

SIMILARITIES AND DIFFERENCES BETWEEN INTERPARTNER ABUSE
AND CRIMINAL OFFENDING: AN EXAMINATION OF LATENT
STRUCTURE AND PREDICTORS

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Abstract

The relationship between interpartner abuse (IPA) and criminal offending has received little scholarly attention, despite its important theoretical and practical implications. Two key questions about this relationship require attention. First, to what extent do IPA, violent offending, and property offending represent empirically distinct behavioural domains? Second, to what extent do these offence types share common predictors? The current study addressed these issues, and several additional issues, in a birth cohort of 950 New Zealand adults. Cohort members were questioned at ages 21, 25, and 30 years about the extent which they had engaged in IPA and criminal offending during the previous year. Information was also obtained from birth to late adolescence on a number of potential predictors of IPA and criminal offending, including socio-economic disadvantage, family dysfunction, childhood abuse, conduct disordered behaviours, deviant peer affiliations, substance abuse, academic ability, the obtainment of a high-school qualification, identification with an ethnic or racial minority, and gender. Confirmatory Factor Analysis results indicated that IPA, violent offending, and property offending represent three empirically distinct, albeit related, behavioural domains. Consistent with this finding were those obtained using Structural Equation Modelling techniques, which indicated that these offence types share many common childhood, adolescent, and demographic predictors. In addition, many predictors, but not all, were found to exert similar effects across these offence types. Analyses also indicated that shared predictors accounted for considerable proportions of the relationships between IPA, violent offending, and property offending. Finally, the vast majority of predictors were found to exert similar effects for males and females on each offence type. The current findings are discussed in relation to previous research and theory, and with respect to their implications for prevention-focused interventions for IPA and criminal offending.

1. Similarities and Differences between Interpartner Abuse and Criminal Offending: An Examination of Latent Structure and Predictors

1.1 Overview

Interpartner abuse (IPA) represents a significant public health issue in New Zealand. It takes many forms, including physical, psychological, and sexual abuse. Previous research indicates that more than 60% of New Zealand male and female adults are victimized by IPA each year (Fergusson, Horwood & Ridder, 2005a). When this behaviour is restricted to physical abuse only, approximately 34% of young male adults and 27% of young female adults in New Zealand are victimized by this abuse each year (Moffitt & Caspi, 1999). The latter prevalence rates are similar to those reported in other countries (Garcia-Moreno, Jansen, Ellsberg, Heise & Watts, 2006). The annual prevalence of psychological IPA in New Zealand appears somewhat higher than that of physical IPA. In one study, the annual prevalence of minor psychological IPA victimisation was approximately 66% for both male and female adults, whereas the annual prevalence of severe psychological IPA victimisation was approximately 15% for male adults and 9% for female adults (Fergusson et al., 2005a). The high prevalence of psychological IPA is particularly concerning given that it may affect victims' quality of life as much as physical IPA (Stets, 1990). Finally, sexual IPA appears to be experienced by only a small proportion of New Zealand adults. Research indicates that approximately 2% of women in Auckland and Waikato experience this abuse each year (Fanslow & Robinson, 2004). Similarly, 0.5% of both male and female adults reported that their partner physically forced sex on them during the previous year (Fergusson et al., 2005a). Overall, these findings indicate that a considerable proportion of New Zealand

adults experience some form of IPA each year. As a result, concerted efforts must be made to reduce this social problem.

The moderately high prevalence of IPA in New Zealand is particularly concerning given its adverse consequences, such as physical, sexual, emotional, and mental health problems (Campbell, 2002; New Zealand Family Violence Clearinghouse, 2007). In addition, IPA results in approximately 14 homicides each year in New Zealand (Goodyear-Smith, 2004). These findings indicate that victims of IPA experience a range of adverse consequences. However, witnesses of IPA may also be adversely affected. Specifically, children exposed to IPA display more aggressive behaviours, more emotional problems, less social competence, and have poorer academic functioning than non-exposed children (Fantuzzo & Mohr, 1999). Interpartner abuse exposure is also found to perpetuate a cycle of abuse in both male and female children, whereby exposed children are more likely than non-exposed children to be abusive towards their partners and children in adulthood (Heyman & Slep, 2002). These findings are particularly concerning in light of evidence suggesting that young parents are more likely than young non-parents to be victimised by IPA (Moffitt & Caspi, 1999). Together these findings highlight the negative effects of IPA, and emphasize the importance of reducing this behaviour.

The previous discussions highlight the seriousness of IPA in New Zealand, and stress the importance of reducing this behaviour. To do so, the theoretical models of IPA that guide the development and delivery of interventions that target this behaviour must be improved. Many issues relevant to these models require further scholarly attention. However, one particularly relevant issue that has received little attention is the extent to which criminal offending and IPA represent empirically distinct behavioural domains. This issue is

important to address, given that general theories of criminal offending may explain IPA with parsimony if criminal offending and IPA are empirically indistinct. By using general theories of criminal offending to explain IPA, financial resources may be used more efficiently, as IPA may no longer require specialist research efforts and funding (Moffitt, Krueger, Caspi & Fagan, 2000).

A second key issue relevant to theoretical models of IPA, and therefore relevant to the prevention and treatment of this behaviour, is the extent to which IPA and criminal offending share common predictors. Findings indicating that these offence types share common predictors would have two key implications. First, given that some predictors will exert causal effects, such findings suggest that these offence types share similar causes. As a result, these offence types may be effectively reduced using similar interventions. Therefore, specifically tailored interventions for perpetrators of IPA may be unnecessary and uneconomical (Moffitt et al., 2000). Second, such findings would have important implications for the Feminist Theory of IPA. This theory is currently the predominant theory of IPA in New Zealand. It maintains that all IPA is either socially sanctioned male-perpetrated abuse used to maintain the power advantage that males have over females in a patriarchal society, or, female-perpetrated abuse used for self-defence (Dutton & Nicholls, 2005). Given that few theories, if any, suggest that male dominance and female self-defence underlie criminal offending, the Feminist Theory of IPA therefore assumes that the underlying causes of IPA and criminal offending differ. However, findings indicating that these offence types share common predictors would indicate that these offence types share similar causes. Such findings would be inconsistent with the Feminist Theory of IPA.

A number of demographic, family background, personality, affective, behavioural, and social variables have been identified as predictors of both IPA and criminal offending (Andrews & Bonta, 2006; Danielson, Moffitt, Caspi & Silva, 1998; Heyman & Slep, 2002; Hilton, Harris, Rice, Lang, Cormier & Lines, 2004; Makepeace, 1987; Moffitt & Caspi, 1999; Seltzer & Kalmuss, 1988; Straus, 1990; White & Widom, 2003). However, few studies have directly compared the predictors of IPA to those of criminal offending. Thus, this issue requires examination. In particular, research needs to investigate the extent to which IPA and criminal offending share similar childhood, adolescent, and demographic predictors, as these predictors may be targeted early in life to help prevent adult IPA and criminal offending.

Between-study comparisons suggest that many childhood, adolescent, and demographic predictors are similarly related to criminal offending and IPA (Andrews & Bonta, 2006; Magdol, Moffitt, Caspi & Silva, 1998). However, gender appears differentially related to these offence types (Fergusson et al., 2005a; Moffitt, Caspi, Rutter & Silva, 2001). Given the theoretical and practical implications of this finding, and the highly controversial nature of the relationship between gender and IPA, particular attention should be paid to gender in studies comparing the predictors of criminal offending and IPA. Such studies should control for other predictors in order to examine 'pure' gender effects, rather than gender differences in the causes of criminal offending and IPA. To date, few such studies have been conducted using New Zealand samples.

Overall, the extent to which criminal offending and IPA represent empirically distinct behavioural domains, and the extent to which these offence types share common predictors represent two key issues in need of further research. The current study aims to address these

issues using data obtained from a cohort of young New Zealand adults as part of the Christchurch Health and Development Study. These issues will be examined using Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM), respectively. A number of additional issues relating to these offence types will also be examined. Specific attention will be paid to gender throughout this study. The findings of this study will have a range of theoretical and practical implications, which may be useful in helping to reduce IPA in New Zealand.

1.2 Criminal Offending and Interpartner Abuse

All offence types, whether they are violent, sex, property, drug, or traffic offences, violate social sanctions and threaten individuals' rights and safety (Moffitt et al., 2000). However, offence types differ in a number of important ways. For example, motivational factors, such as compliance, provocation, financial gain, and excitement, are differentially related to different offence types (Gudjonsson & Sigurdsson, 2004). The presence of such differences raises the question of whether different offence types represent empirically distinct behavioural domains. A number of studies have addressed this issue with respect to violent, property, and sex offending (Brennan, Mednick & John, 1989; Lussier, LeBlanc & Proulx, 2005; Schwaner, 1998; Soothill, Francis, Sanderson & Ackerley, 2000). However, few studies have addressed this issue with respect to IPA. As noted earlier, the extent to which criminal offending and IPA represent empirically distinct behavioural domains is important to address for several reasons relating to the theoretical conceptualisation of IPA, research, and funding.

To date, this issue has been rigorously addressed by only one study (Piquero, Brame, Fagan & Moffitt, 2005). This study used Confirmatory Factor Analysis (CFA) to examine data obtained from a birth cohort of over 800 young New Zealand adults (Moffitt et al., 2000). Analyses revealed that general crime and IPA represent empirically distinct, albeit moderately related, behavioural domains. This was revealed by comparing the fit of two measurement models. The Two-Factor Model proposed that there are empirically distinct, yet related, propensities towards general crime and IPA. Observed measures of vice, fraud, theft, and physical force were assumed to be indicators of the propensity towards general crime. In contrast, observed measures of humiliation, isolation, intimidation, and physical abuse were assumed to be indicators of the propensity towards IPA. The One-Factor Model proposed that a single propensity towards antisocial behaviour underlies both general crime and IPA. This model assumed that all the previously described observed measures were indicators of this propensity.

Comparisons revealed that the Two-Factor Model was highly consistent with the observed data ($\chi^2(19, N = 849) = 48.69, p = .00$; GFI = .99; and RMSEA = .04), whereas the One-Factor Model was not ($\chi^2(20, N = 849) = 290.39, p = .00$; GFI = .96; and RMSEA = .13). This finding was valid for both males and females. A nested model comparison revealed that the Two-Factor Model fitted the data significantly better than the One-Factor Model ($\chi^2(1) = 241.70, p < .001$). Overall, this study provides evidence that general crime and IPA represent empirically distinct, albeit moderately related, behavioural domains. Further studies are needed to replicate this finding.

The Two-Factor Model proposed by Moffitt et al. (2000) assumes that violent and property offending are empirically indistinct behavioural domains. The model was specified this way

for two reasons. First, a scale comprised of all violent and property offending items had high internal consistency ($\alpha = .85$). Second, there was a moderate correlation between violent and property offending scales ($r = .50$). However, given the moderate size of this correlation, and evidence suggesting that a notable proportion, albeit a minority, of offenders may engage exclusively in violent offending (Piquero et al., 2005), it is possible that violent offending and property offending represent empirically distinct behavioural domains. Therefore, a three-factor model may have been more consistent with the observed data than the Two-Factor Model. This three-factor model would assume that IPA, violent offending, and property offending represent three empirically distinct, yet related, behavioural domains. Future studies that use CFA to address the extent to which IPA and criminal offending represent empirically distinct behavioural domains may wish to include this three-factor model in their model comparisons.

While Moffitt et al. (2000) rigorously addressed the extent to which IPA and criminal offending are empirically distinct, they did not specifically address the extent to which IPA and violent offending are empirically distinct. This issue is important to address given the inherent similarities between physical IPA and violent offending. Furthermore, results from several studies suggest that there is considerable overlap between physical IPA and violent offending. For example, findings from the Dunedin Multidisciplinary Health and Development Study revealed that of the 38 males with convictions for violent offending at age 21 years, 51% had also perpetrated physical IPA in the past year. In contrast, of the 442 young adult males with no convictions for violent offending at age 21 years, only 20% had perpetrated physical IPA in the past year (Moffitt & Caspi, 1999). This finding indicates an increased probability of perpetrating physical IPA given a previous conviction for violent offending. Male youths in intimate relationships are also more likely to perpetrate both

physical IPA and street violence (17%) than physical IPA only (14%), or street violence only (12%; Gorman-Smith, Tolan, Sheidow & Henry, 2001). Overall, these findings indicate a notable relationship between physical IPA and violent offending. Such findings highlight the importance of specifically examining the extent to which IPA and violent offending represent empirically distinct behavioural domains.

The previous issue may be addressed within the context of CFA by fitting a model that assumes that observed measures of IPA and violent offending are indicators of a propensity towards abusive behaviour, whereas observed measures of property offending are indicators of a propensity towards property offending. The fit of this model may then be compared to the fit of the aforementioned three-factor model.

1.3 Conceptual Development of Measurement Models

The previous section outlines evidence consistent with a number of hypotheses about the extent to which IPA and criminal offending represent empirically distinct behavioural domains. These hypotheses include:

1. Interpartner abuse, violent offending, and property offending each represent empirically distinct, albeit related, behavioural domains (Hypothesis 1).
2. Interpartner abuse is empirically distinct from, yet related to, both violent offending, and property offending. However, violent offending and property offending are empirically indistinct (Hypothesis 2).
3. Interpartner abuse and violent offending are empirically indistinct. However, property offending is empirically distinct from, yet related to, these offence types (Hypothesis 3).

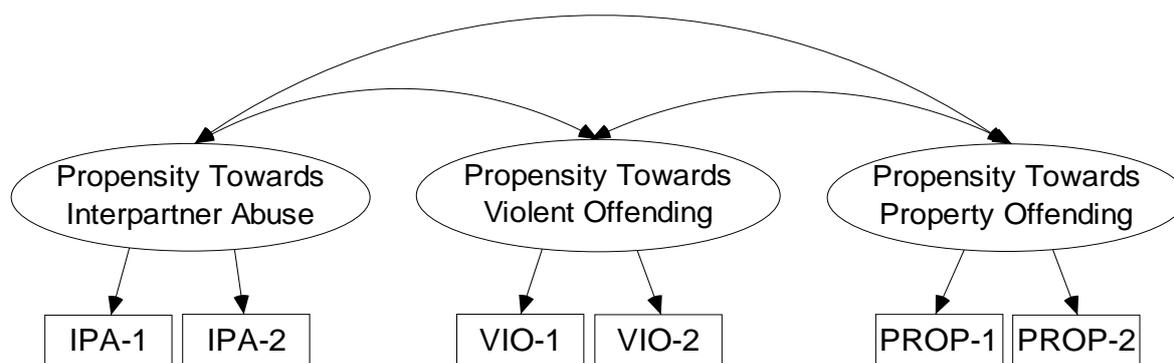
4. Interpartner abuse, violent offending, and property offending are empirically indistinct (Hypothesis 4).

Confirmatory Factor Analysis represents an effective, yet under-utilised, method of testing these hypotheses. Specifically, by using CFA to compare the adequacy of measurement models that embody the assumptions of the previous hypotheses, researchers can identify which hypothesis is most consistent with the observed data.

Models 1 – 4 embody the assumptions of Hypotheses 1 – 4, respectively (see Figures 1 – 4). For demonstrative purposes, each model contains two observed measures of IPA (IPA-1 and IPA-2), violent offending (VIO-1 and VIO-2), and property offending (PROP-1 and PROP-2). However, in practice, more observed measures may be used for each offence type. Any of a number of scales may be used to form these observed measures.

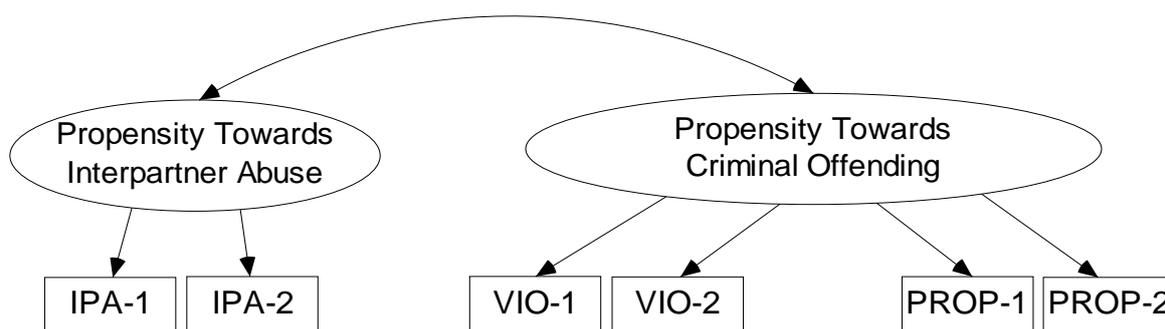
Model 1 is consistent with Hypothesis 1, and assumes that the observed measure pairs IPA-1 and IPA-2, VIO-1 and VIO-2, and PROP-1 and PROP-2 are indicators of empirically distinct latent propensities towards IPA, violent offending, and property offending, respectively (see Figure 1). This model also assumes that the three latent propensities are mutually correlated.

Figure 1. *Model 1.*



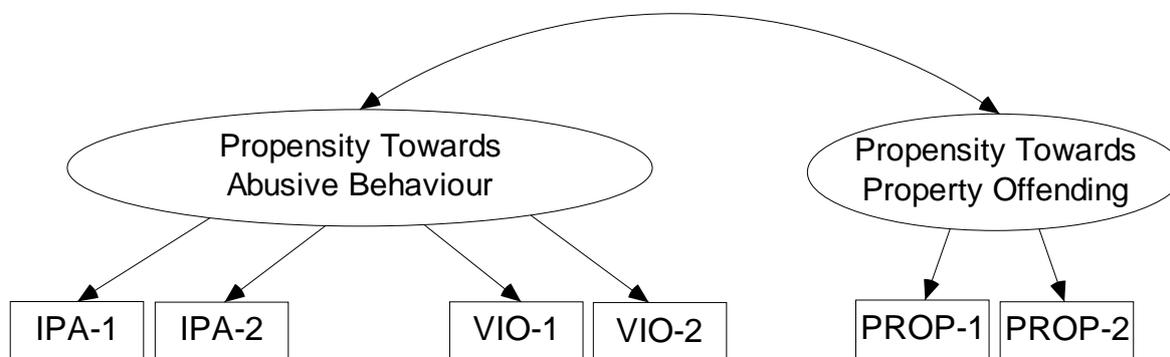
Consistent with Hypothesis 2, Model 2 assumes that IPA-1 and IPA-2 are indicators of a latent propensity towards IPA, whereas VIO-1, VIO-2, PROP-1, and PROP-2 are indicators of a latent propensity towards criminal offending (see Figure 2). Like Model 1, Model 2 also assumes that the latent propensities are correlated.

Figure 2. *Model 2.*



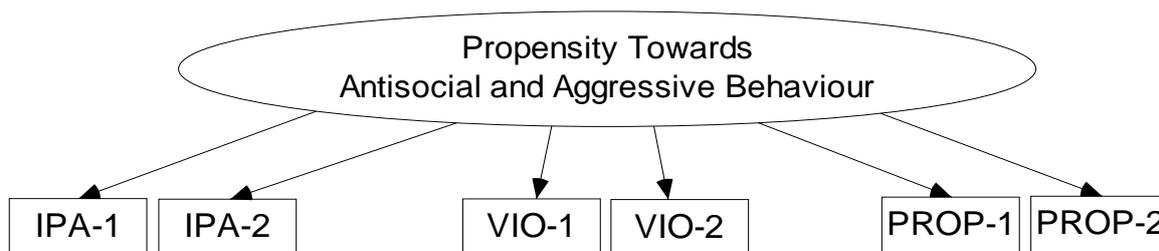
Model 3 is consistent with Hypothesis 3, and assumes that IPA-1, IPA-2, VIO-1, and VIO-2 are indicators of a latent propensity towards abusive behaviour, whereas PROP-1 and PROP-2 are indicators of a latent propensity towards property offending (see Figure 3). Once again, the latent propensities are correlated.

Figure 3. *Model 3.*



Finally, consistent with Hypothesis 4, Model 4 assumes that all observed measures are indicators of a single underlying latent propensity towards antisocial and aggressive behaviour (see Figure 4).

Figure 4. *Model 4.*



Subject to a number of additional assumptions, each of these models may be specified in terms of a series of linear equations. Chapter 4 provides a full description of the assumptions and linear equations for Models 1 – 4.

This thesis examines the extent to which IPA and criminal offending represent empirically distinct behavioural domains using CFA. Specifically, CFA will be used to compare the adequacy of Models 1 – 4 to identify the model, and therefore the hypothesis, that is most consistent with the observed data. Chapter 3 provides an in-depth description of CFA, and discusses a number of key issues that were considered during the development, estimation, and comparing of Models 1 – 4.

1.4 *Predictors of Criminal Offending and Interpartner Abuse*

The previous section highlighted the importance of examining the extent to which IPA and criminal offending represent empirically distinct behavioural domains. A second issue

important to the theoretical conceptualisation of IPA is the extent to which it shares common predictors with criminal offending. As noted earlier, findings indicating that these offence types share many predictors would suggest that they may be effectively reduced using similar interventions. Therefore, it may be unnecessary and uneconomical to tailor interventions specifically for IPA (Moffitt et al., 2000). In addition, such findings would be inconsistent with the Feminist Theory of IPA. Therefore, such findings would suggest that this theory requires alteration, or a new theory needs to be adopted as the predominant theory of IPA.

To date, few studies have directly compared the predictors of criminal offending to those of IPA. One such study examined the strength with which several personality traits predicted general crime and IPA. Multivariate regression analyses revealed that high negative emotionality, defined as a strong tendency to worry, become stressed, feel nervous, and feel vulnerable, predicted both general crime and IPA. However, low constraint, defined as a weak tendency to be reflective, cautious, careful, rational, and well-planned, predicted general crime, but not IPA (Moffitt et al., 2000). Such findings indicate that criminal offending and IPA have both shared and unique personality-related predictors.

These findings are broadly consistent with those made from between-study comparisons of the childhood, adolescent, and demographic predictors of criminal offending and IPA. Such comparisons indicate that criminal offending and IPA share a number of these predictors, including socio-economic disadvantage, family dysfunction, physical and sexual childhood abuse, conduct disordered behaviours, deviant peer affiliations, substance abuse, poor academic ability, and the lack of formal educational qualifications (Babinski, Hartsough & Lambert, 1999; Capaldi, Dishion, Stoolmiller & Yoerger, 2001; Ehrensaft, Cohen, Brown, Smailes, Chen & Johnson, 2003; Farrington, 1989; Farrington, 1990; Fergusson & Horwood,

2002; Fergusson et al., 2005a; Fergusson, Swain-Campbell & Horwood, 2004; Herrenkohl, Mason, Kosterman, Lengua, Hawkins & Abbott, 2004; Magdol et al., 1998; Malinosky-Rummell & Hansen, 1993; Pollock, Briere, Schneider, Knop, Mednick & Goodwin, 1990; Rosenbaum, 1989; Widom & Ames, 1994). Similarly, belonging to an ethnic or racial minority also predicts both criminal offending and IPA (Colburn & Pozzetta, 1974; Marie, Fergusson & Boden, 2008; Ministry of Justice, 2009; Sorenson, Upchurch & Shen, 1996; U.S. Department of Justice, 1997).

In contrast to the previous predictors, recent evidence suggests that gender may predict criminal offending, but not IPA (Farrington & Painter, 2004; Fergusson et al., 2005a; Moffitt et al., 2001). Specifically, males may engage in more criminal offending than females, but may engage in similar amounts of IPA as females. Alternatively, gender may predict both criminal offending and IPA, but have opposite effects, whereby males are the primary perpetrators of criminal offending, but females are the primary perpetrators of IPA (Bookwala, 2002; Foshee, 1996; Moffitt et al., 2001). The highly controversial nature of the relationship between gender and IPA creates confusion around this issue.

Overall, these findings indicate that criminal offending and IPA may have both shared and unique predictors. However, direct comparisons of the predictors of these offence types are needed. The current study addresses this issue by examining the relationships between these offence types and a range of childhood, adolescent, and demographic predictors. These predictors are of particular importance given that policy makers and health care professionals may target them early in life to help prevent these offence types from occurring. This study does not address the time-dynamic predictors of criminal offending and IPA, despite their theoretical and practical importance, due to the nature of the data and analytical methods

used. The predictors addressed in this study will now be discussed in detail. Note that particular attention will be paid to gender, given the controversy surrounding the relationship between gender and IPA.

Socio-economic disadvantage (SED). Families with high levels of SED typically include, but are not limited to, those with low levels of maternal and paternal education, low socio-economic status, low family living standards, and low family income. Individuals from high SED families are at greater risk for adult crime than those from low SED families (Fergusson et al., 2004). In addition, violence is significantly more common amongst adults who have experienced poor housing conditions at age 14 years compared with those who have not (Farrington, 1989). Further support for these findings comes from evidence that low family income, large family size, and poor housing conditions between ages 8 – 11 years each predict increased criminal convictions at age 32 years (Farrington, 1990). Similarly, IPA perpetration is more common in individuals from lower-class families than in those from upper-class families (Magdol et al., 1998). Together these findings indicate that high levels of early SED predict both criminal offending and IPA in adulthood.

Family dysfunction. Dysfunctional families include, but are not limited to, those characterised by several changes of parents, high levels of inter-parental violence, poor child-parent attachment, parental illicit drug use, parental criminality, and parental alcoholism/alcohol problems. Previous research indicates that poor relationships with parents at age 18 years are associated with increased violence at age 32 years (Farrington, 1989). In addition, parental convictions by age 10 years, poor child-rearing at age 8 years, parental disagreement at age 8 years, and parental disharmony at age 14 years are all significantly associated with convictions for violence between ages 10 – 32 years (Farrington, 1989). Furthermore, a

longitudinal study of criminal offending trajectories indicated that significantly more chronic offenders than low-risk offenders experienced two or more changes of parents between ages 0 – 10 years, were from families with high levels of parental conflict, and were from families with a history of parental illicit drug use, criminality, and/or alcohol problems (Fergusson & Horwood, 2002). Collectively, these findings highlight a relationship between criminal offending and family dysfunction. Other findings indicate that IPA is associated with family conflict during childhood and adolescence, and poor child-parent attachment during adolescence (Magdol et al., 1998). Overall, these findings suggest that both criminal offending and IPA during adulthood are predicted by early family dysfunction.

Childhood abuse. Childhood abuse includes both physical and sexual abuse. Higher rates of childhood physical abuse are found in violent inmates and outpatients than in less violent comparison groups (Malinosky-Rummell & Hansen, 1993). In addition, both childhood physical abuse victims and childhood sexual abuse victims commit more sex crimes during adulthood than non-abused individuals (Widom & Ames, 1994). Furthermore, physically abused boys commit more violent sex crimes, such as rape or sodomy, during adulthood than boys who are not physically abused (Widom & Ames, 1994). These findings indicate several links between childhood abuse and adult criminal offending. Both childhood physical abuse and childhood sexual abuse are also significant predictors of IPA during adulthood (Ehrensaft et al., 2003; Herrenkohl et al., 2004). In addition, a strong association has been observed between childhood physical abuse and IPA-related injuries inflicted on a partner (Ehrensaft et al., 2003). The latter finding suggests that childhood physical abuse may not only predict IPA in general, but may also predict severe IPA. Collectively these findings indicate that childhood abuse predicts both criminal offending and IPA in adulthood.

Conduct disordered behaviour. Conduct disordered behaviours include a wide range of antisocial and disruptive behaviours, including, but not limited to, disobedience and defiance of authority, fits of temper and irritability, aggression or cruelty towards others, destruction of property, lying, stealing, and other similar behaviours. Significant associations have been noted between adult violence and several indices of childhood conduct disordered behaviours, including disciplinary problems between ages 8 – 10 years, dishonesty at age 10 years, truancy between ages 12 – 14 years, aggressiveness between ages 12 – 14 years, and self-reported delinquency at age 14 years (Farrington, 1989). These findings are broadly consistent with those indicating that early conduct problems predict both official arrests and self-reported crime for adult males, but not for adult females (Babinski et al., 1999). Similar findings have been noted in relation to IPA, whereby indices of early conduct disordered behaviours, including conduct problems during childhood and adolescence, aggressive delinquency during adolescence, and juvenile police contact, are predictive of IPA during adulthood (Magdol et al., 1998). Overall, these findings indicate that early conduct disordered behaviour represents yet another variable that predicts both criminal offending and IPA during adulthood.

Deviant peer affiliations. A child or adolescent's deviant peer affiliation typically refers to the extent to which their friends truant, break the law, and use tobacco, alcohol, and/or cannabis. Research indicates that adult violence is significantly more common in individuals who had deviant peer affiliations in adolescence compared to those who had no such affiliations during adolescence (Farrington, 1989). Likewise, a study of two male cohorts revealed that males who perpetrate IPA in young adulthood have frequently affiliated with deviant peers during adolescence (Capaldi et al., 2001). Together these findings suggest that adolescent deviant peer affiliation is associated with both adult criminal offending and IPA.

Substance abuse. Substance abuse typically refers to the abuse of tobacco, alcohol, and/or illicit drugs. Research has identified a number of substances whose abuse during childhood and/or adolescence is related to adult violence. Specifically, Farrington (1989) revealed that heavy smoking, using marijuana, and being a habitual drug user at age 18 years were associated with increased rates of violence at age 32 years. Similarly, substance abuse at age 15 years is significantly related to both male-perpetrated and female-perpetrated IPA at age 21 years (Magdol et al., 1998). These findings indicate that early substance abuse is related to increased rates of both adult criminal offending and IPA.

Academic ability. A child or adolescent's academic ability may be measured in a number of ways, such as measuring their reading, writing, spelling, and mathematic ability. Like the previously described variables, early academic ability also appears to predict both adult criminal offending and IPA. Research indicates that low non-verbal intelligence, low verbal intelligence, low junior school attainment, and low secondary school allocation between ages 8 – 11 years each predict criminal convictions at age 32 years (Farrington, 1990). Similar findings have been noted in relation to IPA, whereby IQ and reading achievement between ages 7 – 9 years, and reading achievement at age 15 years each predict IPA perpetration at age 21 years (Magdol et al., 1998). Therefore, childhood and adolescent academic ability appears to predict both adult criminal offending and IPA.

High-school qualification. The lack of a high-school qualification has also been identified as a significant predictor of both adult criminal offending and IPA. Farrington (1989) found that violence was significantly more common amongst adults who had left school by age 15 years than amongst adults who had not left school by this age. Likewise, Fergusson et al. (2005a) revealed that young adults who reported higher levels of IPA victimisation were

significantly more likely than young adults who reported lower levels of IPA victimisation to have a partner who lacked formal educational qualifications. Consistent with this finding are those reported by Sorenson et al. (1996), who found that individuals without a high-school education were more likely to perpetrate physical IPA than individuals with high-school educations. These findings indicate that the lack of a high-school qualification may predispose individuals towards both criminal offending and IPA.

Ethnic or racial minority identification. Identification with an ethnic or racial minority represents yet another variable linked with both adult criminal offending and IPA. National statistics indicate that Māori, an ethnic minority in New Zealand, represent 13% of the general population, yet account for approximately 51% of the prison population. In 2006, Māori accounted for 43% of police apprehensions, were approximately three times more likely than N.Z. Europeans to be apprehended for robbery offences, and were more likely than N.Z. Europeans to be apprehended for homicide, kidnapping and abduction, and grievous and serious assaults (Ministry of Justice, 2009). These findings are consistent with those indicating that other ethnic and racial minorities engage in disproportionately large amounts of antisocial and aggressive behaviour (Colburn & Pozzetta, 1974; U.S. Department of Justice, 1997). Similar findings have been noted in relation to IPA, whereby participants who identified themselves as Māori perpetrated more IPA, and caused more IPA-related injuries than participants who did not identify themselves as Māori (Marie et al., 2008). In addition, African Americans appear more likely than white Americans to be physically violent towards their spouse (Sorenson et al., 1996). Therefore, like the previously described variables, identification with an ethnic or racial minority appears to predict greater levels of both criminal offending and IPA during adulthood.

Gender. Gender has also been strongly linked with both adult criminal offending and IPA. A series of studies conducted by Moffitt et al. (2001) using longitudinal data obtained from a New Zealand birth cohort revealed that males consistently engage in more criminal offending than females. For example, more males than females, at every age, are beginning to engage in theft and violence. In addition, the most active male offenders offend at a much greater rate than the most active female offenders. Furthermore, males engage in more serious antisocial behaviours than females, and are more than twice as likely as females to be diagnosed with an antisocial disorder. These findings are broadly consistent with the general body of research on this issue, which consistently indicates that males engage in significantly more criminal offending than females (Farrington & Painter, 2004; Mears, Ploeger & Warr, 1998; Steffensmeier & Allan, 1996).

In contrast to the relationship between gender and criminal offending, the relationship between gender and IPA remains highly controversial. A number of studies addressing this issue have found that males perpetrate significantly more IPA than females (Arias & Corso, 2005; U.S. Department of Justice, 1995). For example, a study conducted on 16,000 U.S. adults found that females experienced significantly more partner-perpetrated rape, physical assault, and stalking than did males. Females also experienced longer lasting and more frequent victimisation, had greater fears of bodily injury, and sustained more physical injuries than did males. Finally, females utilised medical, mental health, and justice system services more frequently than did males (Tjaden & Thoennes, 2000). These findings are consistent with those revealing that 78.4% of individuals murdered by their partners in New Zealand between 1988 and 1995 were females (Goodyear-Smith, 2004). Such findings are also consistent with the Feminist Theory of IPA.

While the previous findings indicate that males perpetrate more IPA than females, other findings indicate that females perpetrate more IPA than males (Bookwala, 2002; Carrado, George, Loxam, Jones & Templar, 1996; Fehringer & Hindin, 2009; Foshee, 1996; Gray & Foshee, 1997). For example, a study conducted on a large cohort of young New Zealand adults found that physical IPA was perpetrated by 37.2% of females, but by only 21.8% of males (Magdol, Moffitt, Caspi, Newman, Fagan & Silva, 1997). Consistent with this finding are those indicating that females are the primary perpetrators of abuse in 70% of non-reciprocally violent relationships, which account for 50% of all abusive relationships (Whitaker, Haileyesus, Swahn & Saltzman, 2007). These findings stand in stark contrast to those previously discussed, and the Feminist Theory of IPA. As a result, gender differences in IPA represent a highly contentious issue.

The previous findings revealed gender differences in indices of IPA. However, evidence is accumulating to suggest that there are strong gender similarities in these indices (Dutton, 2007; Ehrensaft et al., 2003; Halpern, Oslak, Young, Martin & Kupper, 2001). For example, Fergusson et al. (2005a) found that males and females reported similar experiences of IPA perpetration and victimisation. Similarly, a study of students from seven multiethnic high schools revealed that psychological IPA was experienced by 88% of females and 85% of males. In addition, physical IPA was experienced by 30% of females and 31% of males (O'Leary, Slep, Avery-Leaf & Cascardi, 2008). These findings would be consistent with the Feminist Theory of IPA if all male-perpetrated IPA is motivated by a will to dominate females, and all female-perpetrated IPA is used in self-defence. However, gender similarities in IPA are not explained by the hypothesis that women perpetrate IPA purely in self-defence (Moffitt et al., 2001). Therefore, gender similarities in IPA are also inconsistent with the Feminist Theory of IPA.

Overall, evidence suggests that more males than females engage in criminal offending. However, evidence is accumulating to suggest that females may perpetrate similar amounts of IPA, or more IPA, than males. These findings indicate that gender, unlike the previously described childhood, adolescent, and demographic predictors, may either predict criminal offending, but not IPA, or, may predict both criminal offending and IPA, but have opposite effects. However, it is important to note that the relationship between gender and IPA remains unclear, and is in need of further research.

1.5 Predictor Effect Size Comparisons across Offence Types

The previously discussed findings indicate that criminal offending and IPA may share many common predictors, and therefore may be reduced using similar interventions. However, the extent to which shared predictors exert similar effects across criminal offending and IPA has important implications for interventions used to address both of these offence types. For example, if childhood substance abuse and deviant peers are significant predictors of criminal offending and IPA, but significantly stronger predictors of the former, early intervention programs that target these predictors would likely result in a greater reduction in criminal offending than in IPA. Such information would be important to know in order to understand why interventions have varying effects across different client groups.

Effect size similarity cannot be determined by simply comparing regression coefficient significance levels, as a predictor may exert significantly different effects across criminal offending and IPA despite being a significant predictor of both offence types. Conversely, a predictor may exert similar effects across criminal offending and IPA despite being a significant predictor of only one of these offence types. Therefore, statistical tests must be

used to empirically compare predictors' effects across criminal offending and IPA. To date, few studies, if any, have conducted such tests.

1.6 Gender-Predictor Interactions

The observation that males and females differ in rates of violent and property offending, and may differ in rates of IPA, leads to the question of whether various predictors exert disproportionately stronger effects on these outcomes in one sex compared to the other. One way to address this issue is to examine gender-predictor interactions. Such an interaction would exist if, for example, substance abusing males were disproportionately more likely than substance abusing females to perpetrate IPA. To date, gender-predictor interactions have received little scholarly attention, despite their important theoretical and practical implications. Evidence that many predictors differ significantly in their effects across gender may help clarify gender differences in offence rates. For example, females may perpetrate more IPA than males because many risk factors for IPA may exert significantly stronger effects on females than males. Findings indicating a considerable number of gender-predictor interactions would also indicate that gender-specific theories and interventions may be necessary. For example, if socio-economic disadvantage, family dysfunction, and childhood abuse exert stronger effects on IPA for males than females, while conduct disordered behaviours, deviant peer affiliations, and substance abuse exert stronger effects on IPA for females than males, gender-specific theories of IPA and interventions that focus on the variables relevant to each gender may be required.

One of the few studies on this issue revealed that physical childhood abuse predisposed females towards violent offending to a greater extent than males (Herrera & McCloskey,

2001). Another study found that family adversity, compromised intelligence, difficult temperament, and hyperactivity had stronger effects on male antisocial behaviour than on female antisocial behaviour. However, these gender-predictor interactions were relatively modest (Moffitt et al., 2001). Findings from a third study indicated that while the most important predictors of criminal offending had similar effects for males and females, socio-economic factors, such as low social class, low family income, poor housing, and large family size, were stronger predictors of female offending than male offending. Child-rearing factors, such as low praise by the parents, harsh or erratic discipline, poor parental supervision, parental conflict, low parental interest in education, and low paternal interest in the children, were also stronger predictors of female offending than male offending. In contrast, parental factors, such as parental nervousness and poor parental education, were stronger predictors of male offending than female offending (Farrington & Painter, 2004). Collectively, these findings indicate that many predictors of criminal offending, but not all, exert similar effects across gender.

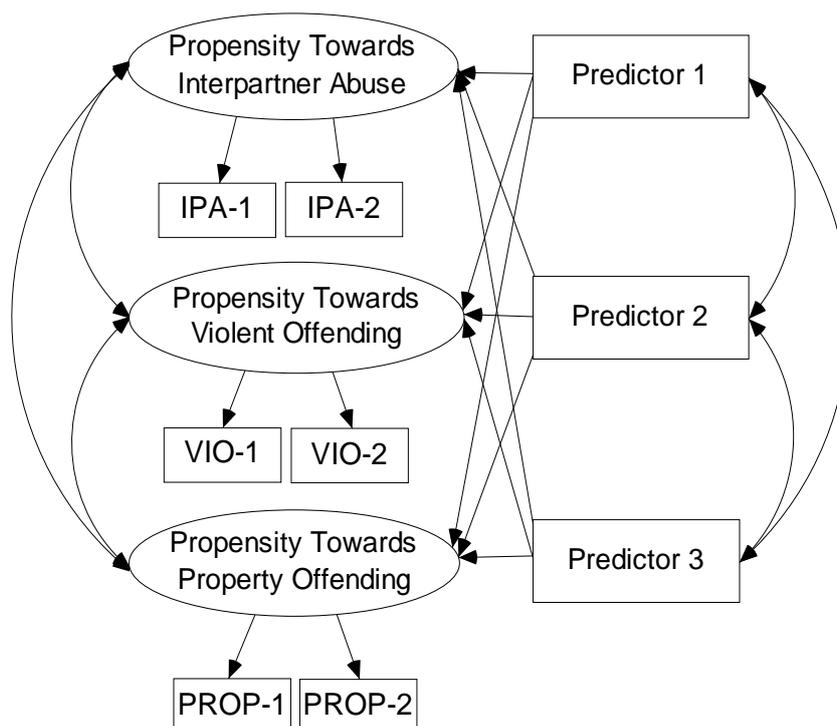
Similar findings have been noted for the predictors of IPA. For example, Katz, Carino, and Hilton (2002) found that partner demands and psychological abuse by partners predisposed males towards physical and sexual IPA perpetration to a greater extent than females. Therefore, some predictors of IPA may also exert different effects across gender.

Overall, gender-predictor interactions in relation to criminal offending and IPA represent an important, yet under-researched, issue that requires further attention. Direct comparisons of predictor effect sizes across gender are required to adequately examine this issue, given that, for example, it may be inaccurate to claim that childhood abuse exerts significantly different effects across gender simply because it predicts male IPA, but not female IPA.

1.7 Conceptual Development of the Predictor Model Template

As previously noted, further research is needed on several issues related to the childhood, adolescent, and demographic predictors of criminal offending and IPA. In particular, studies need to identify the extent to which criminal offending and IPA share common predictors. Comparisons of predictor effect sizes across criminal offending and IPA are also needed, as is an examination of gender-predictor interactions. The current study examined these issues using a range of structural equation models based on the Predictor Model Template (see Figure 5). For demonstrative purposes, this template model was based on Model 1, and contained three correlated observed predictors (Predictors 1 – 3). However, in practice, the template model, and therefore the structural equations models formed from it, would be based on the best-fitting measurement model. In addition, in practice, any number of predictors may be incorporated into this model.

Figure 5. *Predictor Model Template.*



The specific structural equation models formed from this template and used in the current study will be described in Chapter 5. In addition, their assumptions will be explicitly outlined.

1.8 *The Current Study*

Against this general background, the current study uses longitudinal data collected from birth to age 30 years as part of the Christchurch Health and Development Study to examine the relationships between IPA and criminal offending. In particular, this study aims to examine the extent to which IPA and criminal offending, including both violent and property offending, represent empirically distinct behavioural domains. This issue will be addressed by using Confirmatory Factor Analysis (CFA) to investigate the latent structure of observed measures of IPA, violent offending, and property offending. The findings from this analysis will help clarify whether or not IPA requires specialised explanatory theories, research, and funding. This study will also utilise Structural Equation Modelling (SEM) to identify the childhood, adolescent, and demographic predictors of these offence types. This analysis will help identify the extent to which predictors are shared and unique to criminal offending and IPA. By doing so, it will indicate whether or not interventions for criminal offending may also be effective for IPA, and vice versa. In addition, the results of this analysis will have important implications for the Feminist Theory of IPA. Predictor analyses will pay particular attention to gender, given the theoretical and practical importance of this predictor, and the controversy that surrounds the relationship between gender and IPA. Predictor effect sizes will also be compared across criminal offending and IPA using SEM techniques. Such comparisons will help identify why some interventions may benefit some people more than others. Finally, SEM will be used to investigate gender-predictor interactions in relation to

criminal offending and IPA. This analysis will identify whether gender differences in offence rates may be partially explained by gender differences in the magnitude of predictors' effects. In addition, this analysis will indicate whether gender-specific theories and interventions for these offence types may be necessary.

Overall, this study addresses several issues important to the theoretical conceptualisation of IPA. Given that theories of IPA are utilised heavily in the development of interventions for IPA, findings from this study may be useful in reducing this social problem.

2. Method

2.1 Data Source

The Christchurch Health and Development Study (CHDS) is a longitudinal study that has followed a birth cohort of 1,265 children (N male = 635; N female = 630) from birth to age 30 years. The CHDS sample consisted of almost all (97%) the children born in the Christchurch urban region between 15 April and 5 August 1977. The cohort members have been studied at birth, four months, one year, at annual intervals to age 16 years, and at ages 18, 21, 25, and 30 years. A range of data has been collected on their health, development, education, and adjustment. Ethics approval was obtained from the Canterbury (New Zealand) Regional Ethics Committee, and informed consent was provided by cohort members and/or their parents prior to each assessment (Fergusson & Horwood, 2001; Fergusson et al., 2005a). A detailed overview of this study is provided by Fergusson, Horwood, Shannon, and Lawton (1989).

2.2 Sample

The current study uses data obtained from the sample of CHDS cohort members who were interviewed at ages 21, 25, and 30 years ($N = 950$). This sample represents approximately 75% of the original cohort. Of this sample, 458 were male (48.2%) and 492 were female (51.8%). Māori ethnic identification was reported by 116 cohort members (12.2%), of whom 53 were male (45.7%) and 63 were female (54.3%).

Additional sample characteristics will now be described. These characteristics were described at age 30 years, as doing so provided the best indication of average level of education and income, given that many cohort members were studying and not working full-time prior to this age. At age 30 years, 17.7% of the sample had no high-school qualifications, 82.3% had at least one high-school qualification, 66.8% had some form of educational or vocational tertiary qualification, and 31.0% had a university degree. The majority (83.4%) were in paid employment. A minority (4.0%) were unemployed and were seeking work. The sample's net weekly income from all sources ranged from \$0 – \$10,776, had a median of \$650, and a mean of \$790. The majority (66.2%) of this sample were married or cohabiting with a partner at age 30 years. Finally, at age 30 years, 46.1% of the current sample were residing in Christchurch, 30.9% were residing elsewhere in New Zealand, and 23.0% were residing overseas, primarily in Australia and the U.K..

The gender and ethnic distributions of the sample were broadly consistent with those of the New Zealand general population in 2007, at which point cohort members were aged 30 years (Statistics New Zealand, 2008). However, it was difficult to determine the representativeness of the current sample at age 30 years on the remaining factors, given the paucity of appropriate comparative data.

2.3 Procedure

The CHDS has gathered data from many different sources, including: parental follow-up interviews (birth – 16 years); teacher questionnaires (6 – 13 years); child, young person, and adult follow-up interviews (8 – 30 years); hospital records (birth – 16 years); and police records (14 – 30 years; Fergusson & Horwood, 2001). This study used data obtained from a

number of these sources. The data of central importance to this study, which includes data on IPA perpetration, violent offending, and property offending, were obtained during the 21-year, 25-year, and 30-year follow-up interviews. These interviews were conducted by trained interviewers with the cohort members, and typically ranged in length from 1.5 – 2 hours. Face-to-face interviews were conducted with participants at a time and location of their choice. In the great majority of cases (>80%) the preferred location was the participant's place of residence. Telephone interviews were conducted with cohort members who were unable to complete face-to-face interviews, or were living abroad (21-year follow-up interview = <5%; 25-year follow-up interview = 23%; 30-year follow-up interview = 26%). Finally, data on the potential childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending were obtained at a number of ages, and from a number of data sources.

2.4 Outcome Measures

The following section describes the measures used in this study to operationalise IPA and criminal offending. Note that violent and property offending were measured separately so that Models 1 and 3 could be tested. Measures of IPA, violent offending, and property offending were matched in terms of measurement method (confidential self-reports by perpetrators) and reporting period (previous year). In addition, measures of each offence type assessed a variety of behaviours that ranged from mild to severe in nature (Moffitt et al., 2000).

Interpartner abuse perpetration. The Revised Conflict Tactics Scales (CTS-2) are a set of self-report scales used to assess several indices of IPA (Straus, Hamby, Boney-McCoy &

Sugarman, 1996). From this set of scales, this study uses the physical abuse and psychological abuse scales to operationalise IPA. Participants who were currently in a partnership of at least one month, or who had been in such a partnership during the previous year, completed these scales in terms of abuse perpetration and abuse victimisation. However, this study only uses data on abuse perpetration.

The physical and psychological IPA scales each contained subscales for minor and severe abuse. Thus, these two scales assessed four classes of abuse, which included minor psychological abuse (four items), severe psychological abuse (four items), minor physical abuse (five items), and severe physical abuse (seven items). In addition, two items assessed sexual coercion ('used threats to make your partner have sex' and 'physically forced sex on your partner'). These two items were included in the severe psychological abuse subscale and the severe physical abuse subscale, respectively. Appendix A provides a complete summary of the CTS-2 items used in this study. This appendix indicates the class of abuse that each item assessed, the ages at which each item was assessed, and the prevalence of each item at each age. Note that 11 physical IPA items were assessed at ages 21, 25, and 30 years. However, two physical IPA items, and all the psychological IPA items were only assessed at ages 25 and 30 years.

For each item, respondents indicated the number of incidents that had occurred during the previous year using frequency categories (0 = 0 times, 1 = 1 time, 2 = 2 times, 3 = 3 – 5 times, 4 = 6 – 10 times, 5 = 11 – 20 times, 6 = 21+ times, and 9 = No partner). Frequency categories were preferred to categories such as 'never', 'occasionally', and 'frequently' as the latter categories are susceptible to individual and situational differences in interpretation. In addition, the latter categories do not permit estimates of the frequency of abuse.

Previous studies have established that both the psychological abuse scale and the physical abuse scale have adequate construct and cross-cultural validity (Straus, 2004; Straus et al., 1996). In addition, both the psychological abuse scale and the physical abuse scale have been found to have strong internal consistency ($\alpha = .79$ and $.86$, respectively; Straus et al., 1996).

The CTS-2 was completed by 536 cohort members at age 21 years, 786 cohort members at age 25 years, and 846 cohort members at age 30 years. The average relationship lengths at ages 21, 25, and 30 years were 23 months, 36 months, and 51 months, respectively.

Scale scores for IPA perpetration were calculated in four steps. First, at each age, cohort members who were not currently in a partnership of at least one month, or who had not been in such a partnership during the previous year, had scores of 9 re-coded to scores of 0. This assumed that these cohort members did not perpetrate IPA during that reporting period.

Second, for each item, cohort members were scored as 1 if they reported perpetrating that type of abuse during any of the reporting periods. Cohort members were scored as 0 if they did not report perpetrating that type of abuse during any of the reporting periods. For example, given that the item ‘physically twisted your partner’s arm or hair’ was assessed at all three ages, a score of 1 on this item indicated that the cohort member reported perpetrating this type of abuse during at least one of the three reporting periods, whereas a score of 0 indicated that they did not report perpetrating this type of abuse during any of the three reporting periods. Once again, note that items were assessed at either two or three ages. Therefore, depending on the item, a score of 1 may indicate that the cohort member reported

perpetrating that type of abuse during at least one of two reporting periods, or during at least one of three reporting periods.

Third, the 22 CTS-2 dichotomous items were randomly assigned to form two 11-item parcels (Item Parcels 1 and 2; see Appendix A). Finally, the dichotomous items were summed within each parcel to produce diversity scores of IPA. These diversity scores could range from 0 – 11, whereby a score of 0 would indicate that none of the 11 abusive behaviours were perpetrated by the cohort member during any of the reporting periods, and a score of 11 would indicate that all 11 abusive behaviours were perpetrated by the cohort member during the reporting periods. Broadly speaking, these scores provided two quantitative measures of cohort members' propensities towards IPA perpetration. For the purposes of later analyses, note that IPA diversity scores formed from Item Parcels 1 and 2 represent the observed measures IPA-1 and IPA-2, respectively. Previous research indicates that CTS-2-based diversity scores are valid measures of IPA severity (Fergusson et al., 2005a).

Violent and property offending. The current study operationalised violent and property offending using the Self-Report Delinquency Inventory (SRDI; Elliott & Huizinga, 1989). This 44-item scale measured the self-reported frequency of a wide range of criminal offences over the previous year. A series of SRDI items were selected to form scales measuring violent offending (SRDI-V; 9 items) and property offending (SRDI-P; 14 items). Note that two questions from the SRDI-V explicitly measured violence towards people the cohort member lived with. These questions were excluded from the analyses, given that they may have measured violent offending or IPA.

The seven SRDI-V items used in this study assessed the frequency with which cohort members had carried a hidden weapon, attacked someone with a weapon or with intentions of seriously hurting or killing them, assaulted someone, committed robbery, engaged in gang violence, forced sex upon someone, and had been cruel to animals. Conversely, the 14 SRDI-P items assessed the frequency with which cohort members had engaged in, or had attempted to engage in, vandalism, arson, burglary, theft, shoplifting, joyriding, and the buying, selling, or holding of stolen goods.

The SRDI has been found to have adequate construct and cross-cultural validity, strong one month test-retest reliability ($r = .90$), and strong internal consistency ($\alpha = .88$; Moffitt, Silva, Lynam & Henry, 1994). Appendix B provides a complete summary of the SRDI items used in this study. This appendix indicates the scale to which each item belongs, and the prevalence of each item at each age. All SRDI items were assessed at ages 21, 25, and 30 years.

Scale scores for violent and property offending were created in the same way as scale scores for IPA perpetration. First, for each item, cohort members were scored as 1 if they reported engaging in that type of offending during any of the three reporting periods. Cohort members were scored as 0 if they did not report engaging in that type of offending during any of the three reporting periods. Second, the seven violent offending items were randomly assigned to one of two item parcels (Item Parcels 3 and 4; see Appendix B), as were the 14 property offending items (Item Parcels 5 and 6; see Appendix B). Third, the dichotomous items were summed within each parcel to produce diversity scores of violent and property offending. Violent offending diversity scores formed from Item Parcel 3 could range from 0 – 4, whereas those formed from Item Parcel 4 could range from 0 – 3. Property offending

diversity scores formed from Item Parcels 5 and 6 could all range from 0 – 7. Overall, these scores provided quantitative measures of cohort members' propensities towards violent and property offending. Once again, for the purposes of later analyses, note that violent offending diversity scores formed from Item Parcels 3 and 4 represent the observed measures VIO-1 and VIO-2, respectively. Similarly, property offending diversity scores formed from Item Parcels 5 and 6 represent the observed measures PROP-1 and PROP-2, respectively.

The extent to which diversity scores of violent and property offending were valid measures of violent and property offending severity was assessed by examining the bivariate correlations between these diversity scores and several count measures. Diversity scores of violent offending were strongly correlated with count measures of the total number of violent offences ($r_s = .34 - .58, p_s < .0001$) and the total number of arrests between ages 21 – 30 years ($r_s = .34 - .40, p_s < .0001$). Similarly, diversity scores of property offending were strongly correlated with count measures of the total number of property offences ($r_s = .55 - .61, p_s < .0001$) and the total number of arrests between ages 21 – 30 years ($r_s = .33 - .53, p_s < .0001$). Such findings indicate that diversity scores of violent and property offending are valid measures of violent and property offending severity, respectively.

This study creates diversity scores from item parcels. Item parcels were used for two reasons. First, in the context of CFA, item parcels are more reliable than individual items (Moffitt et al., 2000). Second, condensing many items into fewer item parcels reduces the number of model parameters to be estimated. This increases the precision with which the parameters are estimated (Moffitt et al., 2000; West, Finch & Curran; 1995). Similarly, diversity scores have several strengths. These scores are less skewed, and are more reliable than frequency scores. In addition, diversity scores give equal weight to all antisocial

behaviours, whereas frequency scores give more weight to less serious acts committed frequently, and less weight to more serious acts committed infrequently (Moffitt et al., 2000).

Two observed measures were created for IPA, violent offending, and property offending for two reasons. First, for Models 1 – 4 to be identified, each latent variable must be measured by at least two observed indicators (Kline, 2010). Model identification will be discussed in detail in Chapter 3. Second, for this sample, the item prevalences for offending, and in particular violent offending, were very low (see Appendix B). By creating only two observed measures for each offence type, the number of items contributing information towards each observed measure was maximised. This, in turn, ensured that there was adequate variability in the observed measures, which helped avoid problems of data sparseness in model estimation (L. J. Horwood, personal communication, May 2, 2011).

The distributional properties of the previously developed observed measures of IPA (IPA-1 and IPA-2), violent offending (VIO-1 and VIO-2), and property offending (PROP-1 and PROP-2) are displayed in Table 1. An examination of this table indicates that a considerable proportion of cohort members had not perpetrated any IPA (IPA-1 = 24.0%; IPA-2 = 30.7%). However, the majority of cohort members had perpetrated one (IPA-1 = 29.7%; IPA-2 = 35.5%) or two (IPA-1 = 33.7%; IPA-2 = 20.8%) abusive behaviours towards their partner. Only a minority of cohort members had perpetrated three or more such behaviours (IPA-1 = 12.6%; IPA-2 = 13.0%; see Table 1). These findings suggest that IPA had a moderately high prevalence in the current sample, and that the observed measures of IPA were well distributed.

Table 1 also indicates that the majority of cohort members had not engaged in violent offending (VIO-1 = 95.8%; VIO-2 = 92.1%), or property offending (PROP-1 = 90.9%; VIO-2 = 91.8%). However, a notable proportion of cohort members had engaged in one form of violent offending (VIO-1 = 3.2%; VIO-2 = 7.4%), and/or property offending (PROP-1 = 7.1%; VIO-2 = 6.1%). Those who had engaged in two or more forms of violent offending represented a small minority (VIO-1 = 1.0%; VIO-2 = 0.5%), as did those who had engaged in two or more forms of property offending (PROP-1 = 2.0%; PROP-2 = 2.1%; see Table 1). These findings indicate a low prevalence of violent offending, and a moderately low prevalence of property offending in this sample. In addition, they indicate that the observed measures of violent and property offending have satisfactory distributions.

Finally, a comparison of the proportions of cohort members in each diversity score category indicated that observed measures of the same offence type were similarly distributed. This was supported by findings indicating that observed measures of the same offence type had similar means and standard deviations (see Table 1).

Table 1. *Distributional Properties of Observed Measures of IPA, Violent Offending, and Property Offending (N = 950).*

<i>Diversity Score</i>	<i>Observed Measures</i>											
	<i>IPA-1</i>		<i>IPA-2</i>		<i>VIO-1</i>		<i>VIO-2</i>		<i>PROP-1</i>		<i>PROP-2</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
0	228	24.0	292	30.7	910	95.8	875	92.1	864	90.9	872	91.8
1	282	29.7	337	35.5	30	3.2	70	7.4	67	7.1	58	6.1
2	320	33.7	198	20.8	7	0.7	5	0.5	14	1.5	11	1.2
3	69	7.3	50	5.3	3	0.3	0	0.0	2	0.2	5	0.5
4	25	2.6	32	3.4	0	0.0	-	-	2	0.2	4	0.4
5	10	1.1	21	2.2	-	-	-	-	1	0.1	0	0.0
6	9	0.9	14	1.5	-	-	-	-	0	0.0	0	0.0
7	5	0.5	2	0.2	-	-	-	-	0	0.0	0	0.0
8	2	0.2	4	0.4	-	-	-	-	-	-	-	-
9	0	0.0	0	0.0	-	-	-	-	-	-	-	-
10	0	0.0	0	0.0	-	-	-	-	-	-	-	-
11	0	0.0	0	0.0	-	-	-	-	-	-	-	-
M		1.46		1.31		0.06		0.08		0.12		0.12
SD		1.26		1.39		0.29		0.30		0.44		0.46

Note: IPA-1 = Observed measure of interpartner abuse 1; IPA-2 = Observed measure of interpartner abuse 2; VIO-1 = Observed measure of violent offending 1; VIO-2 = Observed measure of violent offending 2; PROP-1 = Observed measure of property offending 1; PROP-2 = Observed measure of property offending 2; M = Mean; SD = Standard deviation.

2.5 Predictor Measures

The following section describes the measures used in this study to operationalise the childhood, adolescent, and demographic predictors of IPA and criminal offending. These predictors included socio-economic disadvantage, family dysfunction, childhood abuse, conduct disordered behaviours, deviant peer affiliations, substance abuse, academic ability, obtainment of a high-school qualification, being of Māori ethnic identity, and gender. Previous studies found the following measures to have adequate predictive validity in relation to a range of antisocial, aggressive, and problem behaviours (Beautrais, Joyce, Mulder, Fergusson, Deavoll & Nightingale, 1996; Fergusson, Boden & Horwood, 2008; Fergusson &

Horwood, 1997; Fergusson, Horwood & Ridder, 2005b; Woodward, Fergusson & Horwood, 2006). For the purposes of comprehension and completion, and for readers who may be unfamiliar with the CHDS, the following section provides detailed descriptions of how scale scores were created, irrespective of whether similar descriptions have been provided in other studies. Finally, composite scores were frequently used to avoid the problem of multicollinearity, and to simplify the predictor models used in subsequent analyses.

Socio-economic disadvantage. Socio-economic disadvantage during childhood and adolescence was measured using a composite scale derived from the following measures:

1. *Maternal education.* Maternal education was scored according to the highest academic qualification reported by the cohort member's mother at the time of the cohort member's birth. This item was coded as follows: 1 = no formal qualifications; 2 = high-school qualification; or 3 = tertiary qualification.
2. *Paternal education.* Paternal education was measured in the same way as maternal education, but was scored in relation to the cohort member's father.
3. *Family socio-economic status.* At birth, family socio-economic status was assessed using the Elley and Irving (1976) scale of socio-economic status for New Zealand. This 6-point scale categorised families according to paternal occupation, whereby 1 = professional, 2 = managerial, 3 = clerical, 4 = technical or skilled, 5 = semiskilled, and 6 = unskilled or unemployed.
4. *Family living standards.* Family living standards were rated each year from ages 1 – 10 years. These ratings were made by interviewers on a 5-point scale ranging from 1 = obviously affluent to 5 = obviously poor. These ratings were then averaged to

provide a measure of the cohort member's average family living standards between ages 1 – 10 years.

5. *Family income.* Estimates of each family's gross annual income were obtained from parental reports each year from ages 1 – 10 years. These estimates were re-coded into decile categories and then averaged over the 10-year reporting period. This provided a measure of the average income available to the cohort member's family over the 10-year period.

A composite score for socio-economic disadvantage was created by dichotomising and then summing the scores from the previous measures. These measures were dichotomised so that a score of zero indicated lower levels of socio-economic disadvantage, and a score of one indicated higher levels of socio-economic disadvantage. Specifically, maternal and paternal education scores were re-coded as follows: 1 = no formal qualifications; 0 = high-school or tertiary qualification. Of the current sample, 48.7% had mothers with no formal qualifications, and 48.5% had fathers with no formal qualifications. Family socio-economic status scores were re-coded as follows: 0 = professional, managerial, clerical, technical, or skilled (76.6%); and 1 = semiskilled, unskilled, or unemployed (23.4%). Family living standards scores were re-coded so that those with average and below average living standards (those with scores of 3.00 and above) were coded 1 (46.2%), and the remainder were coded 0 (53.8%). Finally, family income scores were re-coded so that the quartile with the lowest average income decile rank (those with scores of 3.70 and below) were coded 1 (25.8%), and the remainder were coded 0 (74.2%).

Overall, a composite score for socio-economic disadvantage could vary between 0 – 5; the greater the score, the greater the socio-economic disadvantage experienced by the cohort

member between ages 0 – 10 years. The distribution of scores was as follows: 0 = 24.2%, 1 = 20.8%, 2 = 21.1%, 3 = 13.9%, 4 = 12.5%, and 5 = 7.3%. This 5-item composite scale had a mean of 1.92 and a standard deviation of 1.57.

Family dysfunction. Family dysfunction during childhood and adolescence was also measured using a composite scale derived from a number of measures. These measures included:

1. *Changes of parents.* As part of the parental interview conducted annually from ages 0 – 16 years, information was obtained on changes of parents in the past 12 months to provide an overall measure of family instability. A change of parents may have occurred due to fostering, adoption, parental separation/divorce, reconciliation, remarriage/cohabitation, parental death, or other forms of family breakdown. Both natural and step-parents were considered. Scores were summed across reporting periods to create a total measure of the number of changes of parents experienced between ages 0 – 16 years.
2. *Inter-parental abuse.* At age 18 years, cohort members were questioned about their experiences of inter-parental abuse between ages 0 – 16 years. This was achieved using 8 items derived from the Conflict Tactics Scales (Straus, 1979) that assessed both physical and psychological abuse. Cohort members provided frequency estimates of inter-parental abuse using a 3-point scale, in which 1 = never; 2 = occasionally; and 3 = frequently. Separate questioning was conducted for father-initiated and mother-initiated inter-parental abuse. Item scores were summed to produce scale scores representing the extent of father-initiated abuse, and the extent of mother-initiated abuse. These scales were previously found to have moderate to

strong internal consistency ($\alpha = .77 - .86$; Fergusson & Horwood, 1998). Cohort members were scored according to the highest level of inter-parental abuse reported for either parent.

3. *Parental attachment.* Parental attachment at age 15 years was assessed using the 28-item parental attachment scale from the Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987). Items were scored on a 3-point scale, ranging from 1 = doesn't apply to 3 = definitely applies (Armsden & Greenberg, 1987). Scale scores were created in two steps. First, scores from the trust subscale (10 items) and communication subscale (10 items) were summed. Second, scores from the alienation subscale (8 items) were subtracted from the previously calculated score (Armsden & Greenberg, 1987; Woodward et al., 2006). Previous research has found that this scale has strong internal consistency ($\alpha = .87$; Woodward et al., 2006).
4. *Parental illicit drug use.* At age 11 years, cohort members' parents were questioned as to whether any parent had a history of illicit drug use, including cannabis use. Based on this questioning, cohort members were coded as follows: 0 = no history of parental illicit drug use; or 1 = history of illicit drug use for at least one parent.
5. *Parental criminality.* When cohort members were aged 15 years, information was obtained from their parents as to whether any parent had a history of criminal offending. Based on this information, cohort members were coded as follows: 0 = no history of parental criminality; or 1 = history of criminality for at least one parent.
6. *Parental alcoholism/alcohol problems.* At age 15 years, cohort members' parents were questioned as to whether any parent had a history of alcoholism/alcohol problems. Based on this questioning, cohort members were coded as follows: 0 = no history of parental alcoholism/alcohol problems; or 1 = history of alcoholism/alcohol problems for at least one parent.

A composite measure of family dysfunction was then created in two steps. First, measures that were not already dichotomous were dichotomised so that a score of zero indicated lower levels of family dysfunction, and a score of one indicated higher levels of family dysfunction. Specifically, cohort members who had experienced one or more changes of parents were coded 1 (36.7%), whereas those who had not experienced any such changes were coded 0 (63.3%). Scale scores for inter-parental abuse were re-coded so that those reporting any inter-parental abuse (those with scores of 9.00 and above) were coded 1 (44.9%), while the remainder were coded 0 (55.1%). Finally, parental attachment scale scores were re-coded so that the quartile with the poorest parental attachment (those with scores of 68.00 and below) was coded 1 (26.7%), whereas the remainder were coded 0 (73.3%). Measures pertaining to parental histories of illicit drug use, criminality, and alcoholism/alcohol problems were already dichotomous. Of the current sample for which data on these variables was available, 24.2% had a parental history of illicit drug use, 12.7% had a parental history of criminality, and 11.9% had a parental history of alcoholism/alcohol problems.

Second, the six dichotomous variables were summed to produce a composite score of family dysfunction that varied between 0 – 6; the greater the score, the greater the family dysfunction experienced by the cohort member between ages 0 – 16 years. The distribution of scores was as follows: 0 = 23.5%, 1 = 32.6%, 2 = 21.9%, 3 = 11.6%, 4 = 7.4%, 5 = 2.5%, and 6 = 0.5%. This 6-item composite scale had a mean of 1.56 and a standard deviation of 1.34.

Childhood abuse. At ages 18 and 21 years, cohort members answered custom-written questions about the extent to which their parents had physically punished them before age 16 years, and the extent to which anyone had sexually abused them before this age.

Ratings of parental physical punishment before age 16 years were made on a 5-point scale, ranging from 1 (parent never used physical punishment) to 5 (parent treated me in a harsh and abusive way). Maternal and paternal ratings were made separately, but were combined into a single rating using a composite 4-point scale. This scale classified cohort members according to the highest level of physical punishment reported at either age 18 or 21 years (Fergusson & Lynskey, 1997; Woodward et al., 2006). The ratings on this scale were as follows: 1 = parents never used physical punishment; 2 = parents rarely used physical punishment; 3 = at least one parent regularly used physical punishment; and 4 = at least one parent used physical punishment too harshly, or too severely.

Sexual abuse before age 16 years was assessed by asking respondents whether anyone had attempted to involve them in a series of 15 sexual activities that they did not want to engage in. These activities spanned the following: 1) Non-contact episodes including indecent exposure, public masturbation by others, unwanted sexual propositions, or lewd suggestions; 2) Incidents involving sexual contact including sexual fondling, genital contact, and attempts to undress the respondent; and 3) Incidents involving attempted or completed oral, anal, or vaginal intercourse. Respondents who reported being sexually abused before age 16 years were further questioned about the nature and extent of their abuse, the characteristics of the perpetrator, abuse disclosure, and treatment seeking (Fergusson, Lynskey & Horwood, 1996). Cohort members were then rated on a 4-point scale according to the most severe form of sexual abuse reported at either age 18 or 21 years. The ratings on this scale were as follows: 1 = experienced no sexual abuse; 2 = experienced non-contact sexual abuse only; 3 = experienced contact sexual abuse not involving attempted or completed intercourse; and 4 = experienced sexual abuse involving attempted or completed oral, anal, or vaginal intercourse (Woodward et al., 2006).

Ratings of childhood physical punishment and sexual abuse were then dichotomised for the purposes of creating a composite score of childhood abuse. Ratings of physical punishment were re-coded as follows: 0 = parents never or rarely used physical punishment (82.3%); and 1 = at least one parent used physical punishment regularly, too harshly, or too severely (17.7%). Similarly, ratings of sexual abuse were re-coded as follows: 0 = experienced no sexual abuse, or experienced non-contact sexual abuse only (88.1%); and 1 = experienced contact sexual abuse not involving attempted or completed intercourse, or experienced sexual abuse involving attempted or completed oral, anal, or vaginal intercourse (11.9%). Once dichotomised, these items were summed to create a composite score. This score indicated the extent to which a cohort member experienced childhood abuse between ages 0 – 16 years. Scores ranged from 0 – 2, with 0 = experienced either mild or no childhood abuse (74.1%); 1 = experienced moderate to severe levels of either physical punishment or sexual abuse (22.2%); and 2 = experienced moderate to severe levels of both physical punishment and sexual abuse (3.7%). This 2-item composite scale had a mean of 0.30 and a standard deviation of 0.53.

Conduct disordered behaviours. At ages 7, 8, and 9 years, parents and teachers were questioned about the extent to which cohort members displayed disruptive, oppositional, and conduct disordered behaviours. These behaviours were assessed using an instrument that combined items from the Rutter (Rutter, Tizard, & Whitmore, 1970) and Conners (1969; 1970) parent and teacher questionnaires. The selected items assessed a range of behaviours, including disobedience and defiance of authority, fits of temper and irritability, aggression and cruelty towards others, destruction of property, lying, stealing and other similar behaviours (Woodward et al., 2006). These items were scored on a 3-point scale that ranged from 1 (not at all) to 3 (a great deal). A Confirmatory Factor Analysis conducted by

Fergusson, Horwood, and Lloyd (1991) revealed that items completed by parents and teachers, in each case, measured a single construct representing the extent of childhood conduct disordered behaviours as reported by parents and teachers at each age (Fergusson et al., 2005b). Scale scores were created at each age by summing parental and teacher item scores. These combined scores were then averaged over the three-year period. The resulting score represented an average measure of the extent to which children displayed conduct disordered behaviours in middle childhood. Previous research found this measure to have strong internal consistency ($\alpha = .97$; Woodward et al., 2006). Scale scores in this study ranged from 41.00 – 85.00, had a mean of 49.50, and a standard deviation of 7.18.

Deviant peer affiliations. Deviant peer affiliations at age 16 years were measured using six items developed by Fergusson and Horwood (1996). These items measured the self-reported extent to which the cohort member's best friend and other friends engaged in offending behaviours, used cannabis, used alcohol, smoked cigarettes, truanted, and had police contact. These items were summed to produce a scale score of the extent to which the cohort member affiliated with deviant peers at age 16 years. Higher scores indicated higher levels of deviant peer affiliation. Research has found this measure to have moderate internal reliability ($\alpha = .74$; Fergusson & Horwood, 1996). Scale scores ranged from 2 – 12, had a mean of 5.52, and a standard deviation of 2.57.

Substance abuse. Alcohol and illicit drug abuse during the previous year was measured at ages 15 and 16 years using both self- and parent-reports. The abuse of these substances was measured using custom-written items designed to assess DSM-III-R criteria for alcohol and illicit drug abuse (American Psychiatric Association, 1987). These items were supplemented with the 23-item Rutgers Alcohol Problems Index (White & Labouvie, 1989). This index has

been found to have strong internal consistency ($\alpha = .92$; White & Labouvie, 1989). Cohort members who met DSM-III-R criteria for alcohol abuse at ages 15 and/or 16 years (10.2%) on the basis of self- and/or parent-reports were coded 1. Those who did not meet this criteria were coded 0 (89.8%). This coding system was also used for a second measure that identified cohort members who met DSM-III-R criteria for illicit drug abuse at ages 15 and/or 16 years (3.9%), and those who did not (96.1%). These two dichotomous measures were summed to produce a composite measure representing the extent to which the cohort member abused substances between ages 14 – 16 years. Scores on this scale varied between 0 – 2, whereby 0 = no substance abuse between ages 14 – 16 years (88.2%); 1 = alcohol or illicit drug abuse between ages 14 – 16 years (9.6%); and 2 = alcohol and illicit drug abuse between ages 14 – 16 years (2.3%). This 2-item composite scale had a mean of 0.14 and a standard deviation of 0.41.

Academic ability. Academic ability was measured at age 13 years using the Test of Scholastic Abilities (TOSCA; Reid, Jackson, Gilmore & Croft, 1981). This 70-item general purpose test was designed to assess “verbal and numerical reasoning abilities deemed to be prerequisites for success in academic aspects of the school curriculum” (Reid et al., 1981, p. 4). Correctly answered items were coded 1, whereas incorrectly answered items were coded 0. Items were summed to produce scale scores. Previous research has found this measure to have strong internal consistency ($\alpha = .95$; Woodward et al., 2006). Scale scores ranged from 0.00 – 69.00, had a mean of 35.48, and a standard deviation of 14.60.

Obtainment of a high-school qualification. Cohort members who had left high-school by age 18 years without achieving any passing grades in School Certificate examinations were classified as having left high-school without formal qualifications. These cohort members

were coded 0 (17.1%). Those who had achieved at least one passing grade in School Certificate examinations were classified as having left high-school with a formal qualification, and were coded 1 (82.9%; Fergusson & Horwood, 1997).

Being of Māori ethnic identity. At age 21 years participants were questioned about their ethnic identification using a question from the 1996 census. This question asked participants to indicate which ethnic group/groups they belonged to. This questioning was repeated at age 25 years. For the purpose of this analysis, participants were classified as being of Māori ethnic identity if they identified themselves as Māori at either age 21 or age 25 years. Non-Māori cohort members were coded 1 (87.8%), and Māori cohort members were coded 2 (12.2%).

Gender. At birth, males and females were coded 1 (48.2%) and 2 (51.8%), respectively.

3. Analytical Methods

This study uses Confirmatory Factor Analysis (CFA) to investigate the extent to which IPA and criminal offending represent empirically distinct behavioural domains. The measurement models developed within the context of CFA will also be extended to structural equation models to investigate issues related to the predictors of these offence types. To demonstrate an understanding of CFA, and to simplify subsequent results sections, this chapter describes CFA, and discusses the processes of model specification, identification, and estimation in relation to a measurement model used in this study. The methods of calculating model fit used in this study are also described. This chapter concludes by outlining the generalizability of the processes discussed within the context of CFA to more complex Structural Equation Modelling (SEM) techniques.

3.1 *Confirmatory Factor Analysis*

Confirmatory Factor Analysis is a form of SEM that is concerned specifically with measurement models. These models examine the latent structure of observed measures by investigating their relationships with underlying *latent variables*. Observed measures are quantitative measures, such as CTS-2 or SRDI scale scores. In contrast, latent variables are theoretically-based hypothetical constructs that cannot be measured directly (Brown, 2006).

In measurement models, observed measures serve as *observed indicators* of latent variables. Each measurement model implies a specific set of assumptions about the relationships between the observed indicators and the latent variables. These assumptions may be expressed as a series of linear equations. These equations, along with other model

assumptions, imply a specific variance-covariance matrix of observed indicators, known as the model-implied variance covariance matrix (Σ^{\wedge}). This matrix is compared to a variance-covariance matrix of observed indicators formed from sample data, known as the sample variance-covariance matrix (S). The extent to which Σ^{\wedge} reproduces S determines the adequacy of a measurement model. In well-specified models, Σ^{\wedge} closely approximates S. However, in poorly specified models, Σ^{\wedge} does not closely approximate S. Therefore, in a comparison of competing models, the model with the smallest discrepancy between Σ^{\wedge} and S is most consistent with the observed data. Note that this discrepancy is a function of the specific estimation procedure used.

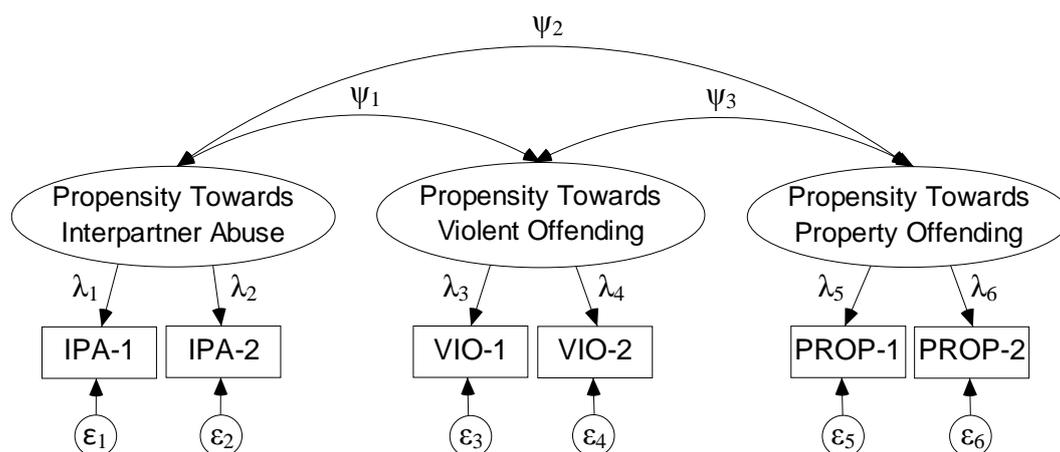
A key benefit of using CFA to investigate the latent structure of observed measures is the ability to control for errors of measurement (Brown, 2006). These errors represent sources of variance in the observed indicators that are uncorrelated with the latent variable/s. They include both systematic sources of variance in the observed indicators that are uncorrelated with the latent variable/s (specificity), and random errors of measurement (unreliability).

3.2 Model Specification

Confirmatory Factor Analysis is a hypothesis-driven method of enquiry. As a result, researchers must pre-specify all aspects of a measurement model prior to beginning the analyses. Specifically, researchers must specify both the assumptions of the model and the series of linear equations implied by the model. This process is illustrated below with reference to Model 1.

In the context of this study, Model 1 (see Figure 6) makes the following assumptions: 1) Observed measure pairs IPA-1/IPA-2, VIO-1/VIO-2, and PROP-1/PROP-2 serve as observed indicators of three empirically distinct, albeit related, latent variables that represent propensities towards IPA (η_1), violent offending (η_2), and property offending (η_3), respectively; 2) Observed indicators are influenced by errors of measurement ($\varepsilon_1 - \varepsilon_6$), which represent sources of variance in the observed indicators that are unexplained by the latent variables; 3) Errors of measurement account for all the variance in the observed indicators that is not explained by the latent variables; 4) Errors of measurement are mutually uncorrelated, and are uncorrelated with the latent variables; and 5) Latent variables are mutually correlated ($\psi_1 - \psi_3$). For simplicity of presentation, the discussion below assumes that all observed indicators and latent variables are scaled to a mean of zero. However, model specification is readily extendable to incorporate mean and intercept terms. Finally, given that latent variables are unobserved, and therefore their scales of measurement are arbitrary, the discussion below also assumes that the latent variables have a variance of one.

Figure 6. *Model 1.*



Based on the previous assumptions, Model 1 implies the following series of linear equations:

$$\begin{aligned}
 \text{IPA-1} &= \lambda_1\eta_1 + \varepsilon_1 \\
 \text{IPA-2} &= \lambda_2\eta_1 + \varepsilon_2 \\
 \text{VIO-1} &= \lambda_3\eta_2 + \varepsilon_3 \\
 \text{VIO-2} &= \lambda_4\eta_2 + \varepsilon_4 \\
 \text{PROP-1} &= \lambda_5\eta_3 + \varepsilon_5 \\
 \text{PROP-2} &= \lambda_6\eta_3 + \varepsilon_6
 \end{aligned}$$

Each equation specifies that $y = \lambda\eta + \varepsilon$, where y is the observed indicator, λ is the factor loading, η is the latent variable, and ε is the error term. The factor loadings $\lambda_1 - \lambda_6$ represent the strengths of the associations between the latent variables and their indicators. When all the variables in a model are standardised, factor loadings may be interpreted as the correlations (r_s) between the indicators and their latent variables. Thus, the square of a standardised factor loading can be interpreted as the proportion of variance in the indicator that is explained by the latent variable. For example, if the standardised factor loading λ_1 in Model 1 had a value of .80, the propensity towards IPA would explain 64% of the variance in IPA-1.

This series of equations can be represented more concisely in matrix form by the equation $y' = \Lambda\eta' + \varepsilon'$, where y' is a 6x1 vector of observed indicators, Λ is a 6x3 parameter matrix of factor loadings, η' is a 3x1 vector of latent variables, and ε' is a 6x1 vector of error terms. The vectors (y' , η' , ε') and matrix (Λ) in the previous equation are depicted below. This equation states that IPA-1, for example, is equal to $[(\lambda_1 \times \eta_1) + (0 \times \eta_2) + (0 \times \eta_3)] + \varepsilon_1$.

$$\begin{bmatrix} y' \\ \text{IPA-1} \\ \text{IPA-2} \\ \text{VIO-1} \\ \text{VIO-2} \\ \text{PROP-1} \\ \text{PROP-2} \end{bmatrix} = \begin{bmatrix} \Lambda \\ \lambda_1 & 0 & 0 \\ \lambda_2 & 0 & 0 \\ 0 & \lambda_3 & 0 \\ 0 & \lambda_4 & 0 \\ 0 & 0 & \lambda_5 \\ 0 & 0 & \lambda_6 \end{bmatrix} \begin{bmatrix} \eta' \\ \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix} + \begin{bmatrix} \varepsilon' \\ \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \end{bmatrix}$$

The previous assumptions and linear equations imply a given covariance structure. This covariance structure determines Σ^\wedge , which is calculated using the following equation: $\Sigma^\wedge = \Lambda\Phi\Lambda^T + \theta_\varepsilon$, where Σ^\wedge is the model-implied variance-covariance matrix of observed indicators, Λ is a 6x3 parameter matrix of factor loadings, Φ is a symmetric 3x3 correlation matrix of latent variables, Λ^T is the transpose of Λ (a 3x6 parameter matrix of factor loadings), and θ_ε is a 6x6 diagonal variance-covariance matrix of error terms. The matrices in this equation are displayed below.

$$\Sigma^\wedge = \begin{bmatrix} \Lambda \\ \Phi \\ \Lambda^T \end{bmatrix} + \begin{bmatrix} \theta_\varepsilon \end{bmatrix}$$

$$\begin{bmatrix} \lambda_1 & 0 & 0 \\ \lambda_2 & 0 & 0 \\ 0 & \lambda_3 & 0 \\ 0 & \lambda_4 & 0 \\ 0 & 0 & \lambda_5 \\ 0 & 0 & \lambda_6 \end{bmatrix} \begin{bmatrix} 1 & \psi_1 & \psi_2 \\ \psi_1 & 1 & \psi_3 \\ \psi_2 & \psi_3 & 1 \end{bmatrix} \begin{bmatrix} \lambda_1 & \lambda_2 & 0 & 0 & 0 & 0 \\ 0 & 0 & \lambda_3 & \lambda_4 & 0 & 0 \\ 0 & 0 & 0 & 0 & \lambda_5 & \lambda_6 \end{bmatrix} + \begin{bmatrix} \sigma^2_{\varepsilon_1} & 0 & 0 & 0 & 0 & 0 \\ 0 & \sigma^2_{\varepsilon_2} & 0 & 0 & 0 & 0 \\ 0 & 0 & \sigma^2_{\varepsilon_3} & 0 & 0 & 0 \\ 0 & 0 & 0 & \sigma^2_{\varepsilon_4} & 0 & 0 \\ 0 & 0 & 0 & 0 & \sigma^2_{\varepsilon_5} & 0 \\ 0 & 0 & 0 & 0 & 0 & \sigma^2_{\varepsilon_6} \end{bmatrix}$$

When the previous equation is expanded, Σ^\wedge represents the symmetric 6x6 variance-covariance matrix depicted below. This matrix includes six indicator variances and 15 indicator covariances. As noted earlier, when deciding between several competing models, the model with the smallest discrepancy between this matrix and the sample variance-covariance matrix is most consistent with the observed data.

$$\Sigma^\wedge = \begin{bmatrix} \lambda_1^2 + \sigma^2_{\varepsilon_1} & \lambda_1\lambda_2 & \lambda_1\psi_1\lambda_3 & \lambda_1\psi_1\lambda_4 & \lambda_1\psi_2\lambda_5 & \lambda_1\psi_2\lambda_6 \\ \lambda_1\lambda_2 & \lambda_2^2 + \sigma^2_{\varepsilon_2} & \lambda_2\psi_1\lambda_3 & \lambda_2\psi_1\lambda_4 & \lambda_2\psi_2\lambda_5 & \lambda_2\psi_2\lambda_6 \\ \lambda_1\psi_1\lambda_3 & \lambda_2\psi_1\lambda_3 & \lambda_3^2 + \sigma^2_{\varepsilon_3} & \lambda_3\lambda_4 & \lambda_3\psi_3\lambda_5 & \lambda_3\psi_3\lambda_6 \\ \lambda_1\psi_1\lambda_4 & \lambda_2\psi_1\lambda_4 & \lambda_3\lambda_4 & \lambda_4^2 + \sigma^2_{\varepsilon_4} & \lambda_4\psi_3\lambda_5 & \lambda_4\psi_3\lambda_6 \\ \lambda_1\psi_2\lambda_5 & \lambda_2\psi_2\lambda_5 & \lambda_3\psi_3\lambda_5 & \lambda_4\psi_3\lambda_5 & \lambda_5^2 + \sigma^2_{\varepsilon_5} & \lambda_5\lambda_6 \\ \lambda_1\psi_2\lambda_6 & \lambda_2\psi_2\lambda_6 & \lambda_3\psi_3\lambda_6 & \lambda_4\psi_3\lambda_6 & \lambda_5\lambda_6 & \lambda_6^2 + \sigma^2_{\varepsilon_6} \end{bmatrix}$$

3.3 Model Identification

Once a model has been specified, consideration must be given to its identification. Specifically, researchers must ascertain whether all of a model's parameters, and thus the model itself, are *identified*, and therefore potentially estimable. Parameter identification is determined by whether or not a unique parameter value may be estimated based on the available information. This information includes the known-to-be-identified elements of the sample variance-covariance matrix of observed indicators, the shown-to-be-identified parameters, and the parameters with *a priori* values set by the researcher. In the context of the current example, Model 1 would be identified if unique parameter values can be estimated for all the parameters in Σ^{\wedge} based on the available information. An unknown parameter is *over-identified* if more than one solution exists, whereas an unknown parameter is *just-identified* if only one solution exists. An unknown parameter that cannot be solved is *under-identified*. Both over-identified and just-identified parameters are identified (Bollen, 1989; Long, 1983; O'Brien, 1994).

A model is identified, and therefore may be estimable, if all its parameters are identified according to the previous criterion (Bollen, 1989; Long, 1983; O'Brien, 1994). A number of rules have been developed to quickly indicate whether or not simple models are identified. For example, Bollen's (1989) 'two-indicator rule' states that measurement models with a factor complexity of one (each indicator loads onto a single latent variable) and uncorrelated measurement errors are identified if they meet the following criteria: 1) There is more than one latent variable; 2) Each latent variable is correlated with one or more other latent variables; 3) There is only one non-zero element per row of the matrix of factor loadings (Λ); 4) There are two or more indicators per latent variable; and 5) The variance-covariance

matrix of error terms for the observed indicators (θ_ε) is diagonal. A number of these rules are available to help establish the identification of simple models. However, these rules may not be appropriate for more complex models. Finally, as indicated throughout this section, identified models are only potentially estimable, given that parameters in identified models may be inestimable due to empirical under-identification (Shipley, 2002). Therefore, model identification is necessary, but not sufficient, for model estimation (L. J. Horwood, personal communication, June 10, 2010).

A second issue of model identification requiring consideration is whether or not a model may be falsified by empirical tests. This issue is directly related to the *degrees of freedom* (df) in a model. A model's degrees of freedom are calculated by subtracting the number of unknown parameters in Σ^\wedge from the number of non-redundant elements in S, known as data points. *Over-identified* models contain more data points than unknown parameters, and therefore contain one or more df. Such models are desirable as they do not necessarily reproduce S exactly. Therefore, they may be falsified by empirical tests. In contrast, *just-identified*, or *saturated*, models contain equal numbers of data points and unknown parameters. Such models contain zero df, and are undesirable as they reproduce S exactly. As a result, they cannot be falsified by empirical tests. Similarly, *under-identified* models contain fewer data points than unknown parameters. These models contain negative degrees of freedom, and are undesirable as they also cannot be falsified by empirical tests. Finally, note that while model over-identification is a necessary condition of testing the discrepancy between Σ^\wedge and S, it is not sufficient (L. J. Horwood, personal communication, June 10, 2010).

To illustrate the concept of model identification, consider Model 1 (see Figure 6). This model fulfils all the criteria of Bollen's (1989) 'two-indicator rule'. Therefore, this model is identified, and is potentially estimable. In addition, based on a count of the data points in S and the unknown parameters in Σ^{\wedge} , Model 1 is over-identified. Therefore, this model may also be falsified by empirical tests. More specifically, given that Model 1 contains six observed indicators (see Figure 6), the sample variance-covariance matrix would represent a 6x6 matrix. This matrix would contain 21 non-redundant data points (since the matrix is symmetric), which would include six observed indicator variances and 15 observed indicator covariances. A count of the unknown parameters in Σ^{\wedge} would indicate that Model 1 contains 15 unknown parameters. These parameters would include three latent variable correlations ($\psi_1 - \psi_3$), six factor loadings ($\lambda_1 - \lambda_6$), and six error term variances ($\sigma_{\varepsilon 1}^2 - \sigma_{\varepsilon 6}^2$). Given that Model 1 would contain six more data points than unknown parameters, Model 1 would have six df. As a result, Model 1 would be over-identified, and could be falsified by empirical tests.

3.4 Model Estimation

Assuming a model is identified, several iterative estimation methods may be used to estimate the unknown model parameters. All estimation methods share the fundamental aim of minimising the discrepancy between Σ^{\wedge} and S . However, they differ in their assumptions about the nature of the observed data. The Maximum Likelihood (ML) method is the most widely used estimation method, and is the estimation method used in this study. The ML method assumes that a model's variables are multivariate-normal, and that Σ^{\wedge} and S are positive-definite (Schermelleh-Engel, Moosbrugger & Müller, 2003). The ML method is

generally robust to violations of the assumption of multivariate-normality. However, such violations can inflate estimations of the discrepancy between $\hat{\Sigma}$ and S .

3.5 Model Fit

Once a model has been estimated, whereby the iterative estimation procedure has converged upon a reasonable solution, the discrepancy between $\hat{\Sigma}$ and S should be examined. The magnitude of this discrepancy determines the *model fit*. A general approach to assessing model fit is to establish the following: 1) The model is identified; 2) The iterative estimation procedure converges; and 3) All parameter estimates represent permissible values (Marsh & Grayson, 1995; Schermelleh-Engel et al., 2003). A large number of goodness-of-fit indices are also available to provide quantitative measures of model fit. It is necessary to consider a range of fit indices when evaluating and comparing model fit. This is due to the lack of a single statistical test that can identify an adequately fitting model, given the observed data. A model may be evaluated inferentially using the chi-square goodness-of-fit test. Alternatively, it may be evaluated descriptively using measures of overall model fit, measures based on model comparisons, and measures of model parsimony (Schermelleh-Engel et al., 2003). The following section describes the fit indices used in this study to examine the goodness of model fit. Several of these indices may be used to both evaluate model fit and compare the fit of competing models, such as the Chi-square, the Root Mean Square Error of Approximation, the Standardised Root Mean Square Residual, and the Comparative Fit Index. However, other indices, such as the Akaike Information Criterion, may only be used to compare the fit of competing models.

1. *Chi-square (χ^2)*. The χ^2 goodness-of-fit test is the only inferential statistical evaluation method available for measurement models and structural equation models. This test analyses the appropriateness of a measurement model by testing the null hypothesis that there are no differences between the model-implied variance-covariance matrix Σ^{\wedge} and the sample variance-covariance matrix S. A statistically significant χ^2 value ($p < .05$) indicates that there are significant differences between these matrices. Thus, a significant χ^2 value indicates that the proposed model is a poor representation of the observed data. Conversely, a non-significant χ^2 value indicates that the null hypothesis can be accepted, and that the proposed model can be regarded as compatible with the observed data. However, it is important to note that a non-significant χ^2 value does not necessarily indicate that the proposed model is the 'best' of all alternative models that are consistent with the observed data (Schermelleh-Engel et al., 2003).

Several issues need to be considered when conducting χ^2 goodness-of-fit tests. First, χ^2 values decrease as the number of model parameters increase. As a result, both well-specified models and over-parameterized models may have non-significant χ^2 values. Second, χ^2 analyses are sensitive to sample size, whereby an increase in sample size can increase a χ^2 value, or a decrease in sample size can decrease a χ^2 value. As a result, a plausible model tested on a large sample may have a significant χ^2 value although the discrepancy between Σ^{\wedge} and S is small. Alternatively, an implausible model tested on a small sample may have a non-significant χ^2 value although the discrepancy between Σ^{\wedge} and S is large. Finally, several assumptions of the χ^2 test are frequently unmet in practical applications, such as having observed indicators that are multivariate-normal, and a sufficiently large sample size. Violations of these assumptions may adversely affect the validity of the χ^2 test. For example, a χ^2 value may be inflated when the ML

method is used to estimate a model from non-normal data. However, a number of approaches have been devised to correct for inflated χ^2 statistics. The present study utilises the robust ML estimation method devised by Satorra and Bentler (1994) to correct for inflated χ^2 statistics resulting from data non-normality. Overall, given the previous issues, a χ^2 value should be interpreted in conjunction with several additional fit indices (Schermelleh-Engel et al., 2003).

2. *Root Mean Square Error of Approximation (RMSEA)*. The RMSEA is a descriptive measure of overall model fit that indicates the difference between Σ^{\wedge} and S. Values range from zero to one, whereby the lower the value, the more accurately Σ^{\wedge} reproduces S. According to Browne and Cudeck (1993), RMSEA values less than or equal to .05 indicate a close fit, values between .05 and .08 indicate a reasonable fit, values between .08 and .10 indicate a mediocre fit, and values greater than .10 indicate a poor fit. Finally, RMSEA is relatively unaffected by sample size, and rewards model parsimony (Browne & Cudeck, 1993; Schermelleh-Engel et al., 2003).
3. *Standardised Root Mean Square Residual (SRMR)*. The SRMR is a second descriptive measure of overall model fit. It is based on *fitted residuals*, which represent the remaining discrepancies between Σ^{\wedge} and S once the model parameters are estimated. A positive residual indicates that the model underestimates the sample covariance, whereas a negative residual indicates that the model overestimates the sample covariance. Like the RMSEA, the SRMR is an overall badness-of-fit measure. Therefore, a SRMR value of zero indicates perfect model fit. Hu and Bentler (1999) propose that a SRMR value close to .08 indicates a relatively good model fit. However, SRMR is sensitive to model misspecification and sample size (Hu & Bentler, 1998).

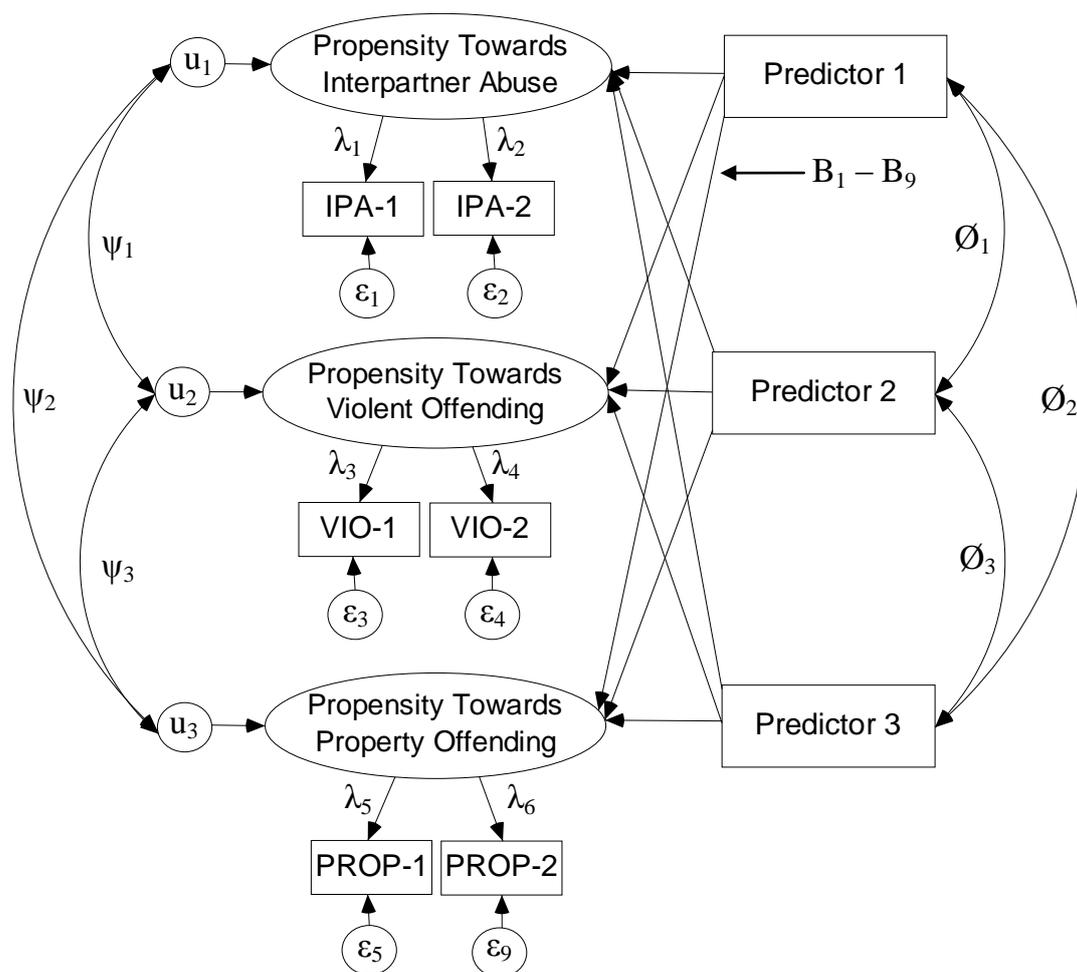
4. *Comparative Fit Index (CFI)*. The CFI is one of several comparison indices that compare the fit of the proposed model to the fit of a baseline model. The independence model is a commonly used baseline model. This model assumes that all observed indicators are measured without error, and that all variables are uncorrelated. As a result, the variances of the variables are the only parameters that require estimation. This index ranges from zero to one, with higher values indicating better model fit. Models with CFI values equal to or greater than .97 are regarded as having a good fit relative to the independence model. However, models with CFI values greater than .95 are deemed to have acceptable fit. Finally, the CFI avoids the underestimation of model fit often found with other comparison indices when models are tested on small samples (Schermelleh-Engel et al., 2003).

5. *Akaike Information Criterion (AIC)*. The AIC is one of several indices that adjust for model parsimony when assessing model fit. Model parsimony represents an important criterion for choosing between alternative models. Thagard (1978) states that theory simplicity is one of three key criteria to consider when choosing between alternative theories. Therefore, according to Thagard (1978), if two models reproduce S equally as well, the simpler model is better. The AIC is a descriptive measure that rewards models that contain high numbers of degrees of freedom, and thus rewards model parsimony. Like RMSEA and SRMR values, lower AIC values indicate better model fit. However, unlike RMSEA and SRMR values, AIC values cannot be interpreted in isolation. Rather, the AIC values of the proposed models must be compared against each other. The model with the lowest AIC value represents the best-fitting model (Schermelleh-Engel et al., 2003).

3.6 *Generalisation to Structural Equation Modelling*

The previous sections have described the processes of model specification, identification, estimation, and determining model fit in the context of CFA. However, these processes are readily extendable to more complex structural equation models that propose causal relationships between observed predictors and latent variables. These processes are briefly discussed below with reference to the Predictor Model Template. As noted earlier, all the structural equation models used in this study are formed from this template. For demonstrative purposes, this template is based on Model 1 and contains three observed predictors. However, in practice, this model would be based on the best-fitting measurement model, and could contain any number of observed predictors.

Like the specification of Model 1, the specification of the Predictor Model Template also involves outlining the model's assumptions, and the series of linear equations implied by the model. In the context of the current study, the Predictor Model Template (see Figure 7) makes several assumptions in addition to those made by Model 1. These additional assumptions include: 1) Latent variables are influenced by three observed predictors; 2) The predictors' effects on the latent variables are represented by the regression coefficients $B_1 - B_9$; 3) Observed predictors are mutually correlated ($\emptyset_1 - \emptyset_3$); 4) Observed predictors do not account for all the variance in the latent variables; 5) Disturbance terms $u_1 - u_3$ account for all the variance in the latent variables that is unaccounted for by the predictors; and 6) Disturbance terms $u_1 - u_3$ are mutually correlated ($\psi_1 - \psi_3$) to account for the hypothesized relationships between the latent variables. Disturbance term correlations in the Predictor Model Template represent the correlations between the latent variables after controlling for the variance explained by shared predictors.

Figure 7. *Predictor Model Template.*

Given the previous assumptions, the Predictor Model Template implies a specific series of linear equations. These equations, in conjunction with the model assumptions, imply a specific covariance structure. This covariance structure determines the model-implied variance-covariance matrix of observed indicators and predictors (Σ^\wedge), which may later be fitted to the sample variance-covariance matrix of observed indicators and predictors (S).

Once specified, consideration must be given to the identification of the Predictor Model Template. In its current form, the Predictor Model Template is identified, and therefore is

potentially estimable. In addition, this model is over-identified as it contains 15 df, and may therefore be falsified by empirical tests.

Given that the Predictor Model Template is identified, its unknown model parameters may be estimated using iterative estimation methods, such as the ML method. In addition, the discrepancy between Σ^{\wedge} and S may be assessed by examining the previously described model fit indices. However, it is important to note that while the fit of structural equation models remains important, researchers are often most interested in the regression coefficients ($B_1 - B_9$; see Figure 7). When standardised, each regression coefficient ($\beta_1 - \beta_9$) in the Predictor Model Template represents the component of the correlation between the latent variable and the predictor that is not explained by other predictors. Each coefficient indicates the magnitude of the change that occurs in the latent variable (dependent variable) when the predictor (independent variable) increases by one standard deviation. For example, if the standardised regression coefficient between Predictor 1 and the propensity towards IPA equalled .20, the propensity towards IPA would increase by .20 standard deviations when Predictor 1 increased by one standard deviation.

The specific models formed from this template will be introduced in Chapter 5, during which the specification of each predictor model will be briefly outlined. When standardised, these models provided a means of comparing predictors' effects across offence types using a consistent metric.

4. Factor Structure

This chapter describes an analysis of the extent to which IPA, violent offending, and property offending represent empirically distinct behavioural domains. Findings revealing that these offence types are empirically indistinct would indicate that general theories of criminal offending may also explain IPA with parsimony. Financial resources could therefore be used more efficiently, given that IPA may not require specialist research efforts and funding. The current analysis addresses this issue using Confirmatory Factor Analysis (CFA). Four competing measurement models (Models 1 – 4; see Figures 1 – 4, respectively) were compared to identify the model that best fit the observed data.

This chapter begins by describing the sample correlation matrix. The specification and identification of Models 1 – 4 are then discussed. This is followed by a comparison of model fit indices, during which the best-fitting model is identified. The best-fitting model's parameter estimates are then described in detail. In particular, the correlations between the indicators and the latent variables are highlighted, as are the correlations between the latent variables themselves. Sensitivity analyses are then conducted to examine the robustness of the key findings. This chapter concludes with a summary of the key findings and their implications.

4.1 *Sample Correlation Matrix*

Table 2 displays the sample correlation matrix of observed measures, and the means and standard deviations of these variables. This table reveals a strong positive correlation between CTS-2-based observed measures ($r = .772, p < .001$), a moderate positive correlation

between SRDI-V-based observed measures ($r = .454, p < .001$), and a moderate positive correlation between SRDI-P-based observed measures ($r = .548, p < .001$). These findings indicated moderate to strong relationships between observed measures of the same offence type.

Modest positive correlations were consistently found between CTS-2-based observed measures and SRDI-based observed measures ($r_s = .148 - .197, p_s < .001$). This indicated that IPA was modestly related to violent and property offending in the current sample. In addition, moderate positive correlations were found between SRDI-based observed measures ($r_s = .318 - .532, p_s < .001$). This indicated that violent and property offending were moderately related in the current sample (see Table 2).

Table 2. *Sample Correlation Matrix and Descriptive Statistics for Observed Measures (N = 950).*

	IPA-1	IPA-2	VIO-1	VIO-2	PROP-1	PROP-2
IPA-1	1.000					
IPA-2	0.772	1.000				
VIO-1	0.175	0.181	1.000			
VIO-2	0.173	0.197	0.454	1.000		
PROP-1	0.148	0.174	0.404	0.318	1.000	
PROP-2	0.167	0.153	0.532	0.356	0.548	1.000
M	1.457	1.312	0.056	0.084	0.120	0.117
SD	1.263	1.392	0.294	0.296	0.441	0.457

Note: All figures in the matrix of correlations are Pearson's correlation coefficients (r), and are statistically significant ($p < .001$); IPA-1 = Observed measure of interpartner abuse 1; IPA-2 = Observed measure of interpartner abuse 2; VIO-1 = Observed measure of violent offending 1; VIO-2 = Observed measure of violent offending 2; PROP-1 = Observed measure of property offending 1; PROP-2 = Observed measure of property offending 2; M = Mean; SD = Standard deviation.

4.2 *Specification and Identification of Models 1 – 4*

Models 1 – 4 were fitted to the sample variance-covariance matrix (S) derived from the data depicted in Table 2 to test Hypotheses 1 – 4. These models shared the following assumptions: 1) Observed indicators were influenced by errors of measurement ($\varepsilon_1 - \varepsilon_6$); 2) Errors of measurement accounted for all the variance in the observed indicators not explained by the latent variables; 3) Errors of measurement were mutually uncorrelated, and were uncorrelated with the latent variables; 4) Observed indicators and latent variables had a mean of zero; and 5) Each latent variable had a variance of one. Models that contained two or more latent variables also assumed that the latent variables were mutually correlated.

While Models 1 – 4 shared a number of assumptions, they differed in their assumptions about the relationships between the observed indicators and the latent variables. Specifically, Model 1 assumed that indicator pairs IPA-1/IPA-2, VIO-1/VIO-2, and PROP-1/PROP-2 loaded onto three empirically distinct, albeit related, latent variables. These variables represented propensities towards IPA (η_1), violent offending (η_2), and property offending (η_3 ; see Figure 1). In contrast, Model 2 assumed that indicators IPA-1 and IPA-2 loaded onto a latent variable that represented a propensity towards IPA (η_1), whereas indicators VIO-1, VIO-2, PROP-1, and PROP-2 loaded onto a latent variable that represented a propensity towards criminal offending (η_2 ; see Figure 2). Model 3 assumed that indicators IPA-1, IPA-2, VIO-1, and VIO-2 loaded onto a latent variable that represented a propensity towards abusive behaviour (η_1), whereas indicators PROP-1 and PROP-2 loaded onto a latent variable that represented a propensity towards property offending (η_2 ; see Figure 3). Finally, Model 4 assumed that all observed indicators loaded onto a single latent variable that represented a propensity towards antisocial and aggressive behaviour (η_1 ; see Figure 4).

Given the previous assumptions, Models 1 – 4 each implied a different series of linear equations. The series of linear equations for each model is displayed below. As noted in Chapter 3, these equations specify that $y = \lambda\eta + \varepsilon$, where y is the observed indicator, λ is the factor loading, η is the latent variable, and ε is the error term.

Model 1	Model 2	Model 3	Model 4
IPA-1 = $\lambda_1\eta_1 + \varepsilon_1$			
IPA-2 = $\lambda_2\eta_1 + \varepsilon_2$			
VIO-1 = $\lambda_3\eta_2 + \varepsilon_3$	VIO-1 = $\lambda_3\eta_2 + \varepsilon_3$	VIO-1 = $\lambda_3\eta_1 + \varepsilon_3$	VIO-1 = $\lambda_3\eta_1 + \varepsilon_3$
VIO-2 = $\lambda_4\eta_2 + \varepsilon_4$	VIO-2 = $\lambda_4\eta_2 + \varepsilon_4$	VIO-2 = $\lambda_4\eta_1 + \varepsilon_4$	VIO-2 = $\lambda_4\eta_1 + \varepsilon_4$
PROP-1 = $\lambda_5\eta_3 + \varepsilon_5$	PROP-1 = $\lambda_5\eta_2 + \varepsilon_5$	PROP-1 = $\lambda_5\eta_2 + \varepsilon_5$	PROP-1 = $\lambda_5\eta_1 + \varepsilon_5$
PROP-2 = $\lambda_6\eta_3 + \varepsilon_6$	PROP-2 = $\lambda_6\eta_2 + \varepsilon_6$	PROP-2 = $\lambda_6\eta_2 + \varepsilon_6$	PROP-2 = $\lambda_6\eta_1 + \varepsilon_6$

Based on the previous specifications, Models 1 – 4 were identified according to several rules of model identification, including the ‘two-indicator rule’ and the ‘three-indicator rule’ (Bollen, 1989; Kline, 2010). Therefore, these models were potentially estimable. In addition, given that there are 21 data points in S (see Table 2), and between 12 – 15 unknown parameters in Models 1 – 4, these models each contained at least six df. As a result, these models were over-identified, and could be falsified by empirical tests of model adequacy.

4.3 Model Comparisons

Models 1 – 4 were estimated using the Maximum Likelihood method. Once estimated, the goodness-of-fit indices for these models were compared to identify which of the four competing models was most consistent with the observed data. Table 3 displays a selection of fit indices used in this study to assess the goodness of model fit. Looking across the fit indices for all models, Model 1 is clearly the best-fitting model. Model 1 has the least significant χ^2 value ($p = .400$), the lowest RMSEA (.006), SRMR (.017), and AIC (7760)

values, and the highest CFI value (.999) of the four models. Given that Model 1 is the best-fitting model, IPA, violent offending, and property offending appear to represent three empirically distinct, yet related, behavioural domains.

The figures presented in Table 3 not only indicate that Model 1 is the best-fitting model, but also that Model 1 is highly consistent with the observed data. Specifically, the χ^2 value for Model 1 was non-significant, and the RMSEA, SRMR, and CFI values for Model 1 all met or exceeded conventional standards for good model fit. Therefore, all fit indices suggest that Model 1 provides an excellent fit to the observed data (see Table 3).

Table 3. *Fit Indices for Models 1 – 4.*

<i>Model</i>	χ^2	<i>df</i>	<i>p</i>	<i>RMSEA</i>	<i>SRMR</i>	<i>CFI</i>	<i>AIC</i>
1	6.2	6	0.400	0.006	0.017	0.999	7760
2	22.3	8	0.004	0.043	0.030	0.964	7798
3	330.6	8	0.000	0.206	0.128	0.184	8539
4	327.5	9	0.000	0.193	0.134	0.194	8589

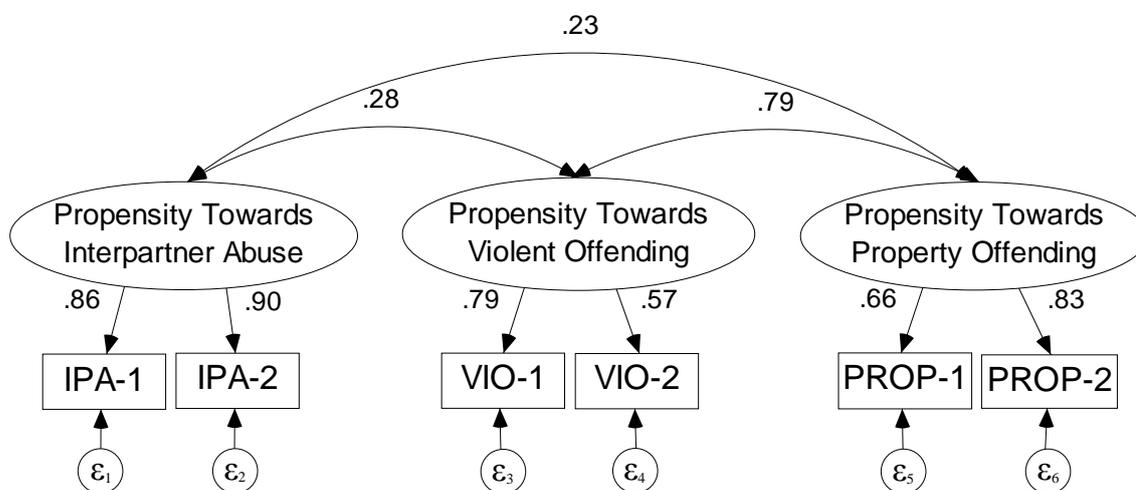
4.4 *The Best-Fitting Model*

The previous model comparisons indicated that Model 1 was the best-fitting model. Figure 8 displays the standardised factor loadings and latent variable correlations for Model 1. As noted earlier, these factor loadings indicate the correlations between the observed indicators and the latent variables. In addition, the square of a standardised factor loading may be interpreted as the proportion of variance in the indicator that is explained by the latent variable. Finally, the latent variable correlations indicate the strength of the relationships between the latent propensities.

All parameter estimates for Model 1 represented permissible values. An examination of the factor loadings revealed that all indicators were moderately to strongly correlated with their respective latent variables ($\lambda_s = .57 - .90$; see Figure 8). These factor loadings also implied that variations in the propensity towards IPA explained 74% and 81% of the variance in IPA-1 and IPA-2, respectively. Variations in the propensity towards violent offending explained only 62% and 33% of the variance in VIO-1 and VIO-2, respectively. Finally, variations in the propensity towards property offending explained 44% and 69% of the variance in PROP-1 and PROP-2, respectively.

An investigation of the latent variable correlations revealed a moderate positive correlation between propensities towards IPA and violent offending ($r = .28, p < .001$). A modest positive correlation was observed between propensities towards IPA and property offending ($r = .23, p < .001$). In contrast, a strong positive correlation was observed between propensities towards violent and property offending ($r = .79, p < .001$; see Figure 8). Together, these findings indicated that propensities towards violent and property offending were more strongly related to each other than to the propensity towards IPA.

Figure 8. *Standardised Parameter Estimates for Model 1.*



4.5 Sensitivity Analyses: Factor Analysis

There are two potential limitations to the above analysis. First, the analysis was based on the sample of 950 participants that were interviewed at ages 21, 25, and 30 years. This sample represented 75% of the original cohort. This raises the possibility that the above results could have been influenced by sample-selection bias arising from the process of sample attrition over the course of the study. To examine this issue, the data weighting methods described by Little and Rubin (1987) were utilised. These methods involved a two-stage process. In the first stage, a sample selection model was developed to predict the probability of inclusion in the analysis sample based on the birth characteristics of the original cohort. This analysis revealed significant ($p < .01$) tendencies for the analysis sample to under-represent participants from more socially disadvantaged childhood backgrounds characterised by low socio-economic status, low parental education, and entry into a single parent family at birth. In the second stage, the previous CFA was repeated with the data weighted by the inverse of the estimated probability of sample inclusion calculated in the last stage. This analysis produced results that were essentially identical to those reported above, suggesting that the above results were not affected by sample-selection bias.

Second, a total of 41 cohort members had missing CTS-2 data at ages 21, 25, and 30 years as they were not currently in partnerships of at least one month, and had not been in such partnerships during any of the three 12-month reporting periods. As noted in Methods, these cohort members were assumed to have perpetrated no IPA during each of the three reporting periods. To examine the effect of this assumption, the previous CFA was repeated using data from a sample of 909 cohort members that excluded the 41 cohort members with missing CTS-2 data at all three ages. The factor analysis conducted on this reduced sample yielded

the same results as found previously, indicating that the previous results were not affected by missing data.

4.6 Factor Analysis Summary

The previous analysis indicated that Model 1 was the best-fitting of the four models. As a result, IPA, violent offending, and property offending appear to represent three empirically distinct, yet related, behavioural domains. The goodness-of-fit indices for Model 1 also revealed that this model was highly consistent with the observed data. This suggests that Model 1 not only provides the best representation of the observed data, but also provides a highly accurate representation of this data. Sensitivity analyses revealed that these findings were robust to sample-selection bias and missing data.

5. Predictor Analyses

The previous analysis examined the extent to which IPA, violent offending, and property offending represent empirically distinct behavioural domains. However, issues related to the childhood, adolescent, and demographic predictors of these offence types remain unexamined. This chapter begins by describing the matrix of correlations between the observed measures and the observed predictors, and the matrix of correlations between the observed predictors themselves. Descriptive statistics are also provided for the observed predictors in the latter matrix. Four specific issues relating to these predictors are then addressed.

First, the childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending are identified and compared across offence types. This analysis has several implications for the prevention of these offence types, given that some predictors likely exert causal influences. In particular, IPA, violent offending, and property offending may be prevented using similar interventions if these offence types share similar predictors. By doing so, financial resources may be used more efficiently. The relationships between gender and these offence types will be given special attention, given the theoretical and practical importance of this predictor, and the controversy that surrounds the relationship between gender and IPA. The proportion of variance in the propensity towards each offence type that is explained by these predictors is also identified. The relationships between these predictors and offence types are addressed by extending Model 1 to a structural equation model that incorporates a number of observed predictors. Sensitivity analyses are conducted to test the robustness of the findings of this analysis.

Second, this chapter examines the extent to which the childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending exert different effects across these offence types. This issue is important to examine in order to identify why an intervention may differ in its effectiveness at preventing these offence types. This issue is addressed by using nested model comparisons to test for the equivalence of predictor effect sizes across latent variables.

Third, this chapter examines the components of the latent variable correlations that are explained by the effects of shared childhood, adolescent, and demographic predictors. By addressing this issue, the proportions of the relationships between IPA, violent offending, and property offending that arise due to shared childhood, adolescent, and demographic predictors can be identified. This issue will be addressed by comparing the latent variable correlations in Model 1 to the disturbance term correlations in a predictor model.

The fourth issue addressed in this chapter is the interaction between gender and the childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending. This issue is important to address as the presence of gender-predictor interactions would help clarify gender differences in offence rates. In addition, by addressing this issue, researchers can identify whether gender-specific theories and interventions for these offence types may be required. This issue is examined within the context of SEM by extending a predictor model to include a number of gender-predictor interaction variables.

The predictor models used to address these issues were all fitted to a list-wise deleted variance-covariance matrix using the Maximum Likelihood estimation method. In addition, all the following predictor models constrained the variances of the latent variables to one.

This ensured that the latent variables had a consistent metric, which in turn permitted direct comparisons of predictor effect sizes across offence types. This chapter concludes with a summary of the key findings, and outlines their implications.

5.1 Matrix of Correlations between Observed Measures and Observed Predictors

The matrix of correlations between the six observed measures and the 10 observed predictors is displayed in Table 4. Note that these correlations were frequently calculated from reduced samples ($N < 950$) due to missing data for several predictors. Therefore, an N value is also presented for each correlation.

Table 4 displays modest correlations between observed measures and observed predictors ($r_s = -.246 - .248, p_s > .05 - < .001$). When looking across the rows, higher levels of IPA, violent offending, and property offending were related to higher levels of socio-economic disadvantage ($r_s = .114 - .165, p_s < .001$), family dysfunction ($r_s = .109 - .209, p_s < .01$), childhood abuse ($r_s = .136 - .248, p_s < .001$), conduct disordered behaviours ($r_s = .168 - .227, p_s < .001$), deviant peer affiliations ($r_s = .097 - .231, p_s < .01$), and substance abuse ($r_s = .125 - .236, p_s < .001$). Higher levels of these offence types were also related to lower levels of academic ability ($r_s = -.079 - -.121, p_s < .05$) and the lack of a high-school qualification ($r_s = -.067 - -.246, p_s < .05$). Being of Māori ethnic identity was related to higher levels of IPA ($r_s = .160 - .182, p_s < .001$) and violent offending ($r_s = .170 - .176, p_s < .001$), but not property offending ($r_s = .059, p_s > .05$). Finally, female gender was related to higher levels of IPA ($r = .097, p < .01$), but lower levels of both violent offending ($r_s = -.139 - -.174, p_s < .001$) and property offending ($r_s = -.159 - -.201, p_s < .001$; see Table 4).

Table 4. *Matrix of Correlations between Observed Measures and Observed Predictors.*

		IPA-1	IPA-2	VIO-1	VIO-2	PROP-1	PROP-2
SED	<i>r</i>	0.158***	0.165***	0.150***	0.115***	0.028	0.114***
	<i>N</i>	941	941	941	941	941	941
Fam. dys.	<i>r</i>	0.209***	0.188***	0.147***	0.152***	0.109**	0.145***
	<i>N</i>	843	843	843	843	843	843
Child. ab.	<i>r</i>	0.248***	0.243***	0.198***	0.136***	0.154***	0.153***
	<i>N</i>	950	950	950	950	950	950
Cond.	<i>r</i>	0.200***	0.174***	0.202***	0.194***	0.168***	0.227***
	<i>N</i>	922	922	922	922	922	922
Dev. peer	<i>r</i>	0.220***	0.174***	0.097**	0.147***	0.151***	0.231***
	<i>N</i>	864	864	864	864	864	864
Subst. ab.	<i>r</i>	0.169***	0.159***	0.125***	0.129***	0.145***	0.236***
	<i>N</i>	879	879	879	879	879	879
Acad.	<i>r</i>	-0.079*	-0.094**	-0.120***	-0.121***	-0.012	-0.102**
	<i>N</i>	950	950	950	950	950	950
Qual.	<i>r</i>	-0.102**	-0.108**	-0.209***	-0.221***	-0.067*	-0.246***
	<i>N</i>	949	949	949	949	949	949
Māori	<i>r</i>	0.160***	0.182***	0.170***	0.176***	0.059	0.059
	<i>N</i>	950	950	950	950	950	950
F. gen.	<i>r</i>	0.097**	0.046	-0.139***	-0.174***	-0.201***	-0.159***
	<i>N</i>	950	950	950	950	950	950

Note: IPA-1 = Observed measure of interpartner abuse 1; IPA-2 = Observed measure of interpartner abuse 2; VIO-1 = Observed measure of violent offending 1; VIO-2 = Observed measure of violent offending 2; PROP-1 = Observed measure of property offending 1; PROP-2 = Observed measure of property offending 2; SED = Socio-economic disadvantage; Fam. dys. = Family dysfunction; Child. ab. = Childhood abuse; Cond. = Conduct disordered behaviours; Dev. peer = Deviant peer affiliations; Subst. ab. = Substance abuse; Acad. = Academic ability; Qual. = Obtainment of a high-school qualification; Māori = Being of Māori ethnic identity; F. gen. = Female gender; * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

5.2 Matrix of Correlations and Descriptive Statistics for Observed Predictors

Table 5 displays the matrix of correlations, means, and standard deviations for the 10 observed predictors. Once again, an *N* value is presented for each correlation due to missing data for several predictors.

This table displays modest to moderate correlations between the observed predictors ($r_s = -.403 - .470$, $p_s > .05 - < .001$). Positive correlations were observed between socio-economic disadvantage, family dysfunction, childhood abuse, conduct disordered behaviours, deviant peer affiliations, and substance abuse ($r_s = .116 - .409$, $p_s < .01$). In contrast, these predictors, with the exception of substance abuse, were negatively associated with academic ability ($r_s = -.100 - -.403$, $p_s < .01$). The obtainment of a high-school qualification was negatively associated with socio-economic disadvantage ($r = -.378$, $p < .001$), family dysfunction ($r = -.266$, $p < .001$), childhood abuse ($r = -.179$, $p < .001$), conduct disordered behaviours ($r = -.380$, $p < .001$), deviant peer affiliations ($r = -.213$, $p < .001$), and substance abuse ($r = -.269$, $p < .001$), but positively associated with academic ability ($r = .470$, $p < .001$). Being of Māori ethnic identity was related to higher levels of socio-economic disadvantage ($r = .212$, $p < .001$), family dysfunction ($r = .208$, $p < .001$), childhood abuse ($r = .125$, $p < .001$), conduct disordered behaviours ($r = .113$, $p < .01$), deviant peer affiliations ($r = .129$, $p < .001$), and substance abuse ($r = .132$, $p < .001$), but lower levels of academic ability ($r = -.104$, $p < .01$). In addition, fewer Māori than non-Māori had obtained a high-school qualification ($r = -.087$, $p < .01$). Female gender was related to higher levels of childhood abuse ($r = .093$, $p < .01$) and academic ability ($r = .096$, $p < .01$), but lower levels of conduct disordered behaviours ($r = -.185$, $p < .001$; see Table 5).

Table 5. *Matrix of Correlations and Descriptive Statistics for Observed Predictors.*

		SED	Fam. dys.	Child. ab.	Cond.	Dev. peer	Subst. ab.	Acad.	Qual.	Māori	F. gen.
SED	<i>r</i>	1.000***									
	<i>N</i>	941									
Fam. dys.	<i>r</i>	0.306***	1.000***								
	<i>N</i>	843	843								
Child. ab.	<i>r</i>	0.213***	0.316***	1.000***							
	<i>N</i>	941	843	950							
Cond.	<i>r</i>	0.269***	0.340***	0.252***	1.000***						
	<i>N</i>	922	841	922	922						
Dev. peer	<i>r</i>	0.165***	0.296***	0.210***	0.214***	1.000***					
	<i>N</i>	864	835	864	858	864					
Subst. ab.	<i>r</i>	0.116**	0.258***	0.174***	0.181***	0.409***	1.000***				
	<i>N</i>	879	843	879	873	863	879				
Acad.	<i>r</i>	-0.403***	-0.185***	-0.145***	-0.319***	-0.100**	-0.030	1.000***			
	<i>N</i>	941	843	950	922	864	879	950			
Qual.	<i>r</i>	-0.378***	-0.266***	-0.179***	-0.380***	-0.213***	-0.269***	0.470***	1.000***		
	<i>N</i>	940	843	949	921	864	879	949	949		
Māori	<i>r</i>	0.212***	0.208***	0.125***	0.113**	0.129***	0.132***	-0.104**	-0.087**	1.000***	
	<i>N</i>	941	843	950	922	864	879	950	949	950	
F. gen.	<i>r</i>	0.016	0.042	0.093**	-0.185***	0.025	-0.019	0.096**	0.061	-0.019	1.000***
	<i>N</i>	941	843	950	922	864	879	950	949	950	950
M		1.917	1.561	0.296	49.495	5.522	0.141	35.477	0.829	1.878	1.518
SD		1.573	1.336	0.531	7.178	2.566	0.408	14.604	0.376	0.328	0.500

Note: SED = Socio-economic disadvantage; Fam. dys. = Family dysfunction; Child. ab. = Childhood abuse; Cond. = Conduct disordered behaviours; Dev. peer = Deviant peer affiliations; Subst. ab. = Substance abuse; Acad. = Academic ability; Qual. = Obtainment of a high-school qualification; Māori = Being of Māori ethnic identity; F. gen. = Female gender; * = $p < .05$; ** = $p < .01$; *** = $p < .001$; M = Mean; SD = Standard deviation.

Collectively, the information presented in Tables 2, 4, and 5 represents the full data set used in subsequent predictor analyses.

5.3 Single Predictor Model

To estimate the bivariate correlations between individual predictors and the latent variables, the best fitting model (Model 1) was extended to a simple structural equation model, known as the Single Predictor Model (SPM; see Figure 9). This model was based on the Predictor Model Template (see Figure 5), and examined the relationships between a single observed predictor (independent variable) and the latent variables (dependent variables). A wide range of predictors were individually entered into the Single Predictor Model, including measures of socio-economic disadvantage, family dysfunction, childhood abuse, conduct disordered behaviours, deviant peer affiliations, substance abuse, academic ability, the obtainment of a high-school qualification, being of Māori ethnic identity, and gender. These variables were examined as previous studies have identified significant relationships between them and IPA, violent offending, and/or property offending (Babinski et al., 1999; Capaldi et al., 2001; Ehrensaft et al., 2003; Farrington, 1989; Farrington, 1990; Fergusson & Horwood, 2002; Fergusson et al., 2005a; Fergusson et al., 2004; Herrenkohl et al., 2004; Magdol et al., 1998; Malinosky-Rummell & Hansen, 1993; Marie et al., 2008; Ministry of Justice, 2009; Pollock et al., 1990; Rosenbaum, 1989; Sorenson et al., 1996; Widom & Ames, 1994).

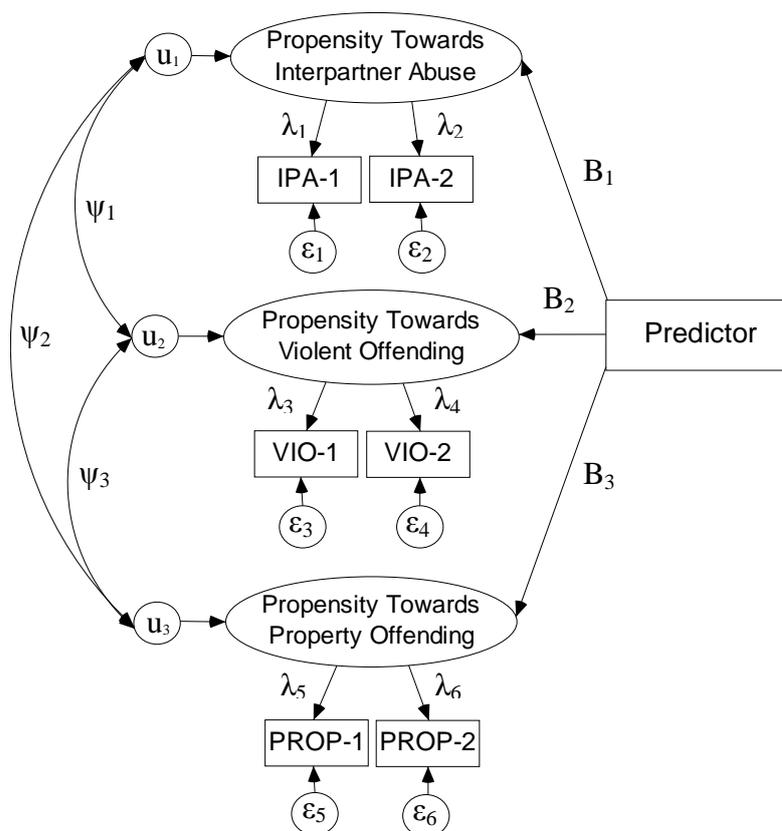
Figure 9. *Single Predictor Model.*

Table 6 displays the estimated bivariate correlations (r) between each predictor and the latent variables. Overall, all correlations were modest to moderate in size ($r_s = -.29 - .28$) and were statistically significant ($p_s < .05$). Higher levels of socio-economic disadvantage, family dysfunction, childhood abuse, conduct disordered behaviours, deviant peer affiliations, and substance abuse were associated with stronger propensities towards IPA ($r_s = .18 - .28$, $p_s < .001$), violent offending ($r_s = .15 - .27$, $p_s < .001$), and property offending ($r_s = .11 - .27$, $p_s < .01$). In addition, lower levels of academic ability and the lack of a high school qualification were associated with stronger propensities towards IPA ($r_s = -.10 - -.12$, $p_s < .01$), violent offending ($r_s = -.17 - -.29$, $p_s < .001$), and property offending ($r_s = -.10 - -.25$, $p_s < .05$). Being of Māori ethnic identify was also associated with stronger propensities towards IPA ($r = .20$, $p < .001$), violent offending ($r = .24$, $p < .001$), and property offending

($r = .08, p < .05$). Females displayed a stronger propensity towards IPA ($r = .09, p < .05$), but weaker propensities towards violent offending ($r = -.21, p < .001$) and property offending ($r = -.23, p < .001$; see Table 6).

Table 6. *Bivariate Correlations (r) between Observed Predictors and Latent Variables in the Single Predictor Model.*

<i>Predictors</i>	<i>Latent Variables</i>		
	<i>Propensity Towards Interpartner Abuse</i>	<i>Propensity Towards Violent Offending</i>	<i>Propensity Towards Property Offending</i>
	<i>r</i>	<i>r</i>	<i>r</i>
Socio-economic disadvantage	0.18***	0.19***	0.11**
Family dysfunction	0.23***	0.20***	0.18***
Childhood abuse	0.28***	0.25***	0.20***
Conduct disordered behaviours	0.21***	0.27***	0.27***
Deviant peer affiliations	0.23***	0.15***	0.26***
Substance abuse	0.18***	0.18***	0.27***
Academic ability	-0.10**	-0.17***	-0.10*
Obtainment of a high-school qualification	-0.12***	-0.29***	-0.25***
Being of Māori ethnic identity	0.20***	0.24***	0.08*
Female gender	0.09*	-0.21***	-0.23***

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

Broadly speaking, when looking down the columns, all predictors were modestly to moderately related to cohort members' propensities towards IPA, violent offending, and property offending. Similarly, when looking across the rows, the directions of the correlations were generally consistent across offence types. However, a visual comparison of the magnitude of the correlations across offence types suggests that some predictors exerted different effects across offence types, most notably gender. This issue is directly addressed in a subsequent analysis (see section 5.6). Finally, note that the correlations between the

latent variables and the predictors (see Table 6) were stronger than those between the observed measures and the predictors (see Table 4). This indicates that the latent variables were more reliable measures of IPA, violent offending, and property offending than the observed measures of these offence types.

5.4 Multiple Predictor Model

The previous analysis highlighted a range of childhood, adolescent, and demographic variables that are significant predictors of adult propensities towards IPA, violent offending, and property offending. However, the analysis did not control for shared variance. As a result, the unique variance in each propensity that is explained by each predictor remains unclear. The following analysis addressed this issue by extending the best fitting model (Model 1) to a structural equation model, known as the Multiple Predictor Model (MPM). This structural equation model was based on the Predictor Model Template (see Figure 5), and regressed the three latent variables (dependent variables) on 10 mutually correlated observed predictors (independent variables). The MPM is depicted in Figure 10. However, for demonstrative purposes, this model was depicted with only socio-economic disadvantage, family dysfunction, and childhood abuse as predictors.

($\beta = .18, p < .001$), and female gender ($\beta = -.20, p < .001$) each explained unique variance in the propensity towards violent offending. In addition, the relationship between conduct disordered behaviours and violent offending ($\beta = .09$) fell only marginally short of statistical significance ($p = .05$). Finally, childhood abuse ($\beta = .12, p < .01$), conduct disordered behaviours ($\beta = .11, p < .05$), deviant peer affiliations ($\beta = .15, p < .001$), substance abuse ($\beta = .13, p < .01$), the obtainment of a high-school qualification ($\beta = -.13, p < .01$), and female gender ($\beta = -.21, p < .001$) each explained unique variance in the propensity towards property offending (see Table 7).

Collectively these predictors explained 15.6%, 22.2%, and 20.3% of the variance in the propensities towards IPA, violent offending, and property offending, respectively (see Table 7). Therefore, while these predictors jointly explained a notable proportion of variance in each propensity, the majority of the variance in each propensity remained unexplained.

Broadly speaking, these findings suggest that similar sets of childhood, adolescent, and demographic variables are predictive of IPA, violent offending, and property offending after controlling for shared variance. When looking across the rows, the directions of the regression coefficients were generally consistent across offence types. However, once again, a number of predictors appeared to exert different effects across offence types (see Table 7). As noted earlier, this issue is the focus of a subsequent analysis (see section 5.6).

Table 7. *Standardised Regression Coefficients (β) between Observed Predictors and Latent Variables in the Multiple Predictor Model.*

<i>Predictors</i>	<i>Latent Variables</i>		
	<i>Propensity Towards Interpartner Abuse</i>	<i>Propensity Towards Violent Offending</i>	<i>Propensity Towards Property Offending</i>
	β	β	β
Socio-economic disadvantage	0.07	0.02	-0.01
Family dysfunction	0.04	0.04	0.02
Childhood abuse	0.17***	0.17***	0.12**
Conduct disordered behaviours	0.13**	0.09 ^(*)	0.11*
Deviant peer affiliations	0.09*	0.02	0.15***
Substance abuse	0.08*	0.04	0.13**
Academic ability	0.00	0.03	0.06
Obtainment of high-school qualification	0.04	-0.18***	-0.13**
Being of Māori ethnic identity	0.12***	0.18***	0.01
Female gender	0.08*	-0.20***	-0.21***
Total variance explained (%)	15.6	22.2	20.3

Note: ^(*) = $p = .05$; * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

5.5 Sensitivity Analyses: Predictor Analyses

To examine the extent to which sample-selection bias arising from the process of sample attrition affected the previous results, the MPM was refitted to data that had been transformed using the previously described data weighting methods originally described by Little and Rubin (1987). This analysis produced essentially identical results to those reported above, indicating that the findings of the previous analysis were not affected by sample-selection bias.

The MPM was also refitted to data from a sample of 909 cohort members, which excluded the 41 cohort members who had missing CTS-2 data at all three ages. The standardised path

weights for the MPM were practically unchanged, indicating that the previous findings were also unaffected by missing data.

Given that the previous results were robust to sample-selection bias and missing data, the results of subsequent predictor analyses were assumed to be unaffected by these issues.

5.6 Comparing Predictor Effect Sizes across Offence Types

Findings from previous analyses suggested that some childhood, adolescent, and demographic predictors exerted different effects on the propensities towards IPA, violent offending, and property offending. As a result, interventions targeting these offence types may differ in their effectiveness across offence types, whereby interventions will be more effective with offence types that are strongly related to the targeted variables, and less effective with offence types that are weakly related to the targeted variables. Given these implications, a more in depth analysis of the equivalence of predictor effect sizes across outcomes was required.

This issue was examined using nested model comparisons. Models are nested if they are identical in form, but one model contains more parameter constraints than the other. Nested model comparisons test the null hypothesis that there is no significant difference ($p < .05$) in the fit of two competing nested models. This is achieved by investigating whether the chi-square difference between the models is significant for the degrees of freedom difference between the models. For example, if Model X had a chi-square of 6.0 and three degrees of freedom, and Model Y had a chi-square of 2.0 and two degrees of freedom, the chi-square difference would be 4.0 and the degrees of freedom difference would be one. A chi-square of

4.0 is significant for one degree of freedom ($\chi^2(1) = 4.0, p < .05$). Therefore, the null hypothesis would be rejected. This would indicate that one model explained the observed data significantly better than the other.

The nested model comparisons in this study tested the equivalence of predictor effect sizes across the three offence types. A separate nested model comparison was conducted for each predictor. For each comparison, the fit of the Multiple Predictor Model (MPM) was compared to the fit of a constrained version of this model (MPM_{Con}). The three path weights from the predictor to the latent variables were left free to vary in the MPM. However, these path weights were constrained to equality in the MPM_{Con}. For example, when comparing the effects of gender across offence types, the fit of the MPM, which left the path weights from gender to IPA, violent offending, and property offending free to vary, was compared to the fit of the MPM_{Con}, which constrained these three path weights to equality.

Table 8 displays the results of these nested model comparisons. Broadly speaking, this table indicates that the majority of the predictors exerted similar effects across offence types, whereby socio-economic disadvantage, family dysfunction, childhood abuse, conduct disordered behaviours, substance abuse, and academic ability all exerted similar effects across IPA, violent offending, and property offending ($ps > .05$). However, deviant peer affiliations, the obtainment of a high-school qualification, being of Māori ethnic identity, and female gender exerted significantly different effects across these offence types (see Table 8). After reviewing Tables 7 and 8, the current results suggested that deviant peer affiliations exerted a significantly greater effect ($p < .05$) on property offending than on abusive behaviours, whereas the obtainment of a high-school qualification appeared to exert a significantly greater effect ($p < .01$) on criminal offending than on IPA. Being of Māori

ethnic identity appeared to be a stronger predictor ($p < .001$) of abusive behaviour than property offending. Finally, females were more likely to perpetrate IPA than males, whereas males were more likely to engage in criminal offending than females ($p < .001$). Together these findings revealed broad similarities in predictors' effects across IPA, violent offending, and property offending. However, several predictors differed significantly in their effects across these offence types, most notably gender. This pattern of similarities and differences is broadly consistent with the pattern of relatedness and distinctness found in the previously described CFA.

Table 8. *Nested Model Comparisons of Predictor Effect Sizes across Offence Types.*

<i>Predictors</i>	χ^2 difference (2 df)	<i>p</i>
Socio-economic disadvantage	4.2	-
Family dysfunction	0.3	-
Childhood abuse	0.6	-
Conduct disordered behaviours	1.7	-
Deviant peer affiliations	9.2	<.05
Substance abuse	4.8	-
Academic ability	1.4	-
Obtainment of a high-school qualification	10.8	<.01
Being of Māori ethnic identity	25.2	<.001
Female gender	51.9	<.001

5.7 Components of the Latent Variable Correlations Explained by Shared Predictors

By examining the parameter estimates for Model 1 and the Multiple Predictor Model, it is possible to identify the components of the latent variable correlations that were explained by shared predictors. As noted earlier, by addressing this issue, researchers can identify the proportions of the relationships between IPA, violent offending, and property offending that were explained by shared childhood, adolescent, and demographic predictors.

This issue is addressed in Table 9, which shows the components of the latent variable correlations explained by shared predictors, the residual unexplained latent variable correlations (disturbance term correlations for the MPM), and the total latent variable correlations for Model 1 (see Figure 8). This table indicates that shared childhood, adolescent, and demographic predictors explained notable, and similar, amounts of the latent variable correlations between IPA and violent offending ($r = .13$), and between IPA and property offending ($r = .11$). However, these predictors explained comparatively more of the latent variable correlation between violent and property offending ($r = .18$). Overall, the majority of these latent variable correlations remained unexplained (see Table 9).

Table 9 also indicates that the residual unexplained correlation between violent and property offending ($r = .61$) was much greater than those between IPA and violent offending ($r = .15$), and between IPA and property offending ($r = .12$). Therefore, shared predictors explained a smaller proportion of the relationship between violent and property offending than of the relationships between IPA and violent offending, and between IPA and property offending.

Table 9. *Components of the Latent Variable Correlations Explained by Shared Predictors.*

<i>Correlation between latent propensities towards...</i>	<i>Component of Correlation Explained by Shared Predictors</i>	<i>Residual Unexplained Correlation</i>	<i>Total Correlation</i>
IPA and Violent Offending	0.13 (46.4%)	0.15 (53.6%)	0.28
IPA and Property Offending	0.11 (47.8%)	0.12 (52.2%)	0.23
Violent and Property Offending	0.18 (22.8%)	0.61 (77.2%)	0.79

Note: Figures in Table 9 represent Pearson's correlation coefficients (r).

5.8 Gender-Predictor Interactions

Previous analyses identified a number of significant childhood, adolescent, and demographic predictors of adult IPA, violent offending, and property offending. However, gender-predictor interactions remain unexamined. As noted earlier, these interactions are important to address as their presence would provide a possible explanation for gender differences in the rates of these offences. Their presence would also indicate that gender-specific theories and interventions for IPA and criminal offending may be required. To investigate this issue, the Multiple Predictor Model (MPM) was expanded to test for the presence of significant interactions between gender and the predictors' effects on the latent variables.

The results of this analysis are summarised in Table 10, which displays the unstandardised regression coefficients (B), standard errors (SE), and significance levels of the gender-predictor interactions. Looking down the columns, this table indicates that conduct disordered behaviours had a greater effect on IPA perpetration for females than males ($B = .03$, $SE = .01$, $p < .05$). In contrast, family dysfunction ($B = -.18$, $SE = .07$, $p < .01$) and childhood abuse ($B = -.46$, $SE = .15$, $p < .01$) had greater effects on violent offending for males than females. Finally, childhood abuse ($B = -.58$, $SE = .14$, $p < .001$) and substance abuse ($B = -.53$, $SE = .20$, $p < .01$) were found to have greater effects on property offending for males than females (see Table 10). These findings provide evidence of gender-predictor interactions in relation to IPA, violent offending, and property offending. However, no predictor consistently displayed significant interactions with gender across all offence types.

Bonferroni adjustments were applied to these findings to reduce the likelihood of reporting significant gender-predictor interactions that may have occurred by chance. Given that the

previous analysis involved 27 calculations of statistical significance, the previous p -value for statistical significance ($p < .05$) was divided by 27 to produce the Bonferroni-adjusted p -value for statistical significance ($p < .002$). When using this more conservative p -value, only one gender-predictor interaction remained statistically significant. Specifically, childhood abuse continued to have a significantly greater effect on property offending for males than females ($p < .001$; see Table 10). However, the interaction between gender and childhood abuse for violent offending fell only marginally short of statistical significance ($p = .002$). These findings suggest that, with the exception of childhood abuse, the predictors examined in this study had similar effects across gender on the propensities towards IPA, violent offending, and property offending.

Table 10. *Gender-Predictor Interactions.*

<i>Gender-Predictor Interactions</i>	<i>Propensity Towards Interpartner Abuse</i>		<i>Propensity Towards Violent Offending</i>		<i>Propensity Towards Property Offending</i>	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
F. gen. - SED	-0.05	0.05	0.01	0.05	0.06	0.05
F. gen. - Fam. dys.	0.07	0.06	-0.18**	0.07	-0.03	0.06
F. gen. - Child. ab.	-0.01	0.14	-0.46**	0.15	-0.58***	0.14
F. gen. - Cond.	0.03*	0.01	-0.02	0.01	-0.02	0.01
F. gen. - Dev. peer	0.06	0.03	0.02	0.03	-0.04	0.03
F. gen. - Subst. ab.	-0.33	0.19	-0.34	0.21	-0.53**	0.20
F. gen. - Acad.	0.00	0.01	0.00	0.01	0.00	0.01
F. gen. - Qual.	0.14	0.22	0.31	0.24	0.00	0.23
F. gen. - Māori	0.35	0.21	-0.38	0.23	0.07	0.22

Note: F. gen. = Female gender; SED = Socio-economic disadvantage; Fam. dys. = Family dysfunction; Child. ab. = Childhood abuse; Cond. = Conduct disordered behaviours; Dev. peer = Deviant peer affiliations; Subst. ab. = Substance abuse; Acad. = Academic ability; Qual. = Obtainment of a high-school qualification; Māori = Being of Māori ethnic identity; * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

5.9 Summary of Predictor Analyses

The analyses described in this chapter revealed that a number of childhood, adolescent, and demographic variables were significant predictors of adult propensities towards IPA perpetration, violent offending, and/or property offending, even after controlling for shared variance (see Table 7). While several variables did not explain unique variance in any propensity, many explained unique variance in two propensities. In addition, a small number of predictors explained unique variance in all three propensities (see Table 7). Overall, these findings suggest that IPA, violent offending, and property offending share a number of the same childhood, adolescent, and demographic predictors.

Of particular note, female gender explained significant amounts of unique variance in the propensities towards IPA ($\beta = .08, p < .05$), violent offending ($\beta = -.20, p < .001$), and property offending ($\beta = -.21, p < .001$; see Table 7). A comparison of the bivariate correlations in Table 6 and the standardised regression coefficients in Table 7 reveals that the effects of all predictors, except gender, decreased considerably after controlling for shared variance. These findings indicate that gender differences in the propensities towards these offence types were not accounted for by gender differences in the predictors examined in this study.

The childhood, adolescent, and demographic predictors examined in this study explained between 15.6% – 22.2% of the variance in the three latent propensities (see Table 7). Such findings revealed that the majority of the variance in these propensities was unexplained.

Nested model comparisons revealed that many predictors had similar effects across the three offence types. However, several predictors, including gender, differed significantly in their effects across offence types (see Table 8). These findings indicated both similarities and differences in the effects of the childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending across these offence types. This was broadly consistent with earlier findings, which indicated that these offence types represent three empirically distinct, yet related, constructs.

Analyses also revealed that predictors explained a smaller proportion of the relationship between violent and property offending than of the relationships between IPA and violent offending, and IPA and property offending (see Table 9).

Only one statistically significant ($p < .002$) gender-predictor interaction was revealed; childhood abuse had a greater effect on property offending for males than females (see Table 10). The absence of additional gender-predictor interactions indicates that predictors typically had similar effects on both male and female propensities towards IPA, violent offending, and property offending.

6. Discussion

The current study analysed data gathered from 950 Christchurch Health and Development Study birth cohort members. Two key issues were examined. First, CFA was used to examine the extent to which IPA and criminal offending represent empirically distinct behavioural domains. Second, SEM techniques were used to identify and compare the childhood, adolescent, and demographic predictors of IPA and criminal offending. Analyses were also conducted to compare predictors' effects across offence types, to examine the proportions of the latent variable correlations that were explained by shared predictors, and to examine gender-predictor interactions. The key findings of this study are discussed below, and their theoretical and practical implications are considered. In addition, consideration is given to the methodological strengths and limitations of this study.

6.1 *Factor Structure*

The extent to which IPA and criminal offending represent empirically distinct behavioural domains is important to the theoretical conceptualisation of IPA. However, this issue has received little scholarly attention. This study examined this issue within the context of CFA by comparing the fit of four measurement models. Analyses revealed that Model 1 was most consistent with the observed data (see section 4.3). This suggests that IPA, violent offending, and property offending represent three empirically distinct, albeit related, behavioural domains. This finding is broadly consistent with those of previous studies (Moffitt et al., 2000; Piquero et al., 2005).

Such a finding indicates that general theories of criminal offending are unlikely to adequately explain IPA, particularly given the modest to moderate size of the latent variable correlations between IPA and violent offending, and between IPA and property offending (see Figure 8). Therefore, the current findings substantiate claims for specialised funding, research efforts, and theories for IPA. Similarly, both violent offending and property offending may require specialised funding, research efforts, and theories, given that these offence types were empirically distinct. However, the strong correlation observed between the latent propensities towards violent and property offending (see Figure 8) suggests that general theories of criminal offending may still explain these offence types. Therefore, this finding partially supports current practices of using general theories of criminal offending, such as differential association theory, psychodynamic theories of criminal offending, and social location theories of criminal offending, to explain both violent and property offending (Andrews & Bonta, 2006).

This study builds on the study conducted by Moffitt et al. (2000) in three ways. First, this study explicitly examined whether IPA and violent offending represent empirically distinct behavioural domains. As noted earlier, this issue was important to address given the inherent similarities between physical IPA and violent offending, and evidence of considerable overlap between these offence types (Gorman-Smith et al., 2001; Moffitt & Caspi, 1999). Second, this study also explicitly examined whether violent and property offending represent empirically distinct behavioural domains. This issue required attention given evidence that these offence types may be empirically distinct (MacDonald, Haviland & Morral, 2009; Moffitt et al., 2000; Piquero et al., 2005).

Finally, this study partially addressed a key limitation of previous research. Specifically, Moffitt et al. (2000) questioned cohort members at age 21 years about the extent to which they had engaged in IPA and general crime during the previous year. This provided information on the concurrent overlap of these offence types. However, evidence suggesting that individuals engaged exclusively in IPA or general crime could not be generalised to other ages, or across the life course, as some individuals involved exclusively in IPA between ages 20 – 21 years may have engaged in general crime at earlier ages, and vice versa (Moffitt et al., 2000). This limitation was minimised in this study by combining information over three reporting periods to create more general measures of individuals' propensities towards each offence type. While these measures enable the current results to be generalized more widely than those reported by Moffitt et al. (2000), caution should still be exerted when generalising these findings to other ages, or across the lifespan, for the reasons previously discussed. The scope of this study did not permit the inclusion of IPA and criminal offending data gathered over the entirety of the cohort members' lives. The generalizability of the current findings could have been improved by including such data.

6.2 Predictors of IPA, Violent Offending, and Property Offending

The childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending were examined by extending the best-fitting measurement model (Model 1) to a structural equation model. This model incorporated a number of observed predictors, which were mutually correlated to control for shared variance. An examination of predictor path weights revealed that stronger propensities towards IPA were associated with higher levels of childhood abuse, conduct disordered behaviours, deviant peer affiliations, substance abuse, being of Māori ethnic identity, and female gender (see Table 7). These findings were

consistent with previous research (Bookwala, 2002; Capaldi et al., 2001; Carrado et al., 1996; Ehrensaft et al., 2003; Fehringer & Hindin, 2009; Foshee, 1996; Gray & Foshee, 1997; Herrenkohl et al., 2004; Magdol et al., 1998; Marie et al., 2008; Sorenson et al., 1996).

Stronger propensities towards violent offending were related to higher levels of childhood abuse, the lack of a high-school qualification, being of Māori ethnic identity, and male gender. The relationship between conduct disordered behaviours and violent offending fell only marginally short of statistical significance (see Table 7). Finally, stronger propensities towards property offending were related to higher levels of childhood abuse, conduct disordered behaviours, deviant peer affiliations, substance abuse, the lack of a high-school qualification, and male gender (see Table 7). All these variables have previously been identified as significant predictors of violent, property, and/or general criminal offending (Babinski et al., 1999; Farrington, 1989; Farrington & Painter, 2004; Malinosky-Rummell & Hansen, 1993; Mears et al., 1998; Ministry of Justice, 2009; Moffitt et al., 2001; Steffensmeier & Allan, 1996; Widom & Ames, 1994).

These findings suggest that IPA, violent offending, and property offending share many of the same childhood, adolescent, and demographic predictors. Given that some of these variables may exert causal effects, prevention-focused interventions that target these variables are likely to be effective with perpetrators of IPA, violent offenders, and property offenders. Such findings indicate that specifically tailored interventions for these offence types may be unnecessary, and therefore uneconomical.

Previous findings highlighted a number of childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending. Many of these variables represent

promising targets for prevention-focused interventions. However, ethnic identity and gender are not plausible targets. Nevertheless, findings linking Māori ethnic identity and specific genders to higher rates of these offence types, even after controlling for shared variance, emphasize the importance of identifying and addressing ethnicity-specific and gender-specific responsivity issues in interventions.

Explanations for the link between Māori ethnic identity and abusive behaviour have been mixed and remain unclear. Stronger propensities towards offending amongst Māori are often assumed to result from impairments in cultural identity due to colonisation (Marie, 2010). However, interventions that focus on restoring cultural identity to Māori have not led to any demonstrable reductions in Māori offending or recidivism rates (Marie, 2010). This indicates that impairments in cultural identity due to colonisation are unlikely to explain the current findings.

Social location theories provide alternative explanations for why Māori displayed stronger propensities towards IPA and violent offending than non-Māori. Robert Merton's (1938) anomic theory proposes that crime is an innovative route to conventional success for individuals who find legitimate routes blocked due to their lower-class status (Andrews & Bonta, 2006). Anomie theory is supported by 1996 national statistics, which indicated that Māori men were over-represented in the lower social class, and under-represented in the upper social class (Statistics New Zealand, 2004). Despite this apparent support for anomie theory, a summary of eight meta-analyses revealed only weak associations between lower-class origins and criminal behaviour (Andrews & Bonta, 2006). This finding weakens the validity of anomie theory as an explanation of the current findings. Therefore, the underlying

causes of the relationships between Māori ethnic identity and both IPA and violent offending represent a key issue for future research to address.

Findings also revealed that females had greater propensities towards IPA than males (see Table 7). This finding is incompatible with the Feminist Theory of IPA, which proposes that male dominance and female self-defence are the only causes of IPA. Specifically, females cannot perpetrate more IPA than males if females only perpetrate IPA in self-defence. Similarly, findings indicating that other childhood, adolescent, and demographic variables may exert causal influences on IPA are also incompatible with the Feminist Theory of IPA as they indicate that male dominance and female self-defence may not be the only causes of IPA. Finally, given that few theories, if any, propose that male dominance and female self-defence underlie criminal offending, the Feminist Theory of IPA therefore assumes that the causes of IPA and criminal offending differ. However, the current findings suggest that IPA, violent offending, and property offending share a number of predictors. Such a finding is also inconsistent with the previously described assumptions of the Feminist Theory of IPA.

Previous studies have revealed a range of other findings incompatible with the Feminist Theory of IPA. For example, a study of over 13,000 university students from 32 countries, including non-Western countries, revealed that males and females exerted similar levels of dominance. In addition, the relationship between female dominance and female-perpetrated IPA was slightly stronger than that between male dominance and male-perpetrated IPA. Furthermore, female dominance and male dominance were similarly associated with severe female-perpetrated and male-perpetrated IPA, respectively (Straus, 2008). Finally, a study of the motives for IPA revealed that only 21.3% of male perpetrators used abuse to intimidate their partners, and only 35.6% of female perpetrators used abuse in self-defence (Makepeace,

1986). Collectively, these studies provide evidence inconsistent with many, if not all, of the major doctrines of the Feminist Theory of IPA.

Both current and previous findings indicate that the Feminist Theory of IPA requires alteration if it is to accurately explain IPA in New Zealand. Given that meta-analytic findings suggest that severe forms of IPA, including beating up, choking, and strangling a partner, are more prevalent amongst males than females (Archer, 2002), the Feminist Theory of IPA may be altered so that it is restricted to explaining severe IPA only. However, since this study does not differentiate between minor and severe IPA, it is unclear whether this alteration would enable the Feminist Theory of IPA to more accurately explain the current findings.

In the event that the Feminist Theory of IPA cannot be modified to incorporate contemporary findings, a different theory may need to be adopted as the predominant explanatory theory of IPA in New Zealand. Johnson and Ferraro (2000) provide a plausible alternative theory. This theory proposes that there are four subtypes of IPA, which include common couple violence, intimate terrorism, violent resistance, and mutual violent control. These subtypes of IPA differ in their relationships with gender. For example, in heterosexual relationships, common couple violence and mutual violent control are gender symmetric. In contrast, intimate terrorism is perpetrated almost exclusively by men, whereas violent resistance is perpetrated almost exclusively by women (Johnson, 2006). These subtypes of IPA are also believed to have different causes, patterns of development, and consequences (Johnson, 2006). For example, both intimate terrorism and mutual violent control are strongly associated with a desire to dominate and control, whereas common couple violence is not (Johnson & Ferraro, 2000). Overall, unlike the Feminist Theory of IPA, the theory proposed

by Johnson and Ferraro (2000) appears capable of accounting for the gender asymmetry in IPA found in this study, as well as the current findings related to the potential causes of IPA. In addition, this theory provides a framework within which more specific theories can be developed about the relationships between gender and indices of IPA.

The finding that females had a stronger propensity towards IPA than males is inconsistent with the dominant discourse in Western society. This discourse maintains that IPA is primarily, if not exclusively, perpetrated by males towards females. However, findings from 275 scholarly investigations are broadly consistent with those of the current study, whereby females were found to perpetrate at least as much physical IPA as males (Fiebert, 2010). Straus (2007) proposed a range of reasons for the apparent disparity between the dominant discourse in Western society and empirical findings. These reasons included the suppression and withholding of evidence that contradicts this discourse, the misrepresentation of findings, and the use of methodology biased towards the Feminist Theory of IPA. These represent several of the more common reasons why dominant discourse, explanatory theory, and interventions continue to be based on the Feminist Theory of IPA, despite the presence of considerable evidence that contradicts this theory.

While propensities towards IPA were stronger for females than males, propensities towards violent and property offending were stronger for males than females (see Table 7). The latter trend has been noted in a number of other studies (Moffitt et al., 2001), although the causes of this trend remain unclear. One explanation of gender asymmetry in adolescent offending is that schools ‘emasculate’ adolescent males by denying masculine ideals, such as independence, dominance, daring, and control. As a result, these males engage in pranks, theft, mischief, minor theft, and drinking outside the school in an attempt to restore the

masculine ideals denied by the school, and to re-establish a public masculine identity that has been partially diminished by the school (Messerschmidt, 1995). In contrast, feminine ideals, such as gentleness and compassion, are not discouraged by schools. Therefore, adolescent females' gender-specific ideals and feminine identities are unlikely to be detrimentally affected by schools. This theory proposes that gender asymmetry in adolescent offending results from emasculation by schools. However, gender asymmetry in adult offending may be explained by a similar process. Specifically, societal norms and values of peace and kindness may, for a minority of adults, have emasculating effects similar to those believed to be present in schools. These adults may then seek to restore their masculine ideals, and re-establish public masculine identities by engaging in criminal behaviour. Research is needed to investigate whether this process is responsible for the gender asymmetry in adult criminal offending.

Other popular explanations for gender differences in criminal offending focus on gender differences in personality traits. Research has revealed that 96% of the gender differences in antisocial behaviour can be explained by gender differences in negative emotionality and constraint, whereby males have more negative emotionality and less constraint than females (Moffitt et al., 2001). Similarly, given evidence that the relationship between gender and criminal offending becomes non-significant when self-control is controlled for, gender differences in criminal offending may also be due to gender differences in self-control (Burton, Cullen, Evans, Alardi & Dunaway, 1998). Together, these findings provide compelling evidence that gender differences in personality traits may underlie gender differences in criminal offending.

Finally, in contrast to the previously described variables, socio-economic disadvantage, family dysfunction, and academic ability were not significant predictors of IPA, violent offending, or property offending once shared variance was controlled for (see Table 7). However, initial analyses using the Single Predictor Model revealed that these variables were significant predictors of all three offence types (see Table 6). This indicates that considerable proportions of the correlations initially observed between these predictors and offence types were explained by other predictors. As a result, childhood and adolescent socio-economic disadvantage, family dysfunction, and academic ability should not represent primary targets in prevention-focused interventions for IPA, violent offending, and property offending.

6.3 Similarities and Differences in Predictor Effect Sizes across Offence Types

Previous analyses identified a general pattern of similarity in the childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending. However, a preliminary examination of the standardised regression coefficients indicated that several predictors exerted different effects across these offence types (see Table 7). This issue was addressed more extensively using nested model comparisons, within the context of SEM, to test the equivalences of predictor effect sizes across offence types.

Broadly speaking, the majority of the childhood, adolescent, and demographic predictors exerted similar effects across IPA, violent offending, and property offending. However, several predictors exerted different effects across these offence types (see Table 8). This pattern of similarities and differences has previously been noted with respect to the personality-based predictors of IPA and general crime (Moffitt et al., 2000), and the

childhood, adolescent, and adulthood predictors of violent and property offending (Farrington, 1991).

In the current study, socio-economic disadvantage, family dysfunction, childhood abuse, conduct disordered behaviours, substance abuse, and academic ability exerted similar effects across all three offence types. However, a number of predictors exerted different effects across two or more offence types (see Table 8). In particular, deviant peer affiliations appeared to exert stronger effects on property offending than on IPA and violent offending (see Tables 7 and 8). These findings indicate that intervention components addressing deviant peer affiliations may be more beneficial for property offenders than for those engaging in abusive behaviours. The obtainment of a high-school qualification appeared to exert stronger effects on violent and property offending than on IPA (see Tables 7 and 8). Therefore, interventions designed to help individuals gain academic qualifications are likely to reduce criminal offending to a greater extent than IPA. Māori ethnic identity appeared to be a stronger predictor of IPA and violent offending than of property offending (see Tables 7 and 8). This suggests that school-based conflict-resolution and anti-violence programs may yield greater benefits when delivered in schools containing high proportions of ethnic and racial minority students. Finally, female gender demonstrated the most significant differences in effect sizes across offence types, whereby female gender was positively associated with IPA, but negatively associated with violent and property offending (see Tables 7 and 8). These findings emphasise the importance of addressing the processes leading to female-perpetrated IPA, and those leading to male-perpetrated criminal offending in prevention-focused interventions.

While a predictor may exert similar effects across offence types, the primary processes through which it predisposes individuals towards each offence type may differ across offence types. For example, say that deviant peer affiliations exerted similar effects across IPA and property offending. Deviant peer affiliations may primarily predispose individuals towards IPA by increasing the extent to which they engage in hostile talk about their partners, and decreasing their perceived social constraints around this behaviour. In contrast, deviant peer affiliations may primarily predispose individuals towards property offending by creating social pressure to engage in this behaviour, and by promoting property offending as a legitimate source of income. These potential differences indicate that, despite the current findings, different interventions could still be required for IPA, violent offending, and property offending to ensure that the relevant predisposing processes are targeted for each offence type. This issue may be clarified by investigating whether predictors' effects and their predisposing processes are similar across offence types.

6.4 Effects of Shared Predictors on Latent Variable Correlations

The previous section discussed an analysis of the extent to which a range of childhood, adolescent, and demographic predictors exerted similar effects across IPA, violent offending, and property offending. Following this analysis, an additional analysis was conducted to identify the components of the latent variable correlations that were explained by these predictors. This analysis indicated that shared predictors explained some of the latent variable correlations (see Table 9). This finding supports those of the initial predictor analyses by further highlighting that IPA, violent offending, and property offending have common predictors, and therefore may have common causes.

Findings from earlier predictor analyses indicated that predictors collectively explained more variance in the propensities towards violent and property offending than in the propensity towards IPA (see Table 7). This finding was reflected in the analysis of latent variable correlations, whereby, in absolute terms, the explained component of the correlation between violent and property offending was larger than the explained components of the correlations between IPA and violent offending, and IPA and property offending (see Table 9). However, the unexplained component of the correlation between violent and property offending was considerably larger than the unexplained components of the other correlations, given that the total correlation between violent and property offending was considerably larger than the other total correlations (see Table 9). This finding raises the question of what other variables may explain the substantial unexplained component of the correlation between violent and property offending.

Many variables have been linked with criminal offending, and may therefore account for the unexplained component of the correlation between violent and property offending noted in this study. In a summary of eight meta-analyses, Andrews and Bonta (2006) identify a range of time-dynamic variables that are strongly related to criminal offending, which include: 1) An antisocial personality pattern characterised by impulsiveness, adventurous pleasure-seeking, generalised trouble, restless aggressiveness, and callous disregard for others; 2) Antisocial attitudes, such as pro-crime attitudes, values, and beliefs; 3) Antisocial associates, including deviant family members and peers; 4) Poor family and marital circumstances, such as poor family/marital relationships, and poor parental monitoring, supervision, and discipline; 5) Poor school and work circumstances, such as poor school/work relationships, and low levels of school/work performance, involvement, rewards, and satisfaction; 6) Low levels of involvement and satisfaction in anti-criminal leisure pursuits; and 7) Substance

abuse. These variables are widely recognised as seven of the strongest predictors of criminal offending (Andrews & Bonta, 2006). Personal distress/psychopathology was also predictive of criminal offending, although its effect was considerably smaller than those of the previous variables (Andrews & Bonta, 2006).

Given that this study only addressed the childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending, future studies may wish to investigate whether the previous time-dynamic predictors help explain the substantial unexplained component of the correlation between violent and property offending (see Table 9). It stands to reason that more proximal predictors, such as current substance abuse and current financial stress, are likely to have a greater influence on current violent and property offending than the childhood, adolescent, and demographic predictors examined in this study. Therefore, more proximal predictors are likely to account for a considerable proportion of the unexplained component of the correlation between violent and property offending.

6.5 Differential Impact of Risk Factors on Outcomes across Gender

The final issue investigated in this study was the differential impact of risk factors across gender. This issue was examined by expanding Model 1 to test for gender-predictor interactions. While several significant ($p < .05$) gender-predictor interactions were initially identified, the interaction between gender and childhood abuse in relation to property offending was the only interaction to remain statistically significant when the more conservative Bonferroni-adjusted significance level was used ($p < .002$). This interaction indicated that abused males were disproportionately more likely than abused females to engage in property offending (see Table 10). To date, few studies, if any, have investigated

gender-predictor interactions specifically in relation to property offending. As a result, there are few findings to compare the current findings against.

Previous studies have identified gender-predictor interactions for several socio-demographic, family, parenting, academic, and personality predictors of antisocial behaviour (Farrington & Painter, 2004; Moffitt et al., 2001). These findings appear inconsistent with the current findings, given that many of the previously described gender-predictor interactions failed to reach statistical significance in this study. This may, in part, have been due to the use of a more stringent p -value in this study ($p < .002$). Further investigations of gender-predictor interactions are needed to identify which, if any, interactions consistently emerge with respect to criminal offending.

The overall lack of gender-predictor interactions in this study suggests that gender-specific theories and interventions for IPA and criminal offending are not necessary. However, such theories and interventions may be required should future studies consistently reveal additional gender-predictor interactions. The overall lack of gender-predictor interactions also indicates that gender differences in IPA and criminal offending are not due to gender differences in the effects of the childhood, adolescent, and demographic predictors of these offence types. Further research on gender-predictor interactions seems warranted given their important theoretical and practical implications, and the paucity of research on this issue.

6.6 Strengths and Limitations

The current study has a number of methodological strengths, including its longitudinal design, and its use of a moderately large, representative sample of young New Zealand

adults. This study utilises data pertaining to IPA, violent offending, and property offending from three different ages, and provides a comprehensive assessment of a wide range of the potential childhood, adolescent, and demographic predictors of these offence types. All data were gathered using valid psychometric instruments. Of particular note, there are comparatively few studies in the world with the richness of data to be able to address the research questions addressed in this study. Despite these obvious strengths there are nevertheless a number of potential limitations to the current study. These limitations are discussed below, together with the ways in which some of them have been, or could be addressed.

Two key limitations of this study were related to its cross-sectional longitudinal design, and to sample-selection bias due to sample attrition. First, given that the CHDS cohort members were born at a specific time and in a specific social context, results from this study may not generalise to individuals who differ from the CHDS cohort members on these characteristics. Second, sample attrition resulted in sample-selection bias, whereby individuals from more socially disadvantaged childhood backgrounds were under-represented in the current sample. However, the application of a sample-selection bias correction method indicated that such bias had minimal effects on this study's major conclusions. It is important to note that these limitations apply to many, if not all, cross-sectional longitudinal studies, and that they are difficult to avoid.

This study analysed self-reported data relating to three behaviours that are rarely directly observable. Therefore, the accuracy of this study's findings largely depend on the accuracy with which cohort members reported engaging in IPA, violent offending, and property offending. A review of comparisons between self-report measures of delinquency and

official records indicates that most self-reports are reliable measures of delinquency (Burfeind & Bartusch, 2010). However, evidence pertaining to the reliability of self-reports of IPA is mixed. Meta-analytic findings indicate that both males and females under-report their own perpetration of IPA. However, males do so to a greater extent than females (Archer, 1999). Other findings indicate that males, but not females, significantly under-report their own victimisation from IPA (Straus & Gelles, 1992). Collectively these findings indicate that males under-report both IPA perpetration and victimisation to a greater extent than females. However, recent findings suggest that males and females are equally reliable reporters of both male-perpetrated, and female-perpetrated IPA (Mann, Friesen, Horwood, Woodward & Vertue, 2009). Given the uncertainty surrounding the reliability of self-reports of IPA, it is important that the current findings are replicated before they are used to help guide public health policy and intervention development. Future studies may also use data-weighting or statistical modelling techniques to statistically control for self-reporter bias.

An important scale-related limitation of this study is the composition of the CTS-2. These scales cover a range of abusive behaviours, yet they do not assess the extent to which individuals control the peer groups with whom their partners associate, withhold money or sex from their partners, or engage in other forms of controlling behaviour. These behaviours are also considered forms of IPA. Therefore, they are important to examine if IPA is to be measured comprehensively.

Several prevalence-related limitations of the study were also evident. First, the low prevalence of offending caused indicators of violent and property offending in Model 1 to have only moderate reliabilities (see Appendix B and Figure 8). Second, due to the low prevalence of offending at each age, data had to be combined over the three reporting periods

to create robust measures of violent and property offending (see Appendix B). As a result, this study could not address the time-dynamic predictors of IPA, violent offending, and property offending. Finally, the prevalence of the more extreme forms of IPA, violent offending, and property offending was low, despite the moderately large sample size (see Appendix B). As a result, this study primarily examines the childhood, adolescent, and demographic predictors of relatively mild forms of these offence types. However, predictors of more extreme forms of IPA, violent offending, and property offending may differ from those of relatively mild forms of these offence types. These prevalence-related limitations could be addressed using a substantially larger sample that includes more individuals who have engaged in IPA, violent offending, and/or property offending, and in particular, a sufficient number of individuals who have perpetrated more extreme forms of these offence types. Similarly, an alternative research design may be used that involves specific analysis of groups selected for more extreme behaviours.

Finally, a number of analyses were conducted to examine the childhood, adolescent, and demographic predictors of IPA, violent offending, and property offending. Findings from these analyses have many important theoretical and practical implications, providing that these predictors exert causal effects on these offence types, rather than vice versa. While this study did not explicitly examine the direction of the causal relationships, there is a very clear temporal sequencing from predictors measured in childhood to outcomes measured in adulthood. As a result, the direction of the causal relationship is very clear, even if the exact nature of the causal process is not.

6.7 Conclusions

This thesis has examined the relationship between IPA and criminal offending by addressing two key issues. First, the extent to which IPA, violent offending, and property offending represent empirically distinct behavioural domains was examined using CFA. This analysis demonstrated that these offence types represent three empirically distinct, yet related, behavioural domains. Second, SEM techniques were used to examine the extent to which IPA, violent offending, and property offending share common childhood, adolescent, and demographic predictors. This analysis revealed broad similarities in the predictors of these offence types. Sensitivity analyses revealed that these key findings were robust to sample-selection bias and missing data.

Nested model comparisons revealed a general pattern of similarity in predictors' effects across IPA, violent offending, and property offending. However, several predictors exerted significantly different effects across these offence types, most notably gender. The pattern of similarities and differences in predictors' effects across IPA, violent offending, and property offending was broadly consistent with the pattern of relatedness and distinctness in the latent structure of these offence types.

An analysis of the proportions of the latent variable correlations that were explained by shared predictors revealed that shared predictors explained some of the three latent variables correlations. Finally, an analysis of gender-predictor interactions revealed that all predictors, with the exception of childhood abuse, exerted similar effects for males and females on each offence type.

These findings were typically consistent with previous research, and have a number of important theoretical and practical implications. In particular, the current findings suggest that general theories of criminal offending are appropriate for explaining violent and property offending, but not IPA. This finding supports current practices of developing IPA-specific theories, researching IPA as a distinct behavioural domain, and providing financial resources specifically to help research and prevent IPA. Findings from predictor analyses suggest that IPA, violent offending, and property offending may be effectively prevented using similar interventions, which would permit a more economical use of human and financial resources. However, interventions used to prevent IPA, violent offending, and property offending may differ in effectiveness across these offence types. This study also indicates that gender-specific theories and interventions for IPA, violent offending, and property offending are unlikely to be beneficial. Finally, findings from both the CFA and SEM analyses provide further evidence that the Feminist Theory of IPA is an incomplete and unsatisfactory explanation of IPA. As a result, an alternative theory may need to be adopted as the predominant theory of IPA in New Zealand.

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Appendix A

Class of abuse	Item: In the past year have you ever...	Assessment Age								Item Parcel
		21 years (N = 536)		25 years (N = 786)		30 years (N = 846)		Any of these ages (N = 950)		
		n	%	n	%	n	%	n	%	
Minor psychological abuse	• Cursed or sworn at your partner	-	-	415	52.8	518	61.2	629	66.2	1
	• Shouted or yelled at your partner	-	-	396	50.4	497	58.7	628	66.1	2
	• Stomped off during a disagreement	-	-	283	36.0	346	40.9	497	52.3	1
	• Deliberately said something to hurt your partner	-	-	172	21.9	171	20.2	286	30.1	2
Severe psychological abuse	• Called your partner fat, ugly, or unattractive	-	-	25	3.2	24	2.8	44	4.6	2
	• Deliberately destroyed something that belonged to your partner	-	-	23	2.9	13	1.5	32	3.4	1
	• Accused your partner of being a lousy lover	-	-	14	1.8	10	1.2	23	2.4	1
	• Threatened to hit or throw something at your partner	-	-	34	4.3	39	4.6	64	6.7	1
	• Use threats to make your partner have sex	-	-	0	0.0	0	0.0	0	0.0	1
Minor physical abuse	• Physically twisted your partner's arm or hair	9	1.7	12	1.5	4	0.5	24	2.5	1
	• Pushed or shoved your partner	56	10.4	38	4.8	47	5.6	121	12.7	2
	• Slapped your partner	34	6.3	20	2.5	25	3.0	70	7.4	1
	• Grabbed or shaken your partner	12	2.2	16	2.0	15	1.8	39	4.1	2
	• Thrown an object at your partner	33	6.2	21	2.7	26	3.1	68	7.2	2
Severe physical abuse	• Choked or strangled your partner	3	0.6	2	0.3	3	0.4	8	0.8	1
	• Kicked your partner	30	5.6	8	1.0	10	1.2	45	4.7	2
	• Punched or hit your partner with something	13	2.4	13	1.7	10	1.2	35	3.7	1
	• Slammed your partner against a wall	-	-	6	0.8	2	0.2	8	0.8	2
	• Burned or scalded your partner on purpose	-	-	0	0.0	0	0.0	0	0.0	2
	• Beaten your partner up	1	0.2	2	0.3	3	0.4	6	0.6	2
	• Used a knife or gun on your partner	1	0.2	0	0.0	0	0.0	1	0.1	2
• Physically forced sex on your partner	2	0.4	0	0.0	0	0.0	2	0.2	1	

Note: Figures in the 'Any of these ages' column were calculated using the full study sample, which included cohort members who completed the CTS-2 at ages 21, 25, and/or 30 years (N = 909), and those who did not complete the CTS-2 at any of these ages (N = 41). - = item was not assessed at that age.

Appendix B

Scale	Item: In the past year have you ever...	Assessment Age								Item Parcel
		21 years		25 years		30 years		Any of these ages		
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Violent offending (SRDI-V)	• Carried a hidden weapon	16	1.7	9	0.9	9	0.9	30	3.2	3
	• Attacked someone with a weapon or with the idea of seriously hurting or killing them	7	0.7	2	0.2	0	0.0	8	0.8	3
	• Hit someone with the idea of hurting them	47	4.9	25	2.6	10	1.1	73	7.7	4
	• Used a weapon, force, or strong-arm methods to rob a person, shop, bank, or other business	1	0.1	0	0.0	1	0.1	2	0.2	4
	• Been involved in a gang fight	9	0.9	6	0.6	3	0.3	15	1.6	3
	• Hurt or threatened someone to get them to have sex with you	0	0.0	0	0.0	0	0.0	0	0.0	3
	• Been cruel to animals	2	0.2	2	0.2	1	0.1	5	0.5	4
Property offending (SRDI-P)	• Purposely damaged or destroyed property that did not belong to you	34	3.6	23	2.4	6	0.6	54	5.7	5
	• Set fire to a house, building, car, or other property, or tried to do so	3	0.3	2	0.2	0	0.0	5	0.5	5
	• Broke into, or tried to go into, a building to steal something	7	0.7	2	0.2	3	0.3	12	1.3	5
	• Stolen or tried to steal money or things worth \$5 or less	6	0.6	1	0.1	2	0.2	9	0.9	5
	• Stolen or tried to steal money or things worth between \$5 and \$100	11	1.2	5	0.5	6	0.6	20	2.1	5
	• Stolen or tried to steal money or things worth between \$100 and \$500	8	0.8	2	0.2	3	0.3	13	1.4	5
	• Stolen or tried to steal money or things worth over \$500	9	0.9	4	0.4	3	0.3	13	1.4	6
	• Taken something from a shop without paying for it	14	1.5	11	1.2	3	0.3	22	2.3	6
	• Snatched someone's purse or wallet, or picked their pocket	0	0.0	0	0.0	1	0.1	1	0.1	5
	• Taken something from a car that did not belong to you	7	0.7	2	0.2	0	0.0	9	0.9	6
	• Knowingly bought, sold, or held stolen goods, or tried to do any of these things	34	3.6	17	1.8	8	0.8	52	5.5	6
	• Converted a car or other vehicle (taken a vehicle for a drive without permission) when you didn't mean to keep or sell it	5	0.5	1	0.1	1	0.1	7	0.7	6
	• Stolen or tried to steal a motor vehicle to keep or sell it	2	0.2	2	0.2	0	0.0	4	0.4	6
	• Stolen money from the place where you worked	3	0.3	0	0.0	1	0.1	4	0.4	6