly different, repeated measures ANOVA $F(3) = 122.21$, *p* <.001,. Correlations between the individual SFPS items are presented in Table 21.

Table 21

Intercorrelations between SFPS items

Item	1	2	3	4
1	1			
2	.64	1		.
3	.58	.75	1	
4	.39	.52	.58	1

Note. All correlation coefficients significant at alpha = .001

Confirmatory factor analysis.

Given the short length of the SFPS, exploratory and comparative confirmatory factor analyses considering multi-factor models were not completed. Instead, only the fit of a single-factor model was evaluated, with a focus on absolute fit statistics. The path diagram for the model tested is presented in   Figure *4*. Latent factor scale identification was achieved via setting item 3 as a marker variable, and item error terms were not permitted to correlate.
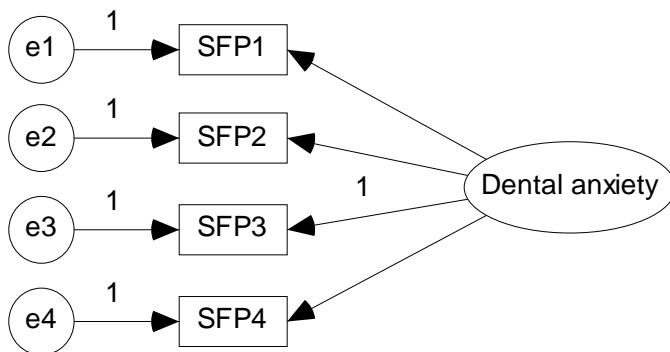
Figure 4. Path diagram for SFPS 1 factor model.

Goodness of fit indices for the one factor model are displayed in Table 22. Overall fit was good, as evidenced by the small chi-square and SRMR values and a large CFI value, although the significant chi-square indicated some deviance from perfect fit. The error in approximation per degree of freedom as indicated by the RMSEA was fairly large, suggesting that fit relative to model complexity was not strong. The small number of

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degrees of freedom for the model also resulted in weak statistical power for the RMSEA and a very wide confidence interval for its value.

Table 22

Goodness of fit for the SFPS one factor model

Fit measure	Value
Chi-square	8.3 (*df* 2, *p* = .016)
SRMR	.025
CFI	.985
RMSEA [90% CI]	.115 [.043-.201], PCLOSE = .066.

Parameter estimates for the one factor model are presented in Table 23. All items loaded strongly on the dental anxiety latent factor, with item 1 having the smallest unstandadised regression weight, although error variance was largest for item 4.

Table 23

Parameter estimates for SFPS one factor model

Parameter			Unstandard-ised estimate	*SE*	*p*	Standardised estimate	Error variance
Regression weights							
SFP1	<---	Dental anxiety	0.746	0.076	<.001	0.698	1.108
SFP2	<---	Dental anxiety	1.088	0.083	<.001	0.872	0.689
SFP3	<---	Dental anxiety	1.000			0.865	0.641
SFP4	<---	Dental anxiety	0.784	0.069	<.001	0.621	1.860
Variances							
Dental anxiety			1.899	0.237	<.001	-	-

Inspection of modification index output for localised areas of strain indicated that the freeing of one error correlation (between items 3 and 4) would result in a statistically significant increase in overall model fit. In fact, application of this alteration would in virtually perfect model fit, $\chi^2(1) = .1$, $p = .730$, RMSEA = 0.00, CFI = 1. Items 3 and 4 (having a tooth drilled, having an injection) were the most anxiety-provoking scenarios and the two items involving imaginal exposure to specific dental treatment. Allowing a free error correlation between the two less threatful scenarios (items 1 and 2) would be an

equivalent action resulting in a decrease in model chi-square to exactly the same degree. This alternative modification may be preferable given the fact that items 1 and 2 involve imaginal exposure to situations not directly involving dental care (having an appointment tomorrow, being in the waiting room); as such, their unique relationship is probably better considered as an incidence of correlated error than the unique relationships between the two items involving imaginal exposure to specific types of dental treatment.

Reliability.

The Cronbach's alpha value for the total scale was .843, indicating impressive internal consistency for a very short scale. Examination of item-total statistics indicated that the only item for which deletion would increase alpha (slightly, to .852) would be item 4 (getting an injection in your gum). Item 3 contributed most to the alpha reliability of the scale, with the lowest alpha-if-deleted value and highest corrected item-total correlation coefficient ($r = .779$).

Tau-equivalence was not entirely present for the SFPS items, with model chi-square increasing significantly when all items were constrained to loading equally on the dental anxiety latent construct, $\chi^2_{diff}(3) = 29.1$, $p < .001$. Calculation of composite scale reliability using Raykov's (2001b, 2004) method resulted in a reliability value of .853, although specification of a correlated error term between the first and second items reduced estimated reliability slightly to .832.

Multi-Scale Analyses: Convergent and Discriminant Validity of the MBDS

The convergent and discriminant validity of the MBDS subscales was examined with reference to the subscales of the CBSS-M, and the SFPS dental anxiety measure. The correlations between these measures are displayed in . The scale and subscale scores in this analysis were calculated via the simple summation of items. Intra- and inter-scale correlations between the monitoring and blunting constructs are also reported as discriminant validity coefficients. Simple bivariate correlations were used for these analyses: More sophisticated CFA-based models for the analysis of convergent and discriminant validity such as the correlated methods and correlated uniquenesses models

are available, but were not utilised given that these models require the measurement of each construct/trait via at least three different methods (see Brown, 2006).

Table 24

Convergent and discriminant validity coefficients

	r	p	95% CI
Convergent validity			
MBDS Monitoring <--> CBSS-M Monitoring	.606	<.001	.519-.680
MBDS Blunting <--> CBSS-M Blunting	.664	<.001	.587-.729
Discriminant validity with respect to dental anxiety			
MBDS Monitoring <--> SFPS Dental Anxiety	.079	.221	-.048-.204
MBDS Blunting <--> SFPS Dental Anxiety	.478	<.001	.374-.570
CBSS-M Monitoring <--> SFPS Dental Anxiety	.190	.003	.065-.309
CBSS-M Blunting <--> SFPS Dental Anxiety	.238	<.001	.115-.354
Discriminant validity: monitoring & blunting			
MBDS Monitoring <--> MBDS Blunting	.315	<.001	.196-.425
MBDS Monitoring <--> CBSS-M Blunting	.353	<.001	.237-.459
MBDS Blunting <--> CBSS-M Monitoring	.396	<.001	.284-.498
CBSS-M Monitoring <--> CBSS-M Blunting	.445	<.001	.337-.541

The statistics in indicate strong convergent validity for both the MBDS blunting and monitoring subscales with respect to their CBSS-M counterparts, with both convergent validity coefficients being over .6. Both coefficients were also fairly close to their theoretical upper limit given the level of measurement error present. These limits were .737 for the monitoring convergent validity coefficient and .693 for the blunting convergent coefficient, as calculated using the formula provided in Feldt (1997): Upper limit = $[(\rho_{xx})(\rho_{yy})]^{1/2}$, where ρ_{xx} and ρ_{yy} are the reliability values of the two correlated measures.

Discriminant validity was strong for the MBDS monitoring subscale with a small, non-significant correlation with dental anxiety, but the correlation of .478 between the MBDS blunting subscale and dental anxiety raised concerns about the discriminant validity of this blunting subscale. This discriminant validity coefficient was statistically significantly smaller than the convergent validity coefficient for the blunting subscale,

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t(237) = 3.197, *p* <.001) and thus met Campbell and D. W. Fiske's (1959) minimum standard for discriminant validity, but was well over the .3 threshold set in the study objectives for acceptable discriminant validity (based on J. Cohen's 1988 criterion for a medium-strength correlation). Of the blunting items, the correlation with dental anxiety was somewhat larger for the four cognitive avoidance items, *r* = .518, *p* = .001, than for the eight distraction items, *r* = .371, *p* <.001. The four cognitive avoidance items also formed four of the six blunting items with the strongest individual correlations with dental anxiety, although a distraction item (item 3: "I would keep myself busy to take my mind off the appointment") had the strongest correlation with dental anxiety of all blunting items, *r* = .450, *p* <.001.

Interestingly, only moderate correlations with dental anxiety were present for both the CBSS-M monitoring (*r* = 0.190) and blunting (*r* = 0.238) subscales, indicating acceptable discriminant validity. Relationships with dental anxiety were unsurprisingly stronger for the items of the dentist scenario of the CBSS-M (correlation with dental anxiety .262 for monitoring and .272 for blunting, both *p* values <.001) than for those of the first doctor scenario (.068 for monitoring and .122 for blunting, both non-significant).

The correlations between monitoring and blunting were fairly large both within and across the MBDS and CBSS-M scales, potentially raising concerns about the discriminant validity of these constructs. However, as suggested in the MBDS invariance testing section, the correlations between monitoring and blunting were much larger for the lower dental anxiety sub-sample than for the higher dental anxiety sub-sample. For instance, the correlation between the monitoring and blunting subscales of the MBDS was .422 in the lower dental anxiety group, but just .208 in the higher dental anxiety group. The correlations between MBDS monitoring and CBSS-M blunting, MBDS blunting and CBSS-M monitoring, and CBSS-M Monitoring and CBSS-M blunting were also all below .3 in the higher dental anxiety group. These correlations suggested that monitoring and blunting were strongly discriminated in the higher dental anxiety group. Convergent validity coefficients, on the other hand, were very similar in the lower and higher dental anxiety sub-samples.

Overall, while discriminant validity with respect to dental anxiety was questionable for the MBDS blunting subscale, construct validity appeared to be acceptable for the scale.

Campbell and D. W. Fiske's (1959) criteria for validity were clearly met, with convergent validity coefficients being substantively and statistically significantly greater than all discriminant validity coefficients (as indicated by non-overlapping confidence intervals).

Ancillary Qualitative Analysis: Content Analysis

While the MBDS is based on a specific theory of how children may cope with dental situations, it was also important to use children's own qualitative comments to learn more about the specific coping strategies participants favoured when not constrained by closed-ended questions. To this end, each of the four MBDS scenarios was followed by an open-ended question asking participants "Is there anything *else* you would do to make yourself feel better in this situation?"

In a number of cases children provided useful comments about what strategies they might utilise, primarily in the form of single phrase or single sentence responses. A total of 339 responses were elucidated with a total of 144 children providing at least one qualitative response. These responses were then subjected to content analysis in order to develop an understanding of the types of strategies most commonly utilised. Coding for content analysis took place at the unit level (i.e. each full response to an item was coded as a single unit), although in occasional cases responses appeared to belong to more than one of the chosen categories and were coded into both applicable categories.

The development of a coding scheme began with the assumption that monitoring-blunting theory could be useful in classifying participant's responses. In order to provide more specific distinctions than merely "monitoring" and "blunting" for those responses classifiable within monitor blunter theory, Bijttebier and colleagues' (2001) sub-categories and the blunting sub-types offered by Miller (1981) were used as a basis for more specific coding categories. These sub-categories were ultimately used only for blunting behaviours: Monitoring-type behaviours were so rare as to demand no finer distinction.

There was an early assumption, however, that monitoring and blunting theory would be unlikely to be able to explain *all* coping responses. The rationale for this was that monitoring-blunting theory, like any theory, relies on a simplification of reality rather than an explanation of all the complexities of behaviour. Therefore, thematic consideration of

responses was used to develop codes for those responses not easily classified within monitoring-blunting theory. The development of these additional codes was completed via repeated "run-throughs" of the data, beginning with initial coding, moving on to a tentative and wide-ranging coding scheme, and on to a final simplified coding scheme as larger patterns in the data emerged. The coding scheme developed is displayed in Table 25, and the frequency of responses falling into each category in Table 26.

Table 25

Primary coding categories utilised for content analysis of children's coping behaviours

Code	Description	Examples
Monitoring	Searching for information about the stressor by asking others, reading information, asking questions; imagining the stressor or similar past events.	"ask my mum what it feels like" "to ask what need's[*sic*] to be done and when"
Blunting sub-types		
Distraction	Distractions or diversions, including behavioural, cognitive and sensory distractions.	"Play on my PSP or iPod touch" "Probably watch a movie to forget"
Avoidance	Attempting to avoid cognitive or literal exposure to the stressor, including attempts to stop from thinking about the stressor, to stop receiving sensory information about the stressor, or to avoid seeing the dentist entirely (i.e. behavioural avoidance).	"try to put it out of my head." "don't think about it" "Close my eyes" "run away!" "skip contrey![*sic*]"
Reinterpretation/thinking positive	Reappraising the threat as a positive event, focusing on the benefits of seeing the dentist, engaging in positive self-talk, or just "thinking positive".	"Not think about the down sides of the injection. I'd think about the benefits." "Tell myself "I'll be numb soon!"
Direct relaxation	Comments suggesting direct attempts to relax or feel calm.	"I would just relax" "feel calm"
Other categories		
Disavowal	Comments stating that the participant is not scared of the dentist, feels no need to cope, etc.	"nothing, I don't mind the dentist" "nothing I like the dentist"
Reinforce after	Comments relating to planning to engage in reinforcing or enjoyable activities after seeing the dentist.	"Ask my mum to get me something after the appiontment[*sic*]" "Tell myself that I would get a chocolate bar afterwards."

Preparation	Taking steps to reduce the likelihood, painfulness or need for traumatic dental care. In some cases includes references to actions that might need to be requested from the dentist (e.g. asking for numbing injection).	"I would maybe clean my teeth as much as possible" "Try to put numbing stuff so it rudused[*sic*] the pain"
Social support	Socialising or seeking support from others, communicating with friends, etc, where there is no clear motive to either blunt or monitor. May include talking to dentist where motive isn't to monitor seek information.	"ask my mum to talk to me calmly." "Hug my mum and hug my best friend" "Text people'
Other	Statements not classifiable within the developed categories, including 4 statements about emotional expression.	"Cry! Just kidding. I have never had a filling though so I would be even more nervous!" "stay still"

Table 26

Frequency of responses falling into each coding category

Code	Frequency	Percent
Monitoring	15	4.4
Blunting sub-types		
Distraction	137	40.4
Avoidance	45	13.3
Reinterpretation/thinking positive	44	13.0
Direct relaxation	18	5.3
Total of blunting sub-types	244	72.0
Total monitoring and blunting	259	76.4
Other coping categories		
Disavowal	31	9.1
Reinforce after	10	3.0
Preparation	13	3.8
Social support	26	7.7
Other	15	4.4
Total of other coping categories	95	28.0
Grand total	354	104.4[a]

Note. [a]Percentages do not sum to 100% due to the presence of 15 responses for which more than one code was applicable.

In general, participant responses classifiable as blunting vastly outnumbered monitoring responses. Distraction strategies were particularly popular, comprising close to half of all responses. Avoidance responses were also popular, however, and primarily cognitive in nature (e.g. "I wouldn't think about it", with rarer responses referring to behavioural/literal avoidance of the dental situation ("Not have the operation"). Several participants favoured blunting in some scenarios and monitoring in others. In fact, virtually all of those participants who providing a monitoring response to at least scenario also responded with a blunting behaviour to at least one of the other scenarios. A substantial minority (13.0%) of responses were classifiable as reinterpretation/thinking positive; Miller (1981) classed such reinterpretation efforts as comprising blunting.

Responses mentioning social support or socialising were fairly common, but in the majority of cases were social contact or support was mentioned, it was unclear whether this behaviour could be considered as monitoring or blunting/distraction. Socialising responses might indeed be motivated by a desire to either blunt or to monitor: One might communicate with friends and family to obtain information about the dentist, or alternatively use social contact to distract from the threatening experience. Where the motivation for the seeking of social support appeared to be a desire to monitor or distract, responses were attributed to the monitoring (4 cases) or distraction (6 cases) categories. However, the majority of socialising-type responses were not classifiable as monitoring or blunting, and thus included in the "social support" coding category.

A small number of children referred to reinforcing behaviours/rewards they might pursue *after* the dental treatment, perhaps showing a basic understanding of the power of reinforcing events in altering the perception of behaviours or situations. Another substantial category was direct relaxation: usually simplistic responses along the lines of "I would just relax" or "feel calm". It was not always clear, in these cases, whether participants were in fact stating that they would be relaxed and therefore not *need* to cope.

In fact, a number of responses fell into the category termed "disavowal": statements declaring that the participant felt no need to cope, or was not fearful of the dentist, and so forth. Some of these responses might be classifiable as denial—a blunting strategy, per Miller (1981)—but given that these responses quite plausibly reflected a genuine lack of

anxiety in dental situations (and therefore not actually constitute coping responses at all), these responses were not classified as blunting.

Occasional participants mentioned active ways to prepare for or control the stressor (e.g. "I would maybe clean my teeth as much as possible"). These behaviours were not classifiable within monitoring-blunting theory, which focuses on coping with threatening information rather than actual attempts to control stressors.

<center>**Discussion**</center>

The discussion section begins with a review of the outcomes for the study's nine specific objectives. This review is followed by a more detailed discussion of the study's results in several key areas. Limitations of the current study and directions for future research follow, and the section concludes with a discussion of the key implications of the study for practice and research.

Findings With Relation to Study Objectives

1. To examine the factorial validity of the MBDS scale using exploratory and confirmatory factor analyses.

A two factor EFA model extracted using principal axis factoring produced item loadings showing a close accordance with the intended monitoring-blunting structure for the scale. Confirmatory factor analysis indicated poor fit for a 1 factor model (RMSEA = .095), acceptable fit for a two factor monitoring-blunting model (RMSEA = .074), and slightly improved fit for a four factor model (RMSEA = .072). The two factor monitoring-blunting model was retained for further analyses.

2. To assess the invariance of the MBDS scale structure across participants with higher and lower dental anxiety.

Relatively poor fit was found for a simple two factor solution (RMSEA = .083) in the higher dental anxiety sub-group of the study sample, although fit in the lower dental anxiety group was acceptable. The addition of 6 correlated error terms resulted in acceptable fit in higher anxiety group (RMSEA = .063) and when this respecified model was estimated simultaneously across higher and lower anxiety groups (RMSEA = .043). Holding factor loading parameters to equality across higher and lower dental anxiety groups when estimating the model in both groups simultaneously led to a statistically significant but fairly small deterioration in fit, $\chi^2_{diff}(22) = 52.0$, $p = .007$, indicating moderate differences in the relationships between the monitoring and blunting latent factors and individual items across the lower and higher dental anxiety groups.

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3. To examine the internal consistency reliability of MBDS monitoring and blunting subscale scores.

Cronbach's alpha was .743 for monitoring subscale and .762 for blunting subscale, indicating acceptable reliability per Nunnally's (1978) cut-off of .7 for acceptable reliability. Reliability estimates were very similar when calculated using Raykov's composite reliability coefficient based on CFA models.

4. To identify specific MBDS items with poor psychometric properties.

Three items (2, 4 and 5) were identified as weak indicators of the monitoring and blunting constructs, based on performances in several areas (missing data, EFA, CFA, reliability analysis). All three items were from the first (appointment tomorrow) scenario.

5. To elucidate a simple classification scheme for interpreting individual MBDS subscale scores, and demonstrate the resulting classification of the study sample.

A simple classification and interpretation scheme was offered based on the average item response on each subscale for each participant. When applied to the responses of the study sample, this scheme suggested that a high preference for blunting in the study sample was common (51%), but a high preference for monitoring less so (33%). Most individuals tended to use a combination of strategies (high monitor/low blunter and high blunter/low monitor groups accounting for only 23% of the sample).

6. To examine the factorial validity and reliability of the Child Behavioural Style Scale – Medical situations (CBSS-M) for use as a convergent validity criterion

Confirmatory factor analysis suggested mediocre fit for a 1 factor model for the CBSS-M (RMSEA = .082), and acceptable fit for two factor model (RMSEA = .061). Cronbach's alpha was acceptable for the monitoring subscale, α = .732, but not the blunting subscale, α = .630.

7. To examine the factorial validity and reliability of the Smiley Faces Paper Scale (SFPS) for use as a discriminant validity criterion.

CFA indicated good absolute fit for 1 factor model (SRMR = .025,), although fit per degree of freedom was questionable (RMSEA = .115). Fit of the 1 factor model was virtually perfect with 1 correlated error term specified $\chi^2(1) = 0.12$, RMSEA = 0, CFI = 1. Cronbach's alpha reliability for the SFPS was high, $\alpha = .843$, indicating impressive reliability for a 4-item scale.

8. To examine the convergent validity of the MBDS with respect to a related scale (the CBSS-M) and its discriminant validity with respect to dental anxiety (as measured by the SFPS).

Good convergent validity for the MBDS was indicated by large correlations between the MBDS and CBSS-M monitoring subscales, $r = .606$, $p < .001$, and the MBDS and CBSS-M blunting subscales, $r = .664$, $p < .001$. These coefficients closely approached their reliability-implied upper possible limits. Discriminant validity as measured by correlation with SFPS dental anxiety was acceptable for the MBDS monitoring subscale $r = .079$, $p = .221$, but not the blunting subscale ($r = .478$, $p < .001$), which exceeded the .3 threshold set in the study objectives for acceptable discriminant validity. Campbell and D. W. Fiske's (1959) minimum requirement that convergent validity coefficients should be larger than the discriminant validity coefficients was met, however.

9. To use content analysis to examine children's self-reported coping behaviours in dental situations (ancillary analysis).

Just over three quarters of the coping strategies participants provided in response to open-ended questions were classifiable with a monitoring and blunting coding scheme. Blunting responses (72.0%) vastly outnumber monitoring responses (4.4%). The most common coping strategy not covered within monitoring and blunting theory was the use of social support (7.7% of responses included some use of social support).

The following sections discuss the above findings in greater detail.

Factorial Validity of the MBDS

Factor analysis of the MBDS was completed in order to examine its construct validity in terms of adherence to a theoretically appropriate factor structure. Specifically, it was hypothesised that a two factor solution would provide substantially better model fit than a one factor bipolar unidimensional model for the MBDS.

Exploratory factor analysis of the MBDS provided somewhat ambiguous results, with a scree plot suggestive of a three factor model. This three factor model produced a primary blunting factor and second and third factors effectively separating monitoring MBDS items into those of the of the first and second scenarios (appointment tomorrow, waiting room) and those of the third and fourth scenarios (having a tooth drilled, having an injection). The SFPS dental anxiety measure, which uses the same scenarios as the MBDS, had indicated that participants found the first two scenarios substantially less anxiety-provoking than the second two scenarios. The finding of a factorial separation between the monitoring items of the first two and second two scenarios appeared to reflect a scenario method effect, wherein the difference in threatfulness of the first and second scenarios as opposed to the third and four scenarios produced a degree of systematic variation in coping responses. A two factor model was therefore also extracted, and this factor model showed a close correspondence with the hypothesised structure of the scale, with exclusively blunting items loading on the first factor, and exclusively monitoring items loading on the second.

Comparative confirmatory factor analyses produced a stronger basis for comparison between various possible factor models for the MBDS. The first finding highlighted by these analyses was that a one-factor model showed very poor fit, with positive loadings for both monitoring and blunting items. This finding indicated that a bipolar unidimensional conceptualisation for the MBDS could not be justified.

In contrast, a two factor model for the MBDS showed reasonable fit by established guidelines for RMSEA and SRMR values, which indicate the relative error in approximating the sample variance-covariance matrix using the selected model. Fit was certainly not perfect, however, with model chi-square values highly significant, and several areas of localised strain in the solution (i.e. sample item covariances not well approximated by the model). Obviously, certain clusters of behaviours represented in multiple MBDS items (such as blunting via watching TV in the waiting room and the surgery) contain

similarities and differences in attractiveness to individual participants that are not explained purely by the degree to which they constitute monitoring or blunting. The limited fit of a simple monitoring-blunting solution is understandable, perhaps, considering how wide a range of behaviours monitoring and blunting items can cover.

This finding of reasonable fit for a two factor solution for monitoring-blunting items was coherent with the findings of Krohne et al. (2000). Krohne et al. found acceptable fit for a two factor solution for their Mainz Coping Inventory (MCI), a scale measuring cognitive vigilance and avoidance—dimensions highly similar to monitoring and blunting. Similarly, Krohne et al. (2001) found acceptable fit for a two factor model of the MCI in an American subsample of participants, although the authors found that the addition of one correlated error term was necessary to achieve acceptable fit in a German subsample. This study is unique amongst existing CFA studies in the monitoring-blunting and vigilance-avoidance area in that existing CFA studies (Krohne et al., 2000; Krohne et al., 2001; Voss et al., 2006) made use of item parcelling strategies before subjecting data to CFA. Item parcelling involves the summation of small sets of items (e.g. the monitoring and blunting items of each individual scenario) into item parcels. These item parcels are then used as the exogenous variables for CFA. This approach can provide input data which more closely approximates the continuous multivariate-normal data assumptions of maximum likelihood CFA, but runs the risk of inflated fit statistics and convergence problems (Nasser & Wisenbaker, 2003), and are problematic when multidimensionality may be present *within* item parcels (Little, Cunningham, Shahar, & Widaman, 2002). Item parcelling strategies also mean that the relationships between individual items and latent constructs cannot be assessed, which is problematic from a scale development context: Items that are weak indicators of their intended constructs cannot be identified. The current study therefore employed a number of robustness checks and management strategies (bootstrapping, estimator comparisons, comparison with solutions generated by Bayesian estimation) to address the violation of the continuous data and normality assumptions while avoiding the problems inherent in item parcelling strategies.

The finding of acceptable fit for a two factor monitoring-blunting model (but not for a one factor model) is also consistent with the general approach in the applied monitoring-blunting literature of treating monitoring and blunting as separate dimensions (e.g. Kliewer,

1991; Miller et al., 1995; Phipps et al., 1995). The current study provides further evidence for the appropriateness of treating monitoring and blunting as independent constructs rather than as poles of a single dimension.

Interestingly, the monitoring and blunting latent factors covaried together substantially in the full sample in the current study ($r = .376$, $p < .001$). This finding conflicts somewhat with previous adult studies which have generally found small negative relationships between monitoring and blunting (Bar-Tal & Spitzer, 1999; Krohne et al., 2001; e.g. van Zuuren et al., 1996), or a small positive relationship (e.g. Muris & Schouten, 1994). On the other hand, a study by Bennett et al. (2008) also found a positive correlation ($r = .28$, $p < .01$) between the monitoring and blunting subscales of the related CBSS scale in youths with cystic fibrosis, perhaps suggesting a general positive relationship between monitoring and blunting in children. The relationship between the monitoring and blunting factors was small and not statistically significant in the higher dental anxiety subgroup of the current study, however, in greater accord with the general finding in adult studies. The strong correlation between monitoring and blunting amongst lower-anxiety participants might be explained by variation in individual acquiescent response styles rather than actual coping preferences; see Smith (2004) for a review of the acquiescent response style bias. Given lower anxiety and therefore little motivation to use coping behaviours, individual acquiescent respondent styles may have played a larger part in determining the lower anxiety respondents' endorsement of responses, and resulted in stronger correlations between the monitoring and blunting constructs.

Some evidence suggested that additional explanation of monitoring and blunting item covariance could be achieved by utilising the sub-categories of monitoring and blunting items suggested by Bijttebier et al. (2001) to as the basis for a factor model. The sub-categories represented in the MBDS items were the blunting sub-categories of distraction and cognitive avoidance, and the monitoring sub-categories of sensory vigilance and active information search. The increased ability of this more complex scheme to describe variance and covariance in MBDS item responses was statistically significant but small, and substantially less than the improvement from a one factor to a two factor model. As such, the increase in complexity to a four factor model did not seem justified for the MBDS, and a two factor model was retained for subsequent analysis.

It is worth noting, however, that the MBDS contains only two sensory vigilance items and four cognitive avoidance items, and therefore provided a limited test of the usefulness of these sub-categories to provide additional explanatory value over the primary monitoring and blunting dimensions. The CBSS-M measure used as a convergent validity criterion for the MBDS included an even more limited coverage of the various Bijttebier et al. (2001) sub-categories and was not subjected to analysis using these sub-categories as the basis for a factorial model. The question of whether these sub-categories provide a superior categorisation of monitoring-blunting type items than purely the two eponymous dimensions would probably be better addressed with the use of scales that provide a sufficient coverage of the various item sub-categories suggested by Bijttebier et al.

Invariance of the MBDS Across Level of Dental Anxiety

Given that the current study sample comprised a group of individuals displaying a wide range of dental anxiety, it was important to assess the degree to which level of dental anxiety influenced the factorial structure of the MBDS. Specifically, it was important to determine whether fit for the hypothesised factor two factor model was acceptable in the crucial higher-anxiety group, and whether the relationships between individual items and the monitoring and blunting latent constructs when used with participants displaying higher and lower levels of dental anxiety.

Adequate explanation of the covariance between individual MBDS items required a more complex factorial model in the higher dental anxiety group as opposed to the lower anxiety group, requiring a respecified model including 6 correlated error terms to approximate acceptable fit. These respecifications were made to improve the fit of the two factor model in the higher dental anxiety group where both strong empirical and substantive evidence existed to suggest covariance in measurement error between a pair of items. These correlated error terms primarily related to items measuring the same construct (monitoring or blunting) within the same scenario. This phenomenon could be due to scenario method effects in the form of unique characteristics of particular scenarios making particular clusters of behaviours more likely. Alternatively, participants may have been more

conscious of providing consistent responses when items were close to each other (i.e. within the same scenario).

Ultimately, given respecifications with reference to instances of correlated measurement error, the two factor monitoring-blunting model provided reasonable fit to responses in both the higher and lower dental anxiety sub-samples as measured by the RMSEA. Fit as measured by the SRMR was borderline, however, indicating that the two factor monitoring blunting model left a moderate degree of inter-item covariance unexplained.

When this respecified model was estimated simultaneously across the lower and higher dental anxiety groups, a statistically significant but reasonably small reduction in model fit was evinced as a result of holding parameter loadings to equality across the two groups. In other words, the relationships between individual items and the monitoring and blunting constructs were different in the lower and higher dental anxiety groups, but not so substantially different as to substantially reduce overall model fit—and as such, providing justification for similar scoring strategies across both groups.

Reliability of the MBDS

The results of the current investigation suggested that the MBDS monitoring and blunting subscales possess acceptable internal consistency reliability. Cronbach's alpha coefficient values were above Nunnally's (1978) criterion of .7 for acceptable reliability, and assessments of the scale's reliability using more sophisticated CFA-based composite reliability coefficients produced similar values.

The reliability values calculated are similar to those found for other monitoring and blunting coping inventories when Likert response scales are used. For instance, Rees and Bath's (2000) review of internal consistency coefficients calculated for Miller's (1987) MBSS found coefficients between .7 and .8 for both subscales in almost all studies where Likert response scales were used. Krohne et al. (2000) also found coefficients between .7 and .8 for the subscales of the Mainz Coping Inventory, while van Zuuren et al. (1996) calculated similar reliability values for the TMSI.

In cases where researchers have utilised dichotomous response formats, reliability values have been lower: For instance, Rees and Bath's (2000) review found studies reporting reliability values as low as .39 for the monitoring subscale and .33 for the blunting subscale of the MBSS when dichotomous response options were used. The additional variability resulting from the use of multi-point Likert response scales clearly has benefits in terms of enhancing reliability. In contrast with the usual approach in the literature of using a 5-point Likert response scale (e.g. Muris et al., 1996; Muris et al., 1994; van Zuuren & Wolfs, 1991), the current study utilised a 4-point response scales for the MBDS and CBSS-M. The intent of this strategy was to eliminate the possibility of participants over-using a neutral middle option (i.e., a forced choice scale). The slightly reduced range of response options did not appear to have too negatively affected reliability for the scale, given that reliability remained acceptable for both scale subscales and similar to reliability values reported in the abovementioned studies for other related scales.

While the reliability values for the MBDS subscales were acceptable, they were not very large in size, not greatly exceeding Nunnally's (1978) criterion of .7 for acceptable reliability. Internal consistency reliability increases with the length of a given scale (Feldt, 1997), and as such the fairly short length (12 items) of the MBDS subscales explains part of why alpha values were moderate in size. Secondly, MBDS inter-item correlations were only small to medium in size: approximately .2 on average within each of the two subscales. Reliability increases as average item intercorrelations increase (Gulliksen, 1945), and as such the limited item intercorrelations limited the reliability of the MBDS.

The reason for these low item intercorrelations may be that the range of behaviours (and thus the potential universe of items) that can be considered as monitoring or blunting is very large, and very diverse. For instance, Miller (1981) defined distraction, self-relaxation, detachment, reinterpretation, intellectualisation and denial as all representing blunting. In fact, virtually any cognitive or behavioural activity in a threatening situation that does not involve attention to threatening information or attempting to control the stressor can arguably be classified as blunting. While this problem is most egregious for the measurement of blunting, monitoring can also cover a wide range of cognitive and behavioural strategies, from sensory vigilance (MBDS item 16: "I would listen out for the sound of the drill"), to vigorous question-asking of one's doctor or dentist, to looking up a

worrisome condition or threat on the internet. These behaviours clearly have something in common in that they all involve seeking out or attending to potentially threatening information, but still represent quite diverse behaviours.

It may therefore be useful for research to focus on individual variation in more specific categories of coping with threatening information. A focus on habitual preferences for a more specific range of behaviours (e.g. cognitive avoidance strategies) may have the potential to both increase measurement reliability and provide scale users with more specific and useful information about how a given respondent is likely to cope in a specific situation. The sub-categories of monitoring and blunting items suggested by Bijttebier et al. (2001) may prove to be a useful framework for such an approach. The examination of the factorial validity of these sub-categories in scales providing wider coverage of several these sub-categories may be a key direction for the measurement of monitoring and blunting.

Possibilities for Revision of MBDS Items

While the previous paragraph highlights conceptual reasons as to why it is difficult for scales such as the MBDS to attain very high reliability, the replacement or revision of particular items in the MBDS may yield some moderate gains in the reliability and validity of the instrument. Three particular items were highlighted as having weak relationships with the underlying monitoring and blunting latent constructs in EFA and CFA, while another item (item 3) was identified as possessing a particularly strong relationship with dental anxiety later in the results section. The items of concern were item 2 ("I would want to talk to my family and friends about the appointment"), item 3 ("I would keep myself busy to take my mind off the appointment), item 5 ("If there was a programme about going to the dentist on the TV I would watch it"), and item 4 ("I would not want to talk about the appointment with anyone"). Items 2 and 5 were monitoring items, whereas items 3 and 4 were blunting items.

The identified items of concern had two distinctive features in common. The first was that all four contained relatively long words ("appointment" in items 2, 3 and 4, and "programme" in item 5). These two words were the longest words contained within the MBDS items, in fact. Children may therefore have struggled to understand these items,

which could also explain the slightly higher incidence of missing data for these items: Items 2 and 5 were the only items with five or more instances of missing data. The long words in these items could be replaced fairly easily. For instance, "appointment" could be replaced with "going to the dentist", and "programme" could be replaced with "show" or the shorter American spelling ("program").

The second distinctive feature these items had in common was their presence in the first MBDS scenario (having to go to the dentist tomorrow). This scenario appeared to be substantially less anxiety-provoking for respondents than other items, with a mean response on the SFPS dental anxiety item for this scenario of just 3.62. This SFPS mean score represented an average response on the smiley faces response scale for this item of a face roughly midway between slightly smiling and neutral. Given this low threatfulness, the ability of items in this scenario to adequately capture coping under threat may have been limited, reducing the correlations between items in this scenario and those in the more threatful scenarios. The psychometric properties of the MBDS might therefore benefit from replacement of the first scenario (having to go to the dentist tomorrow) with a more threatening scenario: for instance, the tooth extraction scenario from the revised Smiley Faces Program (Jones & Buchanan, 2009).

The large correlation between item 3 ("I would keep myself busy to take my mind off the appointment") and dental anxiety may have been due to the use of the qualifying phrase "to take my mind off the appointment". This qualifying phrase was not used in the other distraction-type items, and endorsing this item may have been perceived as an admission of anxiety by respondents.

Of the items identified as being of concern, item 4 ("I would not want to talk about the appointment with anyone") was probably the most problematic, being the item with the lowest regression parameter on its intended construct in all exploratory and confirmatory factor analyses. This item, while designated as a blunting item, could also be viewed as a negatively-worded monitoring item (i.e., representing a negative attitude towards monitoring by seeking out information from others). Selecting a negative response on this item would also have effectively meant endorsing a confusing double negative (e.g. "I would [definitely not] not want to talk about the appointment with anyone"). Complete replacement of this item in subsequent scale revisions would appear to be appropriate.

Interpretation of Individual MBDS Scores

While the current study focused primarily on group analyses, a key question for use of a psychometric scale in applied settings is how individual scores are to be interpreted. Two major approaches exist to this issue. The first is classical test theory, the dominant approach in psychometrics for more than eighty years (T. J. B. Kline, 2005). In the classical test theory approach, individual scores are interpreted with reference to a norm group. Problems with the classical test theory approaches include the requirement of large representative samples to develop norms, a standard error of measurement that is assumed to be invariant across the research population (Embretson & Reise, 2000), and the lack of concrete reference to actual levels of the measured trait.

The second, and newer approach to psychometric score interpretation is item response theory or IRT (also known as latent trait analysis). A core philosophy of IRT is that individuals are scored in relation to responses their responses to a scale. Item response theory approaches have several important advantages, including the ability to validate a test without a representative sample of the population, the ability to account for variance in measurement error at different levels of the measured trait, and score interpretations with reference directly to the measurement scale (Embretson & Reise, 2000).

The analyses utilised in the current study have not been explicitly those of IRT, although there are close links between CFA and IRT. For instance, the parameters of some IRT models can be calculated directly from related CFA models (Brown, 2006). Given this limitation, a rudimentary item-based scoring interpretation scheme was proposed based on the IRT philosophy of score interpretation with reference to the actual measurement scale. The summary scores used for interpretation under this scheme were simply each participant's mean response on each subscale.

The criteria used for interpretation of these mean subscale scores were developed on a simple basis. Individual participants with mean subscale scores close to or over the *probably* response point (cut-off 2.67) on the response scale were classified as showing a high preference for the given coping style (monitoring or blunting), while individuals with scores close to or under the *probably not* point (cut-off 2.33) were classified as having a low preference for the style. Individuals with mean subscale scores in the middle of the

response range (2.33 < 2.67) were classified as being ambivalent toward the given coping style.

Inspection of the resulting classifications in the study sample for monitoring and blunting individually showed that a high preference for blunting was common (51%), while a high preference for monitoring was less common (33%). When classifications for both monitoring and blunting were considered simultaneously, it was clear that it was in fact fairly rare for participants to show a high preference for one style but not the other. Eighteen percent of study participants were classifiable as high blunters/low monitors, while just 5% were classifiable as high monitors/low blunters. The remainder of the sample preferred a more mixed combination of coping strategies.

While the interpretation scheme offered may be useful as a rudimentary guideline for future efforts to develop more rigorously validated interpretation methods, the fact remains that the MBDS still requires revisions and validation studies in more heterogeneous and representative samples. As such, actual applied use of the MBDS involving interpretation of individual respondent scores is probably not yet warranted.

Factorial Validity and Reliability of the CBSS-M

As with the MBDS, comparative confirmatory factor analyses of the CBSS-M indicated poor fit for a one factor model, and reasonable fit for a two factor model. The monitoring and blunting latent factors were again strongly correlated ($r = .516, p <.001$) in the full sample. An exploratory factor analysis was also suggestive of a two factor solution. These findings provided further evidence to suggest that monitoring and blunting are best viewed as unique, related constructs rather than as poles of a single dimension.

Analysis of the reliability of the CBSS-M indicated that the monitoring subscale possessed acceptable reliability, but the blunting subscale showed poorer reliability ($\alpha =$ .630). This lack of reliability could not be accounted for by violation of the assumptions of Cronbach's alpha, as indicated by a similar composite reliability coefficient value calculated using Raykov's (2001b, 2004) method. Earlier studies using the full (32-item) CBSS scale and a dichotomous response format have also found acceptable reliability for the CBSS monitoring subscale, but not the blunting subscale (Bennett et al., 2008; Miller et

al., 1995; Muris et al., 1996). The advantage of the Likert response format was shown in the current study with the Cronbach's alpha value of .630 for the blunting subscale; blunting reliability values fell below .5 in two of the abovementioned studies (Miller et al., 1995; Muris et al., 1996). This improvement was in spite of reducing the scale length by half. Use of both the full CBSS scale and Likert response options might lead to acceptable reliability for the CBSS blunting subscale, which has 16 items in the full scale.

The reliability of the CBSS-M blunting subscale in the current study was somewhat lower than for the MBDS blunting subscale (α = .762). Part of the reason for this may be that the subscales of the CBSS-M were shorter (8 items) than those of the apparently more reliable MBDS blunting subscale (12 items). This hypothesis was only partially supported when using the Spearman-Brown prophecy formula to predict the increase in reliability of the CBSS-M that would result from increasing the subscale length to that of the MBDS blunting subscale (12 items). The predicted alpha under this condition was .719, still slightly lower than the .762 value observed for the MBDS blunting subscale. A second contributor to the limited reliability of the CBSS-M blunting subscale appeared to be limited inter-item correlations: The mean off-diagonal correlation between CBSS-M blunting items was just .174, as opposed to .207 for the MBDS blunting subscale, and .256 for the CBSS-M monitoring subscale.

Interestingly, confirmatory factor analysis showed a fairly clear split between four CBSS-M blunting items with small regression weight loadings on the blunting construct (items 1, 3, 5 and 12) and four items with substantial loadings (7, 13, 14, 16). Of the four weaker-loading items, three were from the first "doctor" scenario, involving imaginal exposure to sitting in a doctor's waiting room. The poorer psychometric performance of these items seems likely to be due to the lower-threat nature of this scenario, demonstrating the important effect that the nature of stimulus scenarios have on monitoring and blunting item responses. The poorest performing item was item 3, with a non-significant regression loading in the factor model and a negative contribution to reliability. This item's wording had been changed from the original CBSS wording of "I would play with other children in the waiting room" to "I would talk to other children in the waiting room" in order to seem less childish to the pre- and early teen respondents in the current study. Nevertheless, the idea of striking up social interaction with other children in the waiting room seemed to be

unattractive to participants (this item having the lowest item mean of 1.72); understandable, perhaps, especially when feeling anxious.

Factorial Validity and Reliability of the SFPS

The single-scale results for the SFPS provided evidence that this brief scale possesses good psychometric properties given its short length. Its internal consistency reliability was very high for a 4 item scale, with both Cronbach's alpha and composite reliability coefficients both over .8 in size. This finding is similar to that of Buchanan (2005), who reported a .8 alpha coefficient in her validation study for the Smiley Faces Program (the computer program on which the SFPS was based). SFPS item means suggested that the third item (having a tooth drilled) was the most anxiety-inducing for participants, also in accordance with Buchanan's findings.

One interesting finding highlighted was that the scale may not adequately cover the full range of dental anxiety in terms of higher levels experienced. The modal response for the two higher-threat scenarios was 7 (the highest possible response point) and in several cases children responded to items by drawing an additional, unhappier face on the end of the scale. The addition of more faces displaying greater distress to the SFPS and/or the related Smiley Faces Program may result in more fine-tuned measurement for respondents on the higher end of the dental anxiety scale.

Confirmatory factor analysis of the four item scale confirmation that overall covariation in item responses could be well explained by a single underlying factor, although the error per degree of freedom as measured by the RMSEA was fairly high. Allowing a correlated error term between the two less anxiety-provoking dental care scenarios (appointment tomorrow, waiting room) resulted in virtually perfect model fit, albeit with just one degree of freedom. This correlated error finding echoed a recurrent theme in all three study scales: that responses appeared to differ systematically (and not just in degree of anxiety) in lower-threat imaginal scenarios not involving actual dental care. The psychometric properties of the SFPS might be improved further by removing the lowest-threat scenario (scenario #1: having appointment tomorrow) and replacing it with a

scenario involving actual dental care such as the tooth extraction item from the revised Smiley Faces Program (Jones & Buchanan, 2009).

Convergent and Discriminant Validity of the MBDS

The MBDS displayed good convergent validity with respect to the related CBSS-M scale, with large correlations between the MBDS subscales and their CBSS-M counterparts ($r = .606$ for monitoring and $r = .664$ for blunting). The reason for the slightly higher convergent validity correlation between the blunting subscales of the MBDS and CBSS-M than for the monitoring subscales may be the differing distributions of monitoring item types in the two scales. When classified according to the monitoring and blunting item sub-categories of Bijttebier et al. (2001), MBDS monitoring items are primarily of the active information search sub-category (10 items), with just two sensory vigilance items, whereas virtually the converse is true for the CBSS-M (6 sensory vigilance items, 2 active information search items). The distribution of blunting items in the two scales is more similar, on the other hand: The MBDS contains 8 distraction items and 4 cognitive avoidance items, and the CBSS-M blunting subscale contains exclusively distraction items.

Discriminant validity was an issue of more concern. The correlation between the MBDS monitoring subscale and dental anxiety was small and not statistically significant, $r = .079, p = .221$, indicating good discriminant validity for this subscale, but there was a substantial correlation ($r = .478, p < .001$) between blunting subscale scores and dental anxiety. This coefficient was statistically significantly weaker than the convergent validity coefficient for the subscale, meeting Campbell and D. W. Fiske's (1959) minimum standard for construct validity, but was still well over J. Cohen's (1988) criterion of .3 for a medium-size correlation. This .3 criterion had been set as a limit for acceptable discriminant validity in the study objectives.

Several hypotheses regarding the specific origin of the correlation between MBDS blunting and dental anxiety can be entertained. The first would be that respondents may perceive stating that they would avoid or distract themselves from threatening dental information as communicating higher levels of fear of the dentist (i.e., a measurement overlap and a true lack of discriminant validity). In contrast, the relationship between the

two variables could also be explained as representing a causal rather than a measurement relationship. For instance, higher dental anxiety might causally result in more blunting responses, or alternatively use of blunting as a coping style might causally result in more anxiety.

Both hypotheses could be supported using the monitoring and blunting literature. For instance, Miller's (1981) comments suggested that blunting is the primary and most useful modality for coping with threatening information for children in uncontrollable situations. The experience of dental care is probably fairly uncontrollable for children, given that responsible adults such as parents and dental staff are likely to make substantive decisions about what care will be undertaken and when. If blunting is the most useful modality for children in dental situations, it seems reasonable to suggest that children experiencing higher dental anxiety might use more blunting strategies. On the other hand, positive relationships between monitoring or blunting and psychological distress have also been interpreted in terms of monitoring style having a causal influence on distress level. For instance, a positive relationship between blunting and psychopathology in soldiers suffering a stress reaction episode during the 1982 Lebanon War (Solomon, Mikulincer, & Arad, 1991) was interpreted in terms of showing that blunting was an ineffective coping strategy for these soldiers. In another example, Miller's (1995, p. 167) comments appeared to suggest that a monitoring style causally results in more psychological distress for cancer patients: "Patients characterized by a monitoring coping style generally are more concerned and distressed about their cancer risk, experience greater treatment side effects.... and manifest greater psychologic morbidity in response to cancer-related threats."

Notably, the four MBDS blunting items of the cognitive avoidance sub-type displayed a stronger relationship with dental anxiety ($r = 0.518$, $p < .001$) than the 8 distraction items ($r = 0.371$, $p < .001$). The strong relationship between cognitive avoidance and anxiety is unsurprising when considering that fear and avoidance of a particular situation are known to be generally strongly associated; indeed, avoidance of the feared object or situation is a prerequisite for the diagnosis of a specific phobia in the DSM-IV-TR (APA, 2000).

The finding of generally better discriminant validity for distraction-type items was echoed by the relatively better discriminant validity coefficient ($r = .238$, $p < .001$) for the

CBSS-M blunting subscale, which contains only distraction-type items. These findings tend to suggest that the use of cognitive or behavioural avoidance items in blunting scales may be unwise when using such scales with populations that are heterogeneous with respect to dental anxiety, as response to avoidance-type items may be conflated with level of dental anxiety. However, in other settings, such as use of monitoring and blunting scales in dental fear clinics, respondents may be fairly homogenous with respect to dental anxiety, and responses to avoidance items may be more informative. Discriminant validity for the CBSS-M monitoring subscale was also acceptable, with a correlation of .190 with dental anxiety.

In terms of similarity with convergent and discriminant validity coefficients in the monitoring and blunting scale literature, the MBDS convergent validity coefficients compared favourably. For example, convergent validity coefficients of between .38 and .66 were observed between the subscales of the TMSI and those of the MBSS and MCI in sub-samples of students and dental patients (van Zuuren et al., 1996). Similarly, convergent validity coefficients of between .46 and .68 were found between the subscales of the TMSI, MBSS and MCI in a similar study with a student population (Muris et al., 1994). Discriminant validity coefficients reported for other scales have usually been lower than the correlation observed between the MBDS blunting subscale and dental anxiety in the current study, however. For instance, Muris et al. (1994) also reported that the subscales of the TMSI were not significantly related to dental anxiety as measured by two different scales. Similarly, the monitoring and blunting subscales of the MBSS were not significantly related with trait or state anxiety in a study with 47 Dutch psychology students (van Zuuren & Wolfs, 1991). On the other hand, monitoring as measured by the MBSS with a 5-point Likert response scale was moderately ($r = 0.26$) correlated with trait anxiety in another Dutch study (Muris et al., 1994), with similar moderate correlations with a number of specific fears as measured by the Fear Survey Schedule (Arrindell, Emmelkamp, & van der Ende, 1984). It is difficult, however, to draw a comparison between the discriminant validity with respect to anxiety of these scales and the discriminant validity of the MBDS given that most of the reviewed studies measure both coping and anxiety in fairly general terms (i.e. coping in a variety of situations, trait anxiety), whereas the MBDS and SFPS measure coping and anxiety specifically in dental situations. This specificity of situational

stimulus may have increased the correlation between the blunting and dental anxiety measurements. This hypothesis was supported in the findings for the CBSS-M, for which the blunting items of the dentist scenario correlated more strongly with dental anxiety ($r = .272$, $p < .001$) than did the blunting items of the doctor scenario ($r = .122$, $p = .059$).

It is interesting, however, that it was the blunting subscale of the MBDS that showed a problematic relationship with dental anxiety. This finding is somewhat out of step with reports in the literature that suggest that it is monitoring that tends to show a relationship with anxiety psychological distress (e.g. Miller, 1995; Miller, Brody, & Summerton, 1988), including child studies with the original CBSS (Bennett et al., 2008; Miller et al., 1995; Muris et al., 1996). The reason why monitoring as measured by the MBDS was not significantly associated with dental anxiety in the current study may be that the MBDS monitoring items focus strongly on active information search type items (e.g. "I would read the pamphlets on "Going to the Dentist" that were in the waiting area"), largely excluding items focusing on sensory vigilance and ruminatory behaviours (e.g. "I would think about what the dentist did last time" from the CBSS-M) that are present in other monitoring and blunting scales. Active information search items would appear to represent a construct more distinct from worrying behaviours.

A limitation of the study directly with reference to convergent and discriminant validation is that these analyses were completed using simple correlation coefficients instead of more sophisticated CFA based approaches, which allow for the explicit accounting of measurement error. However, CFA-based approaches to the analysis of convergent and discriminant validity such as the correlated methods and correlated uniquenesses models have identification constraints that made them untenable in the current study. Specifically, the correlated methods approach requires at least three measured traits and three methods for measuring each trait, while the correlated uniquenesses model requires at least two traits and three methods for measuring each trait (Brown, 2006). These conditions were not met in the current study, and could not feasibly have been met without substantially increasing the length of the study questionnaire (i.e. three coping measures, three dental anxiety measures). CFA-based methods for the analysis of convergent and discriminant validity may be useful in future validation studies of

monitoring and blunting coping scales, given that they offer the potential for a clear delineation of trait and method variance.

The Broader Range of Coping: Conclusions from Content Analysis

A content analysis was conducted of children's qualitative remarks about the coping strategies they might adopt in dental situations. Overall, the responses suggested that children were much more likely to participate in behaviours classifiable as blunting than they were to use monitoring-type strategies. Seventy-two percent of coping responses contained strategies broadly classifiable as blunting, as opposed to just over 4% containing strategies classifiable as monitoring. Distraction-type strategies were particularly popular, comprising 40% of all coping responses. This finding is coherent with the comments of Miller (1981), who stated that blunting is the primary modality in threatening situations involving uncontrollable stressors. Children facing dental situations probably have a limited capacity to control the specifics of the situation, with most decisions being made by the dentist or a parent. The result is also coherent with the earlier finding that the mean MBDS blunting subscale score was somewhat higher (Cohen's $d = 0.375$) than the mean MBDS monitoring subscale score. The difference between subscale means was in the same direction for the CBSS-M, but not statistically significant.

An ambiguity of these results, however, was that while strategies classifiable as distracting strategies were extremely popular, it was difficult to determine for certain whether these strategies actually represented attempts to distract from or avoid threatening information. It is certainly plausible, for instance, that children might want to play with a "PSP" or read a book for other reasons than to blunt out threatening information (e.g. for entertainment, or for self-efficacy). The open-ended questionnaire items simply asked participants what they might do "to feel better", rather than explicitly asking only about strategies to cope or combat anxiety—possibly a limitation of this analysis. The item could have been edited to explicitly use the word *cope* or ask respondents specifically how they might attempt to reduce or manage anxiety, but this would have run the cost of being confusing to participants.

A number of children gave coping responses classifiable as *reinterpretation* or *thinking positive* (e.g. "Not think about the down sides of the injection. I'd think about the benefits"). Just under 13% of participants were classified within this category. Reinterpretation strategies are included as strategies in the Miller's seminal (1981) study but have gained limited attention in monitoring-blunting measurement. For instance, Bijttebier et al. (2001, p. 91) classified "reappraisal" within their miscellaneous emotion-focused blunting sub-category: of the scales Bijttebier et al. reviewed, only the MCI and the full version of the CBSS contained any reappraisal items. In the current study, neither the MBDS nor the shortened CBSS-M contained any reinterpretation/reappraisal items. Limiting blunting items to those relating to avoiding or distracting oneself from threatening information makes the implicit assumption that threatening information is threatening *by nature*. The use of reinterpretation strategies by individuals suggests that "threateningness" is probably better regarded as a flexible perception on the part of the individual rather than as an objective characteristic of a particular situation. By strategically altering one's perception of the stressor—for example, by reinterpretation the information in positive terms or simply instructing oneself to think positively of the situation—the very threateningness of the information can be challenged, reduced, or removed. Items reflecting reinterpretation or reappraisal behaviours could potentially be used to replace the cognitive avoidance items currently in the MBDS, which were problematic in terms of their strong association with dental anxiety.

An important coping modality commonly mentioned and not easily classifiable within monitoring-blunting theory was the use of social support. Some social support seeking behaviours can be explained within monitoring and blunting theory (e.g. by regarding a child asking a parent about the dentist as "monitoring"), but social support seems to matter apart from its value as a monitoring or blunting strategy. In fact, most of the social support type responses in the content analysis did not seem to clearly constitute either monitoring or blunting. It seems likely that utilising social support is an effective coping mechanism distinct from its use as a monitoring or blunting strategy. For instance, social support may constitute a valuable addition to an individual's resources available to deal with a threatening stressor. A number of studies have certainly noted the powerful value of social support as a valuable coping mechanism in dealing with physical and mental

stressors (see for example Greenglass, Fiksenbaum, & Eaton, 2006; Pina et al., 2008; White, Richter, & Fry, 1992).

The fact that certain coping behaviours such as the seeking out of social support are not readily classified or explained within monitoring-blunting theory provides a reminder of the limit in scope of the theory. The concepts of monitoring and blunting were proposed for a very specific purpose: to explain why predictability of a stressor is not consistently negatively related to distress level, as implied by the existing theories of stress at the time (Miller, 1981). As such, monitoring and blunting theory provides an explanatory theory specifically appropriate for understanding informational preferences in threatening situations, but not necessarily other important coping aspects. In this matter this study's findings are coherent with those of van Zuuren's (1994) qualitative study with women undergoing prenatal diagnosis: van Zuuren also found that actual self-reported coping strategies were more variant than those operationalised from monitoring-blunting theory in the MBSS.

A limitation of the content analysis strategy used was that coding categorisations were not subjected to reliability analysis; Krippendorf (2004) provides a review of various reliability measures available for content analysis, most of which constitute some form of interrater reliability. Such reliability analysis would have required the use of multiple raters for coding of coping responses, and was not attempted in the current study for practical/logistical reasons. Another limitation was that the open-ended questions simply asked participants to name coping strategies they might use that were not already covered by the quantitative MBDS/CBSS-M items for the given scenario. These open-ended questions did not enquire as to how frequently or intensely participants might engage in these behaviours.

General Limitations of the Study and Directions for Future Research

Overall, sufficient evidence was present that the MBDS may be a useful scale, but further development is needed. Aside from possible revisions discussed in the "items with poorer psychometric properties section", further validation with more diverse samples is also obviously necessary. The study sample was restricted in age and geographic location,

and comprised primarily of individuals from upper/middle class backgrounds. Further studies with more representative samples of New Zealand are required to assess its appropriateness in more heterogeneous groups, especially with regard to its appropriateness in reading level to younger children. In fact, use with younger children may require a verbal format (i.e. items read to children by an adult). Although studies with such heterogeneous samples is necessary, it may also be useful to examine the properties of the MBDS in individuals selected specifically for having high levels of dental anxiety (e.g. admissions to dental fear clinics). The psychometric properties of the scale with individuals experiencing higher levels of dental anxiety are obviously of serious importance, given that such individuals represent the group with which the scale could potentially be most useful. This concern lead to the use of specific analyses of the internal structure of the MBDS in a higher dental anxiety subsample of the current study subsample, but given that this sub-sample effectively only constituted the upper half (in terms of dental anxiety) of a normal-population sample, examinations of the MBDS's psychometric properties in a sample of individuals experiencing high levels of dental anxiety may be useful.

It is worth noting that neither the CBSS-M (convergent validity criterion) nor the SFPS (discriminant validity criterion) have previously been validated in the exact forms in which they were used in the current study, but were rather adapted from previously published scales. Conclusions regarding convergent and discriminant validity of the MBDS would have been stronger if based on correlations with extensively validated measures. The reasons for the choice of scales used were primarily an intent to keep the study questionnaire as brief as possible to minimise disruption to participants' classes, and to focus data collection on responses on dental situations rather than more general coping styles. In the case of the convergent validity measure (the CBSS-M), using a full established children's monitoring-blunting measure would have meant both elongating the study questionnaire and expanding coping measurement to coping in general (not just medical or dental) situations. In the case of the SFPS, a paper measure based on the Smiley Faces Program was selected in part because versions of the Smiley Faces Program have been tested and developed (showing excellent psychometric properties) as part of the wider Dental Jungle project of which the current study forms a part. Further, the Smiley Faces Program and hence SFPS scenarios use the same stimulus scenarios as the MBDS, making

for a compact and logically flowing study questionnaire in which each scenario had only to be described once. Nevertheless, there is an argument to be made that the study could have been improved with the use of a more established dental anxiety measure such as the CFSS-DS (Cuthbert & Melamed, 1982) or MCDAS (Wong et al., 1998).

A strong focus was made in the current study on the use of confirmatory factor analysis using maximum likelihood estimation. The use of this estimation technique required the assumption of continuous multivariate-normal input data, which was quite strongly violated (principally due to the use of 4-point Likert scale response data). A number of steps were taken to verify the robustness of individual item parameters and standard errors, such as the use of bootstrapping to estimate these parameters, comparison with model estimation via Bayesian resampling procedures, and bootstrapped estimator comparisons to confirm that maximum likelihood was the most appropriate estimation protocol of those available in AMOS. The use of more sophisticated syntax-based computer software such as LISREL or MPLUS could have allowed for the use of robust or diagonally weighted least squares estimation procedures to limit the impact of normality breaches. The fact that model chi-square statistics were likely to have been inflated by the substantial multivariate normality breaches in the current study was specifically problematic; while valid comparisons could be made between competing models, it was difficult to determine definitively whether the fit of the 2-factor monitoring-blunting model was "good". Of course, the use and interpretation of goodness of fit indices in CFA and SEM is a hugely contentious area even regardless of distributional assumption issues; see for instance the recent special issue of *Personality and Individual Differences* (Vernon & Eysenck, 2007) for a variety of perspectives on this debate.

Another limitation of the study was that evidence for predictive validity of the MBDS was not sought. The examination of convergent validity did provide some evidence for the construct validity of the scale, but ultimately suggests only that the MBDS's

measurement of monitoring and blunting converge with the measurements of the CBSS-M, not that the scale can actually predict monitoring and blunting behaviour in dental situations. A focus on the validity of monitoring and blunting scales in terms of their ability to predict actual coping behaviour in threatening situations is a strength of the field (see for example Miller, 1987; Muris, van Zuuren, & Kindt, 1994; Zuuren & Muris, 1993). The assessment of the ability of the MBDS to predict actual coping behaviour in dental situations would provide a valuable addition to knowledge about the scale's construct validity.

Finally, specific evidence for the congruency hypothesis as it applies to the MBDS is also necessary if the scale is to be used to tailor anxiety-reducing interventions to individuals' preferred coping styles. Studies from the general literature support an interaction between coping style and anxiety/distress reducing intervention type (e.g. Efran et al., 1989; Shiloh et al., 1998; Sparks, 1989) but examining the evidence for a congruency effect in the specific context of an interaction between MBDS subscale scores and interventions designed to reduce dental anxiety is an important avenue for future research.

Conclusions and Implications

While limitations to this study are present, several important implications for the applied use of monitoring and blunting theory can be drawn. The first implication for research and clinical practice is that the MBDS may be an appropriate scale for measuring monitoring and blunting preferences in dental situations, although further validation research is still required. The scale exhibits acceptable reliability, strong convergent validity, and adheres reasonably well to a theoretically appropriate factor structure. Discriminant validity with respect to dental anxiety for the blunting subscale is questionable, but to some extent this issue could be alleviated by removing cognitive avoidance items from the blunting subscale—possibly replacing these with distraction or reinterpretation/reappraisal type items. The MBDS has the potential to be a useful instrument for researchers specifically seeking to predict children's coping responses in dental situations, under which conditions the scale can be expected to provide a more

accurate prediction of behaviour than scales measuring "general" monitoring and blunting preferences.

Given further validity evidence, the scale could also potentially be used by dental staff in order to obtain information that can be used to tailor anxiety-reducing interventions to individual children. For instance, a high score on the monitoring scores would suggest that a child could benefit from informational techniques such as "Tell-Show-Do". On the other hand, a high score on the blunting subscale could suggest that the use of distraction (e.g. audiovisual distractions) would be useful. Scores indicating a preference for a mix of monitoring and blunting strategies—which were common the current study—might suggest that a range of anxiety-reducing interventions could be useful.

One specific possibility for applied use of the MBDS could be within the Dental Jungle computer program. The Dental Jungle program is designed specifically for children, and uses a variety of interactive functions to assess and assist in managing children's dental anxiety, as well as to provide information to dental staff that can be used to guide dental anxiety interventions for individual children. The current study forms a part of the wider Dental Jungle research project. The MBDS could potentially be incorporated into the Dental Jungle program in order to provide information about respondents' coping preferences to dental staff, but its applicability would depend to large degree on where the program is being used. It would make little sense to administer the MBDS (with its "appointment tomorrow" and "dentist's waiting room") scenarios to a child who is already sitting in the waiting room before an appointment. On the other hand, the scale could be used sensibly (in or outside of the Dental Jungle program) in settings such as inductions to a dental anxiety clinic, screening of children in a classroom setting before a school visit by a dental nurse, or even online at home before important dental appointments.

The second key implication of the study's results, as indicated by confirmatory factor analyses for both the MBDS and CBSS-M and mentioned previously, is that monitoring and blunting do not appear to represent poles of a single underlying dimension. Rather, monitoring and blunting are better regarded as distinct, related constructs. As such, the calculation of single summary statistics attempting to encapsulate monitoring and blunting differences in a single score (e.g. "difference" scores) seems unwarranted. Neither

does it appear appropriate to attempt to classify individuals as "monitors" or "blunters", given that individuals seem to tend to use a combination of both strategies.

The third key implication is that children may in general prefer blunting to monitoring responses in dental situations, as indicated by the higher mean of the MBDS monitoring subscale as opposed to the blunting subscale, and the predominance of blunting-type strategies in the content analysis of children's self-reported coping strategies. Of course, the study sample was not randomly selected, and as such this study is not particularly well placed to provide overall estimates of monitoring versus blunting preferences in the New Zealand population of children. However, the coherence of the findings in this sample with Miller's (1981) suggestion that blunting is the more useful coping modality in uncontrollable situations lends weight to the notion that blunting may be the preferred modality for children in dental situations. As such, while paediatric dentists may currently be most likely to use monitoring-congruent anxiety-reducing techniques (Buchanan & Niven, 2003), supplementing these techniques with blunting-congruent interventions such as the use of distraction may reap large rewards. Indeed, a variety of distraction-based techniques have been shown to be efficacious in reducing dental anxiety. These distraction techniques include videos watched through audiovisual eyeglasses (Frere et al., 2001), video games (Corah et al., 1979), and even music distraction (Lahmann et al., 2008).

Ultimately, recognition of the relevance of variation in coping styles to the management of dental anxiety may assist dental staff to more effectively address and reduce patients' dental anxiety. Given the use of interventions carefully selected to suit individual patients' preferred coping styles, we can only hope that most children's reactions to being scheduled for a dental appointment become less like Ogden Nash's in the couplet opening this study, and more like the reaction of one of the study participants: "Be happy that I'm going to miss school!"

References

Abrahamsson, K. H., Berggren, U., Hallberg, L., & Carlsson, S. G. (2002). Dental phobic patients' view of dental anxiety and experiences in dental care: A qualitative study. *Scandinavian Journal of Caring Sciences*, *16*(2), 188–196. doi:10.1046/j.1471-6712.2002.00083.x

Allison, P. D. (2001). *Missing data*. (Sage University Papers series on quantitative applications in the social sciences, Series No. 07-136). Thousand Oaks, California: Sage Publications.

American Psychiatric Association. (2000). *DSM-IV-TR: Diagnostic and statistical manual of mental disorders*. Washington DC: Author.

Anderman, C., Cheadle, A., Curry, S., Diehr, P., Shultz, L., & Wagner, E. (1995). Selection bias related to parental consent in school-based survey research. *Evaluation Review*, *19*(6), 663-674. doi:10.1177/0193841X9501900604

Arbuckle, J. L. (2008). *Amos 17.0 User's Guide*. Crawfordville, Florida: AMOS Development Corporation.

Armfield, J. M., Stewart, J. F., & Spencer, A. J. (2007). The vicious cycle of dental fear: exploring the interplay between oral health, service utilization and dental fear. *BMC Oral Health*, *7*(1). doi:10.1186/1472-6831-7-1

Armfield, J. M., Slade, G. D., & Spencer, A. J. (2009). Dental fear and adult oral health in Australia. *Community Dentistry and Oral Epidemiology*, *37*(3), 220-230. doi:10.1111/j.1834-7819.2006.tb00405.x

Armfield, J. M., Spencer, A. J., & Stewart, J. F. (2006). Dental fear in Australia: who's afraid of the dentist? *Australian Dental Journal*, *51*(1), 78-85. doi:10.1111/j.1834-7819.2006.tb00405.x

Arrindell, W. A., Emmelkamp, P. M. G., & van der Ende, J. (1984). Phobic dimensions: I. Reliability and generalizability across samples, gender and nations. *Advances in Behaviour Research and Therapy*, *6*, 207–254. doi:10.1016/0146-6402(84)90001-8

Barlow, D., & Durand, V. (2002). *Abnormal psychology* (3rd ed.). Belmont, California: Wadsworth.

Bar-Tal, Y., & Spitzer, A. (1999). The effect on coping of monitoring, blunting, and the ability to achieve cognitive structure. *The Journal of Psychology*, *133*(4), 395-412.

doi:10.1080/00223989909599751

Bedi, R., Sutcliffe, P., Donnan, P., Barrett, N., & McConnachie, J. (1992). Dental caries experience and prevalence of children afraid of dental treatment. *Community Dentistry and Oral Epidemiology*, *20*(6), 368-371. doi:10.1111/j.1600-0528.1992.tb00701.x

Bedi, R., Sutcliffe, P., Donnan, P. T., & McConnachie, J. (1992). The prevalence of dental anxiety in a group of 13-and 14-year-old Scottish children. *International Journal of Paediatric Dentistry*, *2*(1), 17–24.

Bennett, D. S., Snooks, Q., Llera, S., Vogel, K., Conklin, D., & Varlotta, L. (2008). Monitoring and internalizing symptoms among youths with cystic fibrosis. *Children's Health Care*, *37*(4), 278–292. doi:10.1080/02739610802437426

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, *88*(3), 588–606. doi:10.1037/0033-2909.88.3.588

Ben-Zur, H. (2002). Monitoring/blunting and social support: Associations with coping and affect. *International Journal of Stress Management*, *9*(4), 357–373. doi:10.1023/A:1019990518144

Berggren, U. (1993). Psychosocial effects associated with dental fear in adult dental patients with avoidance behaviours. *Psychology and Health*, *8*(2 & 3), 185-196. doi:10.1080/08870449308403178

Berggren, U., & Meynert, G. (1984). Dental fear and avoidance: causes, symptoms, and consequences. *The Journal of the American Dental Association*, *109*(2), 247-251.

Bijttebier, P., Vertommen, H., & Steene, G. V. (2001). Assessment of cognitive coping styles A closer look at situation-response inventories. *Clinical Psychology Review*, *21*(1), 85–104. doi:10.1016/S0272-7358(99)00041-0

Birmaher, B., Khetarpal, S., Brent, D., Cully, M., Balach, L., Kaufman, J., & Neer, S. M. (1997). The screen for child anxiety related emotional disorders (SCARED): Scale construction and psychometric characteristics. *Journal of the American Academy of Child and Adolescent Psychiatry*, *36*(4), 545–553.

Booth-Kewley, S., Edwards, J. E., & Rosenfeld, P. (1992). Impression management, social desirability, and computer administration of attitude questionnaires: Does the

computer make a difference. *Journal of Applied Psychology*, *77*(4), 562–566. doi:10.1037/0021-9010.77.4.562

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York: The Guilford Press.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, California: Sage Publications.

Buchanan, H. (2005). Development of a computerised dental anxiety scale for children: validation and reliability. *British Dental Journal*, *199*(6), 359-362. doi:10.1038/sj.bdj.4812694

Buchanan, H., & Niven, N. (1996). *Monitoring and blunting: How do children cope with threatening dental procedures?* Poster session presented at the British Society of Paediatric Dentistry Annual Conference, Liverpool, UK.

Buchanan, H., & Niven, N. (2002). Validation of a Facial Image Scale to assess child dental anxiety. *International Journal of Paediatric Dentistry*, *12*(1), 47. doi:10.1046/j.0960-7439 .2001.00322.x

Buchanan, H., & Niven, N. (2003). Self-report treatment techniques used by dentists to treat dentally anxious children: A preliminary investigation. *International Journal of Paediatric Dentistry*, *13*(1), 9-12. doi:10.1046/j.1365-263X.2003.00413.x

Byrne, D. (1964). Repression-sensitization as a dimension of personality. *Progress in Experimental Personality Research*, *72*, 169-220.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, *56*(2), 81–105. doi:10.1037/h0046016

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control-theory approach to human behavior*. New York: Springer-Verlag.

Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research*, *1*(2), 245-276. doi:10.1207/s15327906mbr0102_10

Chou, C., & Bentler, P. M. (1995). Estimates and tests in structural equation modeling. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 37-55). Thousand Oaks, California: Sage Publications.

Christiano, B., & Russ, S. W. (1998). Matching Preparatory Intervention to Coping Style: The Effects on Children's Distress in the Dental Setting. *Journal of Pediatric Psychology*, *23*(1), 17-27. doi:10.1093/jpepsy/23.1.17

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New Jersey: Lawrence Erlbaum Associates.

Cohen, S. M., Fiske, J., & Newton, J. T. (2000). The impact of dental anxiety on daily living. *British Dental Journal*, *189*(7), 385-390.

Corah, N. L. (1969). Development of a dental anxiety scale. *Journal of Dental Research*, *48*(4), 596-596.

Corah, N. L., Gale, E. N., & Illig, S. J. (1979). Psychological stress reduction during dental procedures. *Journal of Dental Research*, *58*(4), 1347-1351. doi:10.1177/00220345790580040801

Cuthbert, M. I., & Melamed, B. G. (1982). A screening device: Children at risk for dental fears and management problems. *ASDC Journal of Dentistry for Children*, *49*(6), 432-436.

De Jongh, A., Bongaarts, G., Vermeule, I., Visser, K., De Vos, P., & Makkes, P. (1998). Blood–injury–injection phobia and dental phobia. *Behaviour Research and Therapy*, *36*(10), 971–982. doi:10.1016/S0005-7967(98)00064-3

De Jongh, A., Muris, P., Horst, G. T., & Duyx, M. (1995). Acquisition and maintenance of dental anxiety: the role of conditioning experiences and cognitive factors. *Behaviour Research and Therapy*, *33*(2), 205–210. doi:10.1016/0005-7967(94)P4442-W

De Jongh, A., Muris, P., Horst, G. T., van Zuuren, F. J., Schoenmakers, N., & Makkes, P. (1995). One-session cognitive treatment of dental phobia: Preparing dental phobics for treatment by restructuring negative cognitions. *Behaviour Research and Therapy*, *33*(8), 947–954.

Doerr, P. A., Lang, W., Nyquist, L. V., & Ronis, D. L. (1998). Factors associated with dental anxiety. *The Journal of the American Dental Association*, *129*(8), 1111-1119.

Efran, J. S., Chorney, R. L., Ascher, L. M., & Lukens, M. D. (1989). Coping styles, paradox, and the cold pressor task. *Journal of Behavioral Medicine*, *12*(1), 91–103. doi:10.1007/BF00844751

Embretson, S. E., & Reise, S. P. (2000). *Item response theory for psychologists*. New York: Lawrence Erlbaum Associates.

Erten, H., Akarslan, Z. Z., & Bodrumlu, E. (2006). Dental fear and anxiety levels of patients attending a dental clinic. *Quintessence International*, *37*(4), 304-310.

Fedorowicz, A. E. (1995). *Children's coping questionnaire (CCQ): Development and factor structure* (Master's thesis). Simon Fraser University, British Columbia. Retrieved from http://ir.lib.sfu.ca/dspace/bitstream/1892/8170/1/b1774989x.pdf

Feldt, L. S. (1997). Can validity rise when reliability declines? *Applied Measurement in Education*, *10*(4), 377-387. doi:10.1207/s15324818ame1004_5

Flesch, R. (1948). A new readability yardstick. *The Journal of Applied Psychology*, *32*(3), 221-233. doi:10.1037/h0057532

Flora, D. B., & Curran, P. J. (2004). An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. *Psychological Methods*, *9*(4), 466–491.

Fredrikson, M., Annas, P., Fischer, H., & Wik, G. (1996). Gender and age differences in the prevalence of specific fears and phobias. *Behaviour Research and Therapy*, *34*(1), 33-39. doi:10.1016/0005-7967(95)00048-3

Frere, C. L., Crout, R., Yorty, J., & McNeil, D. W. (2001). Effects of audiovisual distraction during dental prophylaxis. *The Journal of the American Dental Association*, *132*(7), 1031–1038.

Garland, R. (1991). The mid-point on a rating scale: Is it desirable? *Marketing Bulletin*, *2*, 66–70.

Garson, G. D. (2008). Correlation. *Statnotes: Topics in Multivariate Analysis*. Retrieved January 6, 2010, from http://faculty.chass.ncsu.edu/garson/PA765/correl.htm

Garson, G. D. (2009). Univariate GLM. *Statnotes: Topics in Multivariate Analysis*. Retrieved January 6, 2010, from http://faculty.chass.ncsu.edu/garson/PA765/anova.htm

Garvin, B. J., & Kim, C. J. (2000). Measurement of preference for information in US and Korean cardiac catheterization patients. *Research in Nursing and Health*, *23*(4), 310-318. doi:10.1002/1098-240X(200008)23:4<310::AID-NUR7>3.0.CO;2-#

Greenglass, E., Fiksenbaum, L., & Eaton, J. (2006). The relationship between coping,

social support, functional disability and depression in the elderly. *Anxiety, Stress and Coping*, *19*(1), 15–31.

Gulliksen, H. (1945). The relation of item difficulty and inter-item correlation to test variance and reliability. *Psychometrika*, *10*(2), 79-91. doi:10.1007/BF02288877

Hallstrom, T., & Hailing, A. (1984). Prevalence of dentistry phobia and its relation to missing teeth, alveolar bone loss and dental care habits in an urban community sample. *Acta Psychiatrica Scandinavica*, *70*(5), 438-446. doi:10.1111/j.1600-0447.1984.tb01232.x

Harzing, A. (2006). Response styles in cross-national survey research: A 26-country study. *International Journal of Cross Cultural Management*, *6*(2), 243-266. doi:10.1177/1470595806066332

Holgado–Tello, F. P., Chacón–Moscoso, S., Barbero–García, I., & Vila–Abad, E. (2010). Polychoric versus Pearson correlations in exploratory and confirmatory factor analysis of ordinal variables. *Quality and Quantity*, *44*(1), 153-166. doi:10.1007/s11135-008-9190-y

Hosey, M. T., Macpherson, L. M. D., Adair, P., Tochel, C., Burnside, G., & Pine, C. (2006). Dental anxiety, distress at induction and postoperative morbidity in children undergoing tooth extraction using general anaesthesia. *British Dental Journal*, *200*(1), 39-43. doi:10.1038/sj.bdj.4813123

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55. doi:10.1080/10705519909540118

Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods*, *3*(4), 424-453. doi:10.1037/1082-989X.3.4.424

Jones, L. M., & Buchanan, H. (2009, July). *Validation of the Smiley Faces Program for assessing children's dental anxiety in New Zealand*. Poster session presented at the International Society for Research on Stress and Anxiety 30th Annual Conference, (STAR 2009), Budapest, Hungary.

Kliewer, W. (1991). Coping in middle childhood: Relations to competence, Type A behavior, monitoring, blunting, and locus of control. *Developmental Psychology*,

27(4), 689-697. doi:10.1037/0012-1649.27.4.689

Kline, R. B. (2004). *Principles and practice of structural equation modeling* (2nd ed.). New York: Guilford Press.

Kline, T. J. B. (2005). *Psychological testing*. Thousand Oaks, California: Sage Publications.

Klingberg, G., Berggren, U., Carlsson, S. G., & Noren, J. G. (1995). Child dental fear: cause-related factors and clinical effects. *European Journal of Oral Sciences*, *103*(6), 405-412. doi:10.1111/j.1600-0722.1995.tb01865.x

Krippendorff, K. (2004). Reliability in content analysis. *Human Communication Research*, *30*(3), 411-433. doi:10.1111/j.1468-2958.2004.tb00738.x

Krohne, H. W. (1989). The concept of coping modes: Relating cognitive person variables to actual coping behavior. *Advances in Behaviour Research and Therapy*, *11*(4), 235-248. doi:10.1016/0146-6402(89)90027-1

Krohne, H. W., Egloff, B., Varner, L. J., Burns, L. R., Weidner, G., & Ellis, H. C. (2000). The assessment of dispositional vigilance and cognitive avoidance: Factorial structure, psychometric properties, and validity of the Mainz Coping Inventory. *Cognitive Therapy and Research*, *24*(3), 297–311. doi:10.1023/A:1005511320194

Krohne, H. W., Schmukle, S. C., Burns, L. R., Egloff, B., & Spielberger, C. D. (2001). The measurement of coping in achievement situations: An international comparison. *Personality and Individual Differences*, *30*(7), 1225–1243. doi:10.1016/S0191-8869(00)00105-7

Kuusela, S., Honkala, E., Kannas, L., Tynjala, J., & Wold, B. (1997). Oral hygiene habits of 11-year-old schoolchildren in 22 European countries and Canada in 1993/1994. *Journal of Dental Research*, *76*(9), 1602–1609. doi:10.1177/00220345970760091301

Lahmann, C., Schoen, R., Henningsen, P., Ronel, J., Muehlbacher, M., Loew, T., Tritt, K., et al. (2008). Brief relaxation versus music distraction in the treatment of dental anxiety: A randomized controlled clinical trial. *Journal of the American Dental Association*, *139*(3), 317-324.

Lazarus, R. S. (1993). Coping theory and research: Past, present, and future. *Psychosomatic Medicine*, *55*, 234–234.

Lee, C. Y., Chang, Y. Y., & Huang, S. T. (2007). Prevalence of dental anxiety among 5-to 8-year-old Taiwanese children. *Journal of Public Health Dentistry*, *67*(1), 36-41. doi:10.1111/j.1752-7325.2007.00006.x

Lepore, S. J., & Kliewer, W. (1989). *Monitoring and blunting: Validation of a coping measure for children*. Poster session presented at the 97th Annual Convention of the American Psychological Association, New Orleans, LA.

Litt, M. D., Nye, C., & Shafer, D. (1995). Preparation for oral surgery: Evaluating elements of coping. *Journal of Behavioral Medicine*, *18*(5), 435-459. doi:10.1007/BF01904773

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling*, *9*(2), 151–173. doi:10.1207/S15328007SEM0902_1

Locker, D., Liddell, A., & Shapiro, D. (1999). Diagnostic categories of dental anxiety: a population-based study. *Behaviour Research and Therapy*, *37*(1), 25-37. doi:10.1016/S0005-7967(98)00105-3

Locker, D., & Liddell, A. M. (1991). Dental fear and anxiety in an older adult population. *Community Dentistry and Oral Epidemiology*, *19*(2), 120-124. doi:10.1111/j.1600-0528.1991.tb00125.x

Locker, D., Shapiro, D., & Liddell, A. M. (1996). Negative dental experiences and their relationship to dental anxiety. *Community Dental Health*, *13*(2), 86-92.

Lord, F. M., & Novick, M. R. (1968). *Statistical theories of mental test scores*. Reading, Massachusetts: Addison-Wesley.

Maani, S. A. (2000). *Secondary and tertiary education attainment and income levels for Māori and non-Māori over time*. New Zealand Treasury Working Paper No. 00/18. Retrieved from http://ideas.repec.org/p/nzt/nztwps/00-18.html

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, *1*(2), 130-149. doi:10.1037/1082-989X.1.2.130

Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling*,

11(3), 320–341. doi:10.1207/s15328007sem1103_2

Mattlin, J. A., Wethington, E., & Kessler, R. C. (1990). Situational determinants of coping and coping effectiveness. *Journal of Health and Social Behavior*, *31*(1), 103-122. doi:10.2307/2137048

McCrae, R. R. (1984). Situational determinants of coping responses: loss, threat, and challenge. *Journal of Personality and Social Psychology*, *46*(4), 919-928. doi:10.1037/0022-3514.46.4.919

McGrath, C., & Bedi, R. (2004). The association between dental anxiety and oral health-related quality of life in Britain. *Community Dentistry and Oral Epidemiology*, *32*(1), 67-72. doi:10.1111/j.1600-0528.2004.00119.x

Milgrom, P., Fiset, L., Melnick, S., & Weinstein, P. (1988). The prevalence and practice management consequences of dental fear in a major US city. *The Journal of the American Dental Association*, *116*(6), 641–647.

Miller, S. M. (1995). Monitoring versus blunting styles of coping with cancer influence the information patients want and need about their disease. Implications for cancer screening and management. *Cancer*, *76*(2), 167-177. doi:10.1002/1097-0142(19950715)76:2<167::AID-CNCR2820760203>3.0.CO;2-K

Miller, S. M., Roussi, P., Caputo, G. C., & Kruus, L. (1995). Patterns of children's coping with an aversive dental treatment. *Health Psychology*, *14*(3), 236–236. doi:10.1037/0278-6133.14.3.236

Miller, S. M. (1979). *Monitors vs. blunters: Validation of a questionnaire assessing two cognitive styles for dealing with threat*. Unpublished manuscript, Temple University, Philadelphia.

Miller, S. M. (1980). When is a little information a dangerous thing?: Coping with stressful life events by monitoring vs. blunting. In S. Levine & H. Ursin (Eds.), *Coping and Health: Proceedings of a NATO Conference*. New York: Plenum.

Miller, S. M. (1981). Predictability and human stress: Toward a clarification of evidence and theory. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* (Vol. 14, pp. 203-256). New York: Academic Press.

Miller, S. M. (1987). Monitoring and blunting: validation of a questionnaire to assess styles of information seeking under threat. *Journal of Personality and Social Psychology*,

52(2), 345–353. doi:10.1037/0022-3514.52.2.345

Miller, S. M., Brody, D. S., & Summerton, J. (1988). Styles of coping with threat: implications for health. *Journal of Personality and Social Psychology*, *54*(1), 142-148. doi:10.1037/0022-3514.54.1.142

Moore, R., Brødsgaard, I., & Birn, H. (1991). Manifestations, acquisition and diagnostic categories of dental fear in a self-referred population. *Behaviour Research and Therapy*, *29*(1), 51-60. doi:10.1016/S0005-7967(09)80007-7

Moore, R., Brødsgaard, I., & Rosenberg, N. (2004). The contribution of embarrassment to phobic dental anxiety: a qualitative research study. *BMC Psychiatry*, *4*(10). Retrieved from http://www.biomedcentral.com

Muris, P., De Jong, P. J., Merckelbach, H., & van Zuuren, F. J. (1994). Effects of imposed monitoring and blunting strategies on emotional reactivity. *Anxiety, Stress and Coping*, *7*(1), 53–65. doi:10.1080/10615809408248393

Muris, P., De Jongh, A., van Zuuren, F. J., & Schoenmakers, N. (1996). Monitoring-blunting coping styles and cognitive symptoms of dental fear. *European Journal of Personality*, *10*(1), 35-44. doi:10.1002/(SICI)1099-0984(199603)10:1<35::AID-PER244>3.0.CO;2-A

Muris, P., De Jongh, A., van Zuuren, F. J., & Ter Horst, G. (1994). Coping style, anxiety cognitions, and cognitive control in dental phobia. *Personality and Individual Differences*, *17*(1), 143–145. doi:10.1016/0191-8869(94)90272-0

Muris, P., de Jongh, A., van Zuuren, F. J., Horst, G., Deforchaux, Y. K., & Somers, P. (1995). Imposed and chosen monitoring and blunting strategies in the dental setting: Effects, self-efficacy, and coping preference. *Anxiety, Stress and Coping*, *8*(1), 47–59. doi:10.1080/10615809508249363

Muris, P., Meesters, C., & Merckelbach, H. (1996). Monitoring and fearfulness in children. *Personality and Individual Differences*, *21*(6), 1059–1061. doi:10.1016/S0191-8869(96)00149-3

Muris, P., Merckelbach, H., & De Jongh, A. (1995). Colour-naming of dentist-related words: role of coping style, dental anxiety, and trait anxiety. *Personality and Individual Differences*, *18*(5), 685–688. doi:10.1016/0191-8869(94)00185-U

Muris, P., Merckelbach, H., Gadet, B., & Meesters, C. (2000). Monitoring and anxiety

disorders symptoms in children. *Personality and Individual Differences*, *29*(4), 775–781. doi:10.1016/S0191-8869(99)00223-8

Muris, P., & Schouten, E. (1994). Monitoring and blunting: a factor analysis of the Miller Behavioural Style Scale. *Personality and Individual Differences*, *17*(2), 285-287. doi:10.1016/0191-8869(94)90032-9

Muris, P., van Zuuren, F. J., De Jong, P. J., De Beurs, E., & Hanewald, G. (1994). Monitoring and blunting coping styles: The Miller Behavioural Style Scale and its correlates, and the development of an alternative questionnaire. *Personality and Individual Differences*, *17*(1), 9–19. doi:10.1016/0191-8869(94)90257-7

Muris, P., van Zuuren, F. J., & De Vries, S. (1994). Monitoring, blunting and situational anxiety: A laboratory study on coping with a quasi-medical stressor. *Personality and Individual Differences*, *16*(3), 365–372. doi:10.1016/0191-8869(94)90061-2

Muris, P., van Zuuren, F. J., & Kindt, M. (1994). Monitoring coping style, fear of AIDS, and attitudes towards AIDS prevention. *Social Behavior and Personality*, *22*(2), 137-143. doi:10.2224/sbp.1994.22.2.137

Muris, P., van Zuuren, F. J., Merckelbach, H., Stoffels, E., & Kindt, M. (1994). Coping with an ego-threat: Monitoring and blunting during an intelligence test. *European Journal of Personality*, *8*(3), 213-221. doi:10.1002/per.2410080306

Nash, O. (1941). *The face is familiar; the selected verse of Ogden Nash*. New York: Garden City Publishing.

Nasser, F., & Wisenbaker, J. (2003). A Monte Carlo study investigating the impact of item parceling on measures of fit in confirmatory factor analysis. *Educational and Psychological Measurement*, *63*(5), 729-757. doi:10.1177/0013164403258228

Neverlien, P. O. (1990). Assessment of a single-item dental anxiety question. *Acta Odontologica Scandinavica*, *48*(6), 365–369. doi:10.3109/00016359009029067

New Zealand Ministry of Education. (2009). Rolls by year level as at 1 July 2009. *Education Counts*. Retrieved October 30, 2009, from http://www.educationcounts.govt.nz/statistics/schooling/july_school_roll_returns/14667/57564

Ng, S. K. S., & Leung, W. K. (2008). A community study on the relationship of dental anxiety with oral health status and oral health-related quality of life. *Community*

Dentistry and Oral Epidemiology, *36*(4), 347-356. doi:10.1111/j.1600-0528.2007.00412.x

Ng, S. K. S., Stouthard, M. E. A., & Leung, W. K. (2005). Validation of a Chinese version of the Dental Anxiety Inventory. *Community Dentistry and Oral Epidemiology*, *33*(2), 107-114.

Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.

Olsson, U. H., Foss, T., Troye, S. V., & Howell, R. D. (2000). The performance of ML, GLS, and WLS estimation in structural equation modeling under conditions of misspecification and nonnormality. *Structural Equation Modeling*, *7*(4), 557–595. doi:10.1207/S15328007SEM0704_3

Phipps, S., Fairclough, D., & Mulhern, R. K. (1995). Avoidant coping in children with cancer. *Journal of Pediatric Psychology*, *20*(2), 217–232. doi:10.1093/jpepsy/20.2.217

Pina, A. A., Villalta, I. K., Ortiz, C. D., Gottschall, A. C., Costa, N. M., & Weems, C. F. (2008). Social Support, Discrimination, and Coping as Predictors of Posttraumatic Stress Reactions in Youth Survivors of Hurricane Katrina. *Journal of Clinical Child and Adolescent Psychology*, *37*(3), 564-574.

Potosky, D., & Bobko, P. (1997). Computer versus paper-and-pencil administration mode and response distortion in noncognitive selection tests. *Journal of Applied Psychology*, *82*(2), 293–299. doi:10.1037/0021-9010.82.2.293

Poulton, R., Thomson, W. M., Davies, S., Kruger, E., Brown, R. H., & Silva, P. (1997). Good teeth, bad teeth and fear of the dentist. *Behaviour Research and Therapy*, *35*(4), 327–334. doi:10.1016/S0005-7967(96)00096-4

Poulton, R., Waldie, K. E., Thomson, W. M., & Locker, D. (2001). Determinants of early-vs late-onset dental fear in a longitudinal-epidemiological study. *Behaviour Research and Therapy*, *39*(7), 777-785. doi:10.1016/S0005-7967(00)00060-7

Ragnarsson, B., Arnlaugsson, S., Karlsson, K., Magnússon, Þ., & Arnarson, E. (2003). Dental anxiety in Iceland: an epidemiological postal survey. *Acta Odontologica Scandinavica*, *61*(5), 283-288. doi:10.1080/00016350310005844

Ragnarsson, E. (1998). Dental fear and anxiety in an adult Icelandic population. *Acta Odontologica Scandinavica*, *56*(2), 100-104. doi:10.1080/00016359850136067

Raykov, T. (2001a). Bias of coefficient alpha for fixed congeneric measures with correlated errors. *Applied Psychological Measurement*, *25*(1), 69-76. doi:10.1177/01466216010251005

Raykov, T. (2001b). Estimation of congeneric scale reliability using covariance structure analysis with nonlinear constraints. *British Journal of Mathematical and Statistical Psychology*, *54*(2), 315-323. doi:10.1348/000711001159582

Raykov, T. (2004). Behavioral scale reliability and measurement invariance evaluation using latent variable modeling. *Behavior Therapy*, *35*(2), 299–331. doi:10.1016/S0005-7894(04)80041-8

Rees, C. E., & Bath, P. A. (2000). The psychometric properties of the Miller Behavioural Style Scale with adult daughters of women with early breast cancer: A literature review and empirical study. *Journal of Advanced Nursing*, *32*(2), 366-374. doi:10.1046/j.1365-2648.2000.01485.x

Rosenbaum, M., & Piamenta, R. (1998). Preference for local or general anesthesia, coping dispositions, learned resourcefulness and coping with surgery. *Psychology and Health*, *13*(5), 823–845. doi:10.1080/08870449808407434

Roy-Byrne, P. P., Milgrom, P., Khoon-Mei, T., Weinstein, P., & Katon, W. (1994). Psychopathology and psychiatric diagnosis in subjects with dental phobia. *Journal of Anxiety Disorders*, *8*(1), 19-31. doi:10.1016/0887-6185(94)90020-5

Ryan, N. M. (1989). Stress-coping strategies identified from school age children's perspective. *Research in Nursing and Health*, *12*(2), 111-122. doi:10.1002/nur.4770120208

Schuller, A. A., Willumsen, T., & Holst, D. (2003). Are there differences in oral health and oral health behavior between individuals with high and low dental fear?. *Community Dentistry and Oral Epidemiology*, *31*(2), 116-121. doi:10.1034/j.1600-0528.2003.00026.x

Seligman, M., & Rosenhan, D. (1989). *Abnormal psychology* (2nd ed.). New York: W.W. Norton and Company.

Shiloh, S., Mahlev, U., Dar, R., & Ben-Rafael, Z. (1998). Interactive effects of viewing a contraction monitor and information-seeking style on reported childbirth pain. *Cognitive Therapy and Research*, *22*(5), 501–516. doi:10.1023/A:1018777700691

Skaret, E., Raadal, M., Berg, E., & Kvale, G. (1998). Dental anxiety among 18-yr-olds in
Norway: Prevalence and related factors. *European Journal of Oral Sciences*,
106(4), 835-843. doi:10.1046/j.0909-8836.1998.eos106402.x

Smith, P. B. (2004). Acquiescent response bias as an aspect of cultural communication
style. *Journal of Cross-Cultural Psychology*, *35*(1), 50-61.

Sohn, W., & Ismail, A. I. (2005). Regular dental visits and dental anxiety in an adult
dentate population. *The Journal of the American Dental Association*, *136*(1), 58-66.

Solomon, Z., Mikulincer, M., & Arad, R. (1991). Monitoring and blunting: Implications for
combat-related post-traumatic stress disorder. *Journal of Traumatic Stress*, *4*(2),
209-221. doi:10.1007/BF00977004

Sparks, G. G. (1989). Understanding emotional reactions to a suspenseful movie: The
interaction between forewarning and preferred coping style. *Communication
Monographs*, *56*(4), 325-340. doi:10.1080/03637758909390268

Stevens, J. P. (2002). *Applied multivariate statistics for the social sciences* (4th ed.).
Mahwah, New Jersey: Lawrence Erlbaum Associates.

Stouthard, M. E. A., & Hoogstraten, J. (1990). Prevalence of dental anxiety in the
Netherlands. *Community Dentistry and Oral Epidemiology*, *18*(3), 139-142.
doi:10.1111/j.1600-0528.1990.tb00039.x

Tanaka, J. S. (1987). "How big is big enough?": Sample size and goodness of fit in
structural equation models with latent variables. *Child Development*, *58*(1), 134-
146. doi:10.2307/1130296

Ten Berge, M., Veerkamp, J. S. J., Hoogstraten, J., & Prins, P. J. M. (2002). Childhood
dental fear in the Netherlands: prevalence and normative data. *Community Dentistry
and Oral Epidemiology*, *30*(2), 101-107. doi:10.1034/j.1600-0528.2002.300203.x

Terry, D. J. (1994). Determinants of coping: The role of stable and situational factors.
Journal of Personality and Social Psychology, *66*(5), 895–895. doi:10.1037/0022-
3514.66.5.895

Thomson, W. M., Broadbent, J. M., Locker, D., & Poulton, R. (2009). Trajectories of
dental anxiety in a birth cohort. *Community Dentistry and Oral Epidemiology*,
37(3), 209-219. doi:10.1111/j.1600-0528.2009.00473.x

Thomson, W. M., Locker, D., & Poulton, R. (2000). Incidence of dental anxiety in young

adults in relation to dental treatment experience. *Community Dentistry and Oral Epidemiology*, *28*(4), 289–294. doi:10.1034/j.1600-0528.2000.280407.x

Thomson, W. M., Stewart, J. F., Carter, K. D., & Spencer, A. J. (2006). Dental anxiety among Australians. *International Dental Journal*, *46*(4), 320-324.

Uitenbroek, D. G. (1999). SISA correlation analysis online. Retrieved December 5, 2009, from http://www.quantitativeskills.com/sisa/statistics/correl.htm

Vassend, O. (1993). Anxiety, pain and discomfort associated with dental treatment. *Behaviour Research and Therapy*, *31*(7), 659–666. doi:10.1016/0005-7967(93)90119-F

Vernon, T., & Eysenck, S. B. G. (Eds.). (2007). Structural equation modeling [Special issue]. *Personality and Individual Differences*, *42*(5), 811-898.

Vispoel, W. P., Boo, J., & Bleiler, T. (2001). Computerized and Paper-and-Pencil Versions of the Rosenberg Self-Esteem Scale: A Comparison of Psychometric Features and Respondent Preferences. *Educational and Psychological Measurement*, *61*(3), 461-474. doi:10.1177/00131640121971329

Voss, U., Müller, H., & Schermelleh-Engel, K. (2006). Towards the assessment of adaptive vs. rigid coping styles: Validation of the Frankfurt Monitoring Blunting Scales by means of confirmatory factor analysis. *Personality and Individual Differences*, *41*(2), 295–306. doi:10.1016/j.paid.2005.12.021

White, N. E., Richter, J. M., & Fry, C. (1992). Coping, social support, and adaptation to chronic illness. *Western Journal of Nursing Research*, *14*(2), 211-224.

Wogelius, P., Poulsen, S., & Sørensen, H. T. (2003). Prevalence of dental anxiety and behavior management problems among six to eight years old Danish children. *Acta Odontologica Scandinavica*, *61*(3), 178-183. doi:10.1080/00016350310003468

Wong, H. M., Humphris, G. M., & Lee, G. T. (1998). Preliminary validation and reliability of the Modified Child Dental Anxiety Scale. *Psychological Reports*, *83*(3 Pt 2), 1179-1186. doi:10.2466/PR0.83.7.1179-1186

Wright, F. A. C., Giebartowski, J. E., & McMurray, N. E. (1991). A national survey of dentists' management of children with anxiety or behaviour problems. *Australian Dental Journal*, *36*(5), 378-383. doi:10.1111/j.1834-7819.1991.tb01361.x

van Zuuren, F. J. (1994). Cognitive confrontation and avoidance during a naturalistic

medical stressor. *European Journal of Personality*, *8*(5), 371-384.
doi:10.1002/per.2410080503

van Zuuren, F. J. (1998). The effects of information, distraction and coping style on
symptom reporting during preterm labor. *Psychology and Health*, *13*(1), 49–54.
doi:10.1080/08870449808406130

van Zuuren, F. J., De Jongh, A., Beekers, C., & Swinkels, P. (1999). Coping with dental
treatment correlates of dispositional and domain specific monitoring and blunting.
Psychology and Health, *14*(2), 323–337. doi:10.1080/08870449908407331

van Zuuren, F. J., de Groot, K. I., Mulder, N. L., & Peter, M. (1996). Coping with medical
threat: An evaluation of the threatening medical situations inventory (TMSI).
Personality and Individual Differences, *21*(1), 21–31. doi:10.1016/0191-
8869(96)00029-3

van Zuuren, F. J., Grypdonck, M., Crevits, E., Walle, C. V., & Defloor, T. (2006). The
effect of an information brochure on patients undergoing gastrointestinal
endoscopy: A randomized controlled study. *Patient Education and Counseling*,
64(1-3), 173-182. doi:10.1016/j.pec.2005.12.014

van Zuuren, F. J., & Wolfs, H. M. (1991). Styles of information seeking under threat:
Personal and situational aspects of monitoring and blunting. *Personality and
Individual Differences*, *12*(2), 141–149. doi:10.1016/0191-8869(91)90097-U

Zuuren, F. J., & Muris, P. (1993). Coping under experimental threat: Observable and
cognitive correlates of dispositional monitoring and blunting. *European Journal of
Personality*, *7*(4), 245-253. doi:10.1002/per.2410070405

Appendix 1: Participant Information and Consent Documents

Note: Information sheets for children and parents were printed on Massey University letterhead. Documents have been reformatted slightly (margins) in order to fit on bound pages.

Dental Jungle Project – Information Letter for Children (turn over for information for parents)

Kia ora students! We would like to tell you about a new computer program we have started making called DENTAL JUNGLE and how we need school children's help to test some of the questions we're thinking about putting into the program.

The DENTAL JUNGLE computer program is about helping make going to the dentist more positive for children. We are asking the children at your school to help us by filling out a survey, with some questions about how you cope with going to the dental clinic. Looking at how students at your school answer the questions in our survey will help us to decide what things to have in the program!

Please have a talk about this with your parents, and think about whether you're ok with helping out. We will be visiting classes from the 14th to the 24th of September so you have at least a week to decide!

We have talked to your School Principal about our study, and if you're happy to help, you can fill out our survey during class. Even though DENTAL JUNGLE is a computer program, the questions we give you will just be on a pen and paper form this time!

We would really like your help, but when we visit your class you will be allowed to say no – that's quite ok! If you do decide to fill out our survey, you will still have the right to:
- decide not to answer any particular question
- stop filling out the questions at any time
- ask any questions about the study you have
- stay anonymous – your name won't be put on your survey
- be told about what we found out when the project is finished (if you would like us to send you what we find out, please give Matt an email at matthew.williams.9@uni.massey.ac.nz)

We will be giving your school $3 for everyone who volunteers, up to $200, for library books for the help we are getting from you and your school. All children in the classes we visit will also get a toothbrush and small tube of paste to help you keep your teeth healthy.

Thank you for reading this letter. I hope you will help.
Matt Williams and Dr Linda Jones

This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern A, Application 09/37. If you have any concerns about the ethics of this research, please contact Professor Julie Boddy, Chair, Massey University Human Ethics Committee: Southern A telephone 06 350 5799 x 2541, email humanethicsoutha@massey.ac.nz.

Dental Jungle Project - Information for Parents

Dear [school name] Intermediate School Parents

The Massey University Dental Jungle team will be visiting [school name] Intermediate from 14 to 24 September 2009 to do some survey research, involving asking children how they might cope in a variety of dental situations. A parental consent form for the study is attached. **Please return this form only if you do NOT want your child to participate.** If you are happy for your child to participate you don't need to do anything!

The Dental Jungle project is about developing a computer program to assess and manage children's dental anxiety. Fear of visiting the dentist can lead to missing important appointments, and is linked with poorer oral health. We have approached your school to participate in a key aspect of the development of the Dental Jungle program: testing and validating a measure of the coping styles children use to deal with dental anxiety. The version of the measure we will be testing will be a pen and paper one, which will later be converted to a computerised version. As well as questions about what the children would do to cope in a range of common dental situations, the survey will ask children about how anxious they would feel in these situations, and about how often they brush their teeth and use dental floss. Completing the survey will take them about half an hour.

The school will receive book vouchers to the value of $3 per child participating to a maximum of $200, and all children in the selected classes will be given a toothbrush and paste (whether they participate or not!) Your child is in one of the classes selected for the project.

You and your child are under no obligation to accept our invitation to help. When we visit, your child will have the right to:
- decide not to participate in the study
- decline to answer any particular question;
- withdraw from the study;
- ask any questions about the study at any time;
- remain anonymous (your child's name will not be recorded on his or her survey form)
- be given access to a summary of the project findings when it is concluded.

You also have the right to refuse consent for your child to participate.

The ultimate aim of our project is to make dentistry positive, but if participating in the project makes your child concerned about dental treatment, please contact Dr Linda Jones (the project supervisor), who will be able to assist you.

We will be sending a summary of our findings to the school principal once the study has been completed. If you would like to be sent a copy of these findings please feel free to email or call Matt Williams or Linda Jones using the details given below. You are also very welcome to contact us if you have any questions about the project or your child's participation.

Kind regards,

Matt Williams, Project Leader
MA Candidate, School of Psychology
Auckland Campus, Massey University
Telephone 027 630 2108
matthew.williams.9@uni.massey.ac.nz

Dr Linda Jones, Project Supervisor
Senior Lecturer, School of Psychology
Wellington Campus, Massey University
PO Box 756, Wellington
Telephone: 09 414 0800 extension 6530
L.M.Jones@massey.ac.nz

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Dental Jungle Project - Consent Form for Parents

Kia ora [school name] Intermediate School Parents

Dental Jungle researcher, Matt Williams, will be in your school from 14 to 24 September 2009. Your Principal is happy for the research to be carried out in the school, so…

- **send back this form only if you <u>do not</u> want your child to participate**.

Please note that we do not look at your child's teeth. This is not about their teeth but how they answer the questions in our questionnaire about how they cope with being at the dentist.

If you have any concerns or questions about the project, please feel free to contact lead researcher Matt Williams or supervisor Dr Linda Jones by phone or email.

Please circle the NO below if you do NOT wish your child to participate, and ask your child to return this form to his or her form teacher before Monday 14 September. **If you are willing for your child to participate there is no need to do anything further.**

NO - I do not want my child to participate.

Child's name:_____ **Child's class:**_____

Parent / Guardian's printed name:_____

Signature:

THANK YOU

Note that this consent form will be archived at Massey University for five (5) years.

Matt Williams, Project Leader
MA Candidate, School of Psychology
Auckland Campus, Massey University
Telephone: 027 630 2108
matthew.williams.9@uni.massey.ac.nz

Dr Linda Jones, Project Supervisor
Senior Lecturer, School of Psychology
Wellington Campus, Massey University
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L.M.Jones@massey.ac.nz

Appendix 2: Study Questionnaire

Note: Study questionnaire reformatted slightly (margins, font size of items) in order to fit on bound pages. The items of the CBSS-M scale included in the study questionnaire are not reproduced here due to copyright restrictions applying to the original CBSS items upon which these items were closely based.

Lead researcher: Matt Williams, Massey University Auckland
Supervisor: Dr Linda Jones, Massey University Wellington

DENTAL JUNGLE COPING SURVEY

Hi! Thank you for filling out our questions. Please answer each question as honestly as you can – there are no right or wrong answers here! Please <u>don't</u> write your name anywhere on the survey.

If you would prefer not to fill out the questionnaire you don't have to. You also have the right to leave out any question, or stop at any time.

If you have any trouble understanding a question, please feel free to ask me or your teacher. You can also write any constructive feedback you have about any of our questions on the form.

Most of the questions ask you to decide how likely you would be to do something in a particular situation. Circle the option that <u>best</u> describes what you would do. For example:

| You're hungry. Would you eat some sushi, if you could buy some? | Definitely Not | Probably Not | (Probably) | Definitely |
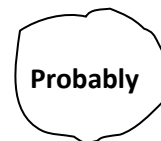
Thank you for helping us!

QUESTION 1

1.a) <u>**If you had to go to the dentist tomorrow**</u>**, how would you feel? (circle the number below the face that best shows how you would feel)**


```
  1     2     3     4     5     6     7
```

And how likely is it that you would do each of these things? (circle your answer)

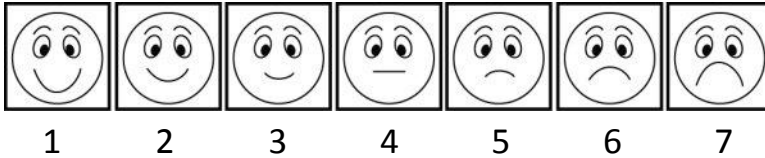|				
1.b) I would think up questions that I might want to ask the dentist.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
1.c) I would want to talk to my family and friends about the appointment.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
1.d) I would keep myself busy to take my mind off the appointment.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
1.e) I would not want to talk about the appointment with anyone.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
1.f) If there was a programme about going to the dentist on the TV I would watch it.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
1.g) I would push all thoughts of the dentist out of my mind.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**

1.h) Is there anything **else** you might do in this situation to make yourself feel better? (write your answer)

QUESTION 2

2.a) <u>**If you were sitting in the waiting room waiting to have a filling done**</u>**, how would you feel? (circle the number below the face that best shows how you would feel)**


```
  1     2     3     4     5     6     7
```
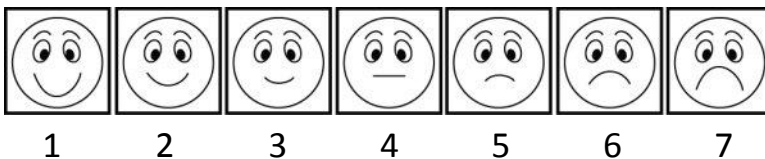
And how likely is it that you would do each of these things while you waited? (circle your answer)

2.b) I would watch the waiting room TV, even if I didn't much like the show that was on.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**

2.c) I would read the pamphlets on "Going to the Dentist" that were in the waiting area.	Definitely Not	Probably Not	Probably	Definitely
2.d) If there was someone with me (like mum or dad) I would chat to them about the dental treatment.	Definitely Not	Probably Not	Probably	Definitely
2.e) I would read the magazines or books in the waiting room, whatever they were.	Definitely Not	Probably Not	Probably	Definitely
2.f) I would read all of the posters on the wall about tooth decay and dental treatment.	Definitely Not	Probably Not	Probably	Definitely
2.g) I would try and think about something nice that might happen in the future.	Definitely Not	Probably Not	Probably	Definitely

2.h) Is there anything **else** you might do in this situation to make yourself feel better? (write your answer)

QUESTION 3

3.a) If you were about to have a tooth drilled, how would you feel? (circle the number below the face that best shows how you would feel)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
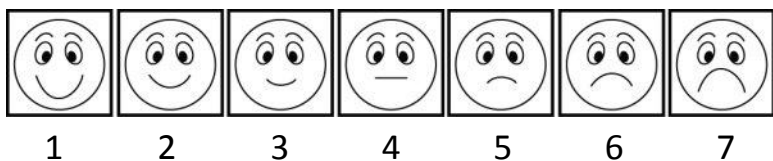
And how likely is it that you would do each of these things? (circle your answer)

3.b) I would watch all of the dentist's movements.	Definitely Not	Probably Not	Probably	Definitely
3.c) I would watch the TV on the wall, if there was one.	Definitely Not	Probably Not	Probably	Definitely
3.d) I would sing a favourite song in my head.	Definitely Not	Probably Not	Probably	Definitely
3.e) I would listen out for the sound of the drill.	Definitely Not	Probably Not	Probably	Definitely
3.f) I would want the dentist to tell me exactly what he or she was going to do.	Definitely Not	Probably Not	Probably	Definitely
3.g) I would think about what I was going to do when I got home.	Definitely Not	Probably Not	Probably	Definitely

3.h) Is there anything **else** you might do in this situation to make yourself feel better? (write your answer)

QUESTION 4

4.a) <u>If you were about to have an injection in your gum</u>, how would you feel? (circle the number below the face that best shows how you would feel)
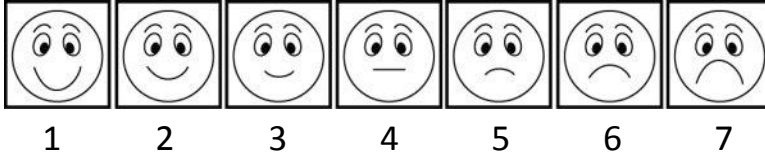

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

And how likely is it that you would do each of these things? (circle your answer)

4.b) I would close my eyes or look away so I couldn't see the needle coming towards me.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
4.c) I would want the dentist to tell me when I would feel pain.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
4.d) I would try to push any thoughts about the needle or injection out of my head.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
4.e) I would try to think about nice stuff that's happened lately.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
4.f) I would want the dentist to tell me exactly what he or she was doing step-by-step.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**
4.g) I would ask the dentist questions about the injection.	**Definitely Not**	**Probably Not**	**Probably**	**Definitely**

4.h) Is there anything **else** you might do in this situation to make yourself feel better? (write your answer)

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Now, just a few questions about you:

7. How often do you <u>brush your teeth</u>?

☐ Less than once a day ☐ Once a day ☐ More than once a day

8. How often do you <u>use dental floss</u>?

☐ At least once a day ☐ At least once a week ☐ Rarely or never

9. How <u>old</u> are you? _____

10. What is your gender? ☐ Male ☐ Female

11. What ethnicity are you? (tick as many as apply to you)

☐ NZ European/Pākehā ☐ Pasifika/Pacific Islander ☐ her European

☐ NZ Māori ☐ Asian ☐ dian

☐ Cook Island Māori

Other (please specify) _____

All done – thank you for your help =)

Table 27

CBSS-M item intercorrelations (standard deviations on main diagonal)

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	.94															
2	.12	.81														
3	.08	.05	.73													
4	.14	.31	.07	.79												
5	.14	.13	.12	.15	.79											
6	.10	.29	.12	.25	.09	.77										
7	.07	.17	.01	.15	.06	.10	.80									
8	.04	.24	.09	.32	-.07	.31	.23	.86								
9	.22	.22	.09	.29	.17	.30	.08	.25	.81							
10	.16	.16	.15	.29	.03	.38	.05	.42	.36	.84						
11	.09	.11	.15	.32	.07	.18	.12	.24	.30	.30	.93					
12	.10	.14	.03	.14	.20	.23	.22	.06	.34	.12	.17	.74				
13	.15	.19	.04	.18	.14	.04	.44	.10	.10	.04	.21	.25	.80			
14	.10	.29	.12	.16	.09	.12	.39	.21	.10	.09	.21	.10	.38	.90		
15	.16	.23	.24	.19	.02	.18	.15	.16	.17	.18	.20	.09	.15	.30	.84	
16	.28	.21	.14	.17	.08	.27	.30	.13	.07	.09	.22	.19	.33	.35	.25	.82

Note. N = 240.

Table 28

MBDS item intercorrelations (standard deviations on main diagonal)

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	.71																							
2	.26	.76																						
3	.09	.20	.85																					
4	-.06	-.15	.23	.75																				
5	.16	.09	.02	-.08	.83																			
6	.05	.19	.47	.29	.07	.85																		
7	-.07	-.03	.18	.15	.10	.28	.75																	
8	.34	.18	.00	-.04	.20	.04	.13	.84																
9	.21	.28	.06	-.16	.19	.03	-.10	.29	.79															
10	.11	.15	.16	-.09	.00	.18	.22	.27	.03	.84														
11	.09	.17	-.01	.02	.16	.02	.06	.23	.16	.18	.82													
12	.18	.18	.29	.14	.18	.36	.21	.11	.00	.12	.09	.88												
13	.16	.17	.17	.01	.11	.08	.15	.25	.12	.18	.21	.13	.92											
14	.09	.13	.17	.02	.10	.20	.48	.05	.04	.22	.12	.30	.13	.79										
15	.10	.12	.17	.00	.13	.13	.30	.12	.07	.29	.14	.26	.20	.25	.92									
16	-.05	-.06	.05	.08	.05	.04	.01	.07	-.04	.10	.12	.06	.35	-.07	-.02	1.03								
17	.24	.25	.17	-.01	.07	.24	.10	.16	.25	.14	.11	.20	.27	.14	.07	.26	.95							
18	.10	.14	.21	-.03	.13	.04	.05	.10	-.02	.07	-.04	.21	.06	.10	.11	-.04	.02	.81						
19	.04	.15	.22	.04	.11	.17	.19	.10	.14	.16	.20	.13	.13	.24	.29	-.09	.15	.15	.97					
20	.20	.14	.10	.09	-.05	.23	.13	.11	.15	.04	.20	.14	.10	.22	.08	.11	.41	-.04	.23	.02				
21	.01	.10	.23	.02	.06	.30	.18	.05	.04	.19	.13	.31	.11	.23	.24	-.02	.08	.10	.52	.16	.90			
22	.14	.25	.19	.01	.16	.28	.19	.18	.05	.22	.16	.51	.10	.29	.37	-.06	.13	.22	.29	.10	.46	.88		
23	.20	.08	.07	.13	.11	.20	.07	.17	.11	.13	.20	.19	.28	.05	.02	.24	.58	-.05	.10	.35	.13	.12	.98	
24	.27	.13	.11	.05	.17	.23	.03	.26	.15	.11	.18	.18	.31	.05	.04	.19	.47	.04	.05	.33	.07	.07	.49	.97

Note. N = 240.

COPING IN THE CHAIR: A VALIDATION STUDY OF THE MONITOR BLUNTER DENTAL SCALE (MBDS)

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Background: The monitor-blunter theory of coping in threatening situations (Miller, 1981, 1987) suggests that when faced with a threatening situations, individuals can respond either by attending to threatening information ("monitoring") or avoiding threatening information ("blunting"). A valid and reliable measure of children's preferred coping dental situations may assist dental staff in providing efficacious anxiety-reducing interventions to diverse groups of children. The current study sought to validate a scale of children's preference for monitoring or blunting in dental situations (the MBDS).

Method: The MBDS, an adapted version of the Smiley Faces Program dental anxiety scale (divergent validity criterion), and a short form of the Child Behavioural Style Scale or CBSS (convergent validity criterion) were administered to a group of 244 eleven to thirteen year old New Zealand children. The psychometric characteristics of the scale were assessed via both traditional internal consistency/correlatory analyses and confirmatory factor analysis.

Results: Internal consistency reliability was adequate for both the monitoring (alpha = 0.74) and blunting (alpha = 0.76) subscales. Convergent validity was evident by strong correlations between both the monitoring (r = 0.61, p <.001) and blunting (r = 0.66, p <.001) subscales and their CBSS counterparts. Divergent validity was strong for the monitoring subscale (correlation with dental anxiety 0.08, ns), but not the blunting subscale (correlation with dental anxiety 0.48, p <.001). Confirmatory factor analysis yielded adequate fit for the predicted two factor solution (RMSEA = 0.079).

Discussion/Conclusions: The MBDS may be a reliable and valid measure of children's coping preference in dental situations, although concerns over the divergent validity of the blunting subscale are discussed. We comment on difficulties in the measurement of the blunting construct, and make suggestions for future developments. Possible future utilities for the scale are discussed, with particular reference to the Dental Jungle program – a computer application being designed to assist in the assessment and management of children's dental anxiety.