

Chapter 2

ADOLESCENT DATING RELATIONSHIPS: SEXUAL COERCION AND HIGH RISK SEXUAL PRACTICES

In this chapter I focus on the development and characteristics of adolescent dating relationships. As there is a dearth of research among South African adolescents, much of the information presented on the development of dating relationships is from a selected review of the international literature, particularly from the United States. This is followed by a presentation on dating and sexual experience among South African adolescents with a specific focus on the characteristics of sexual behaviour and the prevalence of sexual coercion in dating relationships. I conclude the chapter with an overview of the existing research on the association between sexual coercion and high risk sexual behaviour among adolescents.

2.1 Definition of dating relationships

It is difficult to define the concept of dating relationships as the ways in which people date have evolved over historical periods and vary considerably across cultures. The practice of courtship and dating originates primarily from Western societies and typically involves the process of selecting a marriage partner based on love, for the purposes of having children and raising a family. Lloyd (1991) points out that around the turn of the twentieth century courtship was a highly structured activity, centred around the woman's home, and largely controlled by the young woman and her family. In the early part of the twentieth century, dating became the centre of courtship as couples began to court in public. Accordingly, parental monitoring of dating couples declined, shifting the control of dating activities to the man (Lloyd, 1991). The decline of parental monitoring also allowed couples more opportunity for sexual intimacy. Although dating has become more informal in contemporary Western societies, the romantic image of the heterosexual dating couple, which typically involves the idealisation of one's partner and the notion that love will sustain the relationship regardless of any difficulties the couple may encounter (Lloyd, 1991), remains an important basis for marriage. This image of dating is regularly featured in the popular media such as movies, soap

operas, and songs.

In the research literature on dating violence, the term dating has been defined as a “dyadic interaction that focuses on participation in mutually rewarding activities that may increase the likelihood of future interaction, emotional commitment, and/or sexual intimacy” (Sugarman & Hotaling, 1991, p.103). According to this definition, dating is recognised as covering a spectrum of relationships ranging from short-term and casual encounters to long-term relationships. Although the majority of dating encounters involve heterosexual couples, some of the literature has also included same-sex relationships (see Furman, Brown, & Feiring, 1999; Levy, 1991).

Much of the research on dating experiences and violence has tended to focus on older adolescents and young adults. In this respect, Brown (1999) points to the difficulties in defining dating relationships as they not only vary substantially among different individuals, but also change substantially over the course of adolescence. Considerably less research has been conducted on the earlier phases of adolescent dating, and consequently little is known about the developmental course of romantic experiences (Brown, 1999; Feiring, 2000; Shulman & Scharf, 2000).

2.2 The development and characteristics of adolescent dating relationships

According to Brown (1999), romance first emerges in adolescence not as a relational issue, but as an identity issue. Early romantic relationships are approached in terms of gaining confidence and skills in relating to potential romantic partners, and in terms of fitting in, being accepted and establishing a reputation among peers (Brown, 1999). Therefore, romantic activity in early adolescence tends not to focus on the quality or features of relationships, but rather on characteristics within the self and the broader peer culture in which such relationships will be enacted.

Dating relationships are important experiences in verifying masculinity or femininity (Feiring, 1999). The broader peer culture is instrumental in defining what is acceptable romantic behaviour for a girl or boy and acceptable views of the self and the partner. Depending on the nature of the peer culture, the prescription to conform

to stereotypical gender roles and forms of dating will vary (Feiring, 1999). Several studies have revealed gender differences with respect to dating behaviours, with female adolescents emphasising more commitment, care, self-disclosure and intimacy in their romantic relationships than male adolescents (Feiring, 1999; Shulman & Scharf, 2000). On the other hand, male adolescents are more likely to focus on the sexual aspects of relationships than female adolescents (Miller & Benson, 1999).

Romantic relationships of early and middle adolescents tend to be brief and casual (Feiring, 1996; Shulman & Scarf, 2000). Brown (1999) argues that the short-term, superficial nature of romantic relationships in early to middle adolescence is particularly adaptive as adolescents must first gain security in their self-concept before risking self-expansion in a relationship (Brown, 1999). According to Brown (1999) somewhere between middle adolescence and young adulthood there is a shift away from the context in which the relationship exists toward the relationship itself. During this phase, peer groups appear to be less active and instrumental than in the early dating phases as the salience of the relationship increases (Brown, 1999). In this respect, older adolescents tend to have relationships of longer duration than younger adolescents (Shulman & Scharf, 2000) and as relationships become long term, they often involve commitment, exclusivity, caregiving and attachment (Furman & Simon, 1999).

The emergence of dating also provides young people with situations to experiment with and express their developing sexuality (Miller & Benson, 1999; Brooks-Gunn & Paikoff, 1997). Although sexual intercourse is likely to occur within committed dating relationships (Miller & Benson, 1999) sexual activity also occurs in early casual dating. In a study among adolescent girls between the ages of 12 to 15 years, it was found that compared to their sexually inexperienced peers experienced girls were more likely to share unique information and spend time with their boyfriends, and to anticipate that their relationships would last longer (Rosenthal, Burklow, Lewis, Succop & Biro, 1997). Nevertheless, regardless of their sexual experience, 35% of the adolescent girls in this study reported that their relationships were not mutually

exclusive. Among adolescents, sexual activity may serve autonomy, identity and intimacy needs (Brooks-Gunn & Paikoff, 1997; Miller & Benson, 1999). Adolescents with predominantly identity goals had more casual dating and sexual partners while adolescents with relatively clear ideas of their own personal identity focused predominantly on intimacy goals related to sharing, closeness, trust in their relationships and had longer dating relationships (Sanderson & Cantor, 1995).

As relationships become more long term, usually somewhere in late adolescence or young adulthood, Brown (1999) contends that individuals typically confront the issue of whether or not one can and should form a lifelong bond to one's romantic partner. However, while dating and romantic relationships are often construed in Western societies as part of the process of selecting a marriage partner, with marriage being the appropriate context within which to bear children, it is important to note that in the United States a decline in marriage has occurred over the past few decades with more couples choosing to live together (see Bozon, 2001). Among the various factors that may have contributed to this decline, Graber, Britto and Brooks-Gunn (1999) have pointed to the economic constraints that have delayed or prevented some young people from getting married and setting up home, resulting in their decision to have children rather than wait for marriage - a trend which has also been reported in South Africa (e.g. Preston-Whyte & Allen, 1992).

On the other hand, marriage based on love and choice of one's own spouse is more prevalent in individualistic Western societies with nuclear family structures compared to collectivist societies characterised by extended family systems (Dion & Dion, 1993). In collectivist societies, such as those found in China, Japan and India, dating may be reduced or eliminated by the practice of arranged marriages, where partners are chosen for young people by their parents (Dion & Dion, 1993). Similarly, in many traditional African cultures, marriage involves an arrangement made between two families based on the custom of *lobola* (payment for the bride from the prospective groom to the father of the bride) (Deveaux, 2003). Nevertheless, even in collectivist cultures changes are occurring partly as a result of increasing modernisation and Westernisation. For instance, Dion and Dion (1993) point to the increasing trend for young Japanese women to report preferring to find their own husband and to have a marriage based on love.

Accordingly, the connection between the development of romantic relationships, sexual expression and marriage has varied over time and differs across cultures. In order to understand the development of adolescent dating and sexuality it is important to consider the social context in which it is situated. The peer group (Brown, 1999), neighbourhood (Coates, 1999; Graber et al., 1999), as well as community and cultural expectations for young women and men (Feiring, 1999) are among the important contexts shaping adolescent dating behaviour and experiences.

2.3 Dating and sexual experience among South African adolescents

There is little information on the emergence and development of dating relationships among South Africa adolescents. However, there is some evidence to suggest that dating starts in early adolescence between 13 and 14 years of age (Buga, Amoke & Ncayiyana, 1996; Jewkes, Vundule, Maforah & Jordaan, 2001) while between the ages of 16 and 20 years most adolescents report being in a relationship, half of which they describe as casual (Richter, 1996). Research also suggests that for many adolescents, sexual experience follows shortly after the first dating relationship (Buga et al., 1996; Jewkes et al., 2001).

According to a number of surveys, sexual initiation typically occurs during the early to middle teens (between 14 and 16 years of age) with boys initiating sex earlier than girls (Buga et al., 1996; loveLife, 2000; NPPHCN, 1996; Richter, 1996). The recent *National Survey of HIV and Sexual Behaviour among 15-24 year olds* reveals that by age 17 most (56%) young people report having had sex (Pettifor, Rees, Steffenson, Hlongwa-Madikizela, MacPhail, Vermaak, & Kleinschmidt, 2004). The tendency for young men to report initiating sex earlier than young women suggests that boys' first sexual encounters are with girls who are older than themselves. However, in one of the few studies to collect information on sexual partners, Kelly and Parker (2000), who conducted a survey among 760 youth between 15 and 30 years of age in six sentinel sites across South Africa, found that 28% of the male participants compared to 91% of the female participants reported that at the time of their first sexual encounter their partner was one or more years older than they were. Hence, for the

majority (72%) of boys, their first sexual encounter involved a partner who was either the same age or younger than them. Therefore, if boys are initiating sex earlier than girls and their partners are younger, who are they having sex with? The same girl? Other boys? As most surveys do not provide any information on the characteristics of the first sexual partner one can only speculate about the context of boys' first sexual encounters. On the other hand, due to social expectations that young men should demonstrate their sexual experience while young women should appear to be sexually inexperienced, it is possible that young men may over-report early sexual initiation while women under-report the same.

2.3.1 Characteristics of sexual behaviour

Quantitative studies of sexual behaviour among South African youth have also revealed the tendency among young people to engage in high risk sexual practices, for example, by having multiple sexual partners and engaging in unprotected sexual intercourse (loveLife, 2000; NPPHCN, 1996; Richter, 1996; Rutenberg, Kehus-Alons, Brown, Macintyre, Dallimore & Kaufman, 2001). The recent *National Survey of HIV and Sexual Behaviour among 15-24 year olds*, shows that among young people who had sex in the past 12 months, 44% of males and 12% of females reported having had more than one sexual partner in the prior year (Pettifor et al., 2004). Furthermore, in a survey conducted among a national sample of 12 to 17 year olds, loveLife (2000) found that 18% of the sexually active young people report having multiple sexual partners at the moment. In their review of quantitative studies on sexual behaviour among South African adolescents, Eaton and colleagues (2003) concluded that between 10% and 30% of all sexually active young people have more than one sexual partner at a given time, with more men than women having concurrent sexual relations.

On the positive side, a review of the literature suggests an increase in condom use among South African adolescents over the past years. For example, 21.4% of the sexually experienced young people in the study conducted by NPPHCN (1996) and 20% of the adolescent women between 15 and 19 years in the *South Africa Demographic and Health Survey* (Department of Health, 1998) reported using a

condom during their last sexual encounter, whereas more recently the *National Survey of HIV and Sexual Behaviour* reveals that of those 15 to 19 year old youth who reported ever having sex, 57% of males and 55% of females reported that they used a condom the last time they had sex (Pettifor et al., 2004). Notwithstanding these findings, studies continue to reveal that the majority of sexually active young people use condoms irregularly, if at all. In this respect, *The First South African Youth Risk Behaviour Survey* found that 29% of learners practised consistent condom usage (Reddy, Panday, Swart, Jinabhai, Amosun, James, Monyeki, Stevens, Morejel, Kambaran, Omardien, & Van den Borne, 2003). Similarly, the *National HIV and Sexual Behaviour Study* reveals that of those 15 to 19 year adolescents who reported having had sex in the past 12 months, 33% reported that they always used a condom with their most recent sexual partner, while 31% reported that they never used a condom with their most recent partner (Pettifor et al., 2004).

There is also evidence of a significant number of young people engaging in risky behaviour by having sex under the influence of alcohol. Findings from *The South African Youth Risk Behaviour Survey* reveal that 14% of sexually experienced youth had sex after consuming alcohol or drugs (Reddy et al., 2003). In addition, of the 56% of young people participating in *National HIV and Sexual Behaviour Study*, who reported ever having used alcohol, 24% reported they had sex when under the influence of alcohol, with males twice as likely as females to report having had sex under the influence of alcohol (Pettifor et al., 2004). Despite this evidence, little information exists on the relationship between alcohol use and negative sexual outcomes among South African adolescents. Research from the United States reveals that the use of alcohol and other substances among adolescents is linked to risky sexual behaviour such as unplanned sexual intercourse, multiple sexual partners, inconsistent condom use, and STIs (e.g. Fergusson & Lynskey, 1996; Poulin & Graham, 2001; Tapert, Aarons, Sedlar, & Brown, 2001). In a study of adolescents' perceptions of problematic social situations leading to high risk sexual behaviour, respondents who mentioned alcohol or drug use in social situations connected with sexual activities were more likely to describe a variety of problems, including sexual assaults (females) and non-use of condoms (males) (Noell, Biglan,

Berendt, Ochs, Metzler, Ary, & Smolkowski, 1993). Thus, there is clearly a need for research to examine the relationship between alcohol use and sexual risk behaviours among South African adolescents.

2.3.2 Sexual coercion in adolescent dating relationships

In South Africa there has been a growing concern regarding the extent of coercive sexual experiences among adolescents. In a national sample of grade 8 to 11 learners, the *First South African Youth Risk Behaviour Survey* found that 11.1% of females and 8.1% of males indicated having ever been forced to have sex (Reddy et al., 2003). In the *National HIV and Sexual Behaviour Study* among 15-24 years olds, 10% of the sexually experienced females and 2% of the sexually experienced males reported ever having had sex because someone physically forced them (Pettifor et al., 2004). Another study involving a national sample of 2000 young people between the age of 12 and 17 years found that 39% of sexually experienced girls and 7% of sexually experienced boys reported that they had been forced to have sex when they did not want to (loveLife, 2000). Differences noted among the studies may be attributed to differences between samples as well as variations in the measures used to investigate experiences of sexual victimisation. However, these national studies are limited in that they provide no information about the context of forced sexual encounters. Therefore, it is not clear to what extent reports of forced sex might have involved a dating partner or someone else, such as a family member, friend, teacher or stranger.

Studies originating mainly from Western countries have focused specifically on sexual coercion and violence in adolescent dating relationships. For example, surveys involving high school students in the United States have found that between 15.5% and 17.8% of females and between less than 1% and 11.4% of males reported ever having been forced to engage in unwanted sexual activity in a dating relationship (Bergman, 1992; Jezl, Molidor, & Wright, 1996; Molidor & Tolman, 1998). Although the focus has not been specifically on sexual coercion in relationships, evidence from surveys on adolescent sexuality and reproductive health reveal that a high proportion of South African young women also experience sexual coercion as part of their dating

experiences. In a study conducted by Richter (1996) among youth between the age of 16 and 20 years from Soweto, Khayelitsha and Umlazi, 28% of the female participants reported having been forced, against their will, to have sex with someone, most often a boyfriend (67%). On the other hand, nearly a fifth of all male respondents reported that they had sex with a girl after she said she didn't want to have sex, again most frequently a girlfriend (82%). In a more recent case control study among female adolescents from Khayelitsha (Jewkes et al., 2001), 31.9% of the 191 pregnant adolescents and 18.1% of 353 non-pregnant adolescents reported that their first sexual encounter was forced, with the majority of first sexual partners having been a boyfriend (90.8% of pregnant and 94.9% of non-pregnant adolescents). Furthermore, most of the participants in this study indicated that they feared they would be beaten by their partners if they refused sex (77.9% of the 191 pregnant participants and 72.1% of the 353 non-pregnant participants).

Much of the quantitative research is limited in establishing the prevalence of sexual coercion by focusing exclusively on 'forced' sexual experiences. Sexual coercion need not involve physical force. Qualitative studies conducted both internationally and locally reveal that verbal pressure in the form of "you would have sex if you loved me" (Hird & Jackson, 2001) and begging and pleading (Wood & Jewkes, 1998) are common strategies used by young men to obtain sex. Higher prevalence estimates are likely to emerge in studies that include strategies such as verbal pressure as a measure of sexual coercion. For instance, Poitras and Lavoie (1995) found that among Canadian high school students between 15 and 19 years of age, 54% of the female and 13.1% of the male adolescents reported having been victims of sexual coercion in their dating relationships. In the same study, 14.3% of the males and 6.3% of the females reported initiating sexual coercion. In a more recent study in New Zealand, almost equally high proportions of female (76.9%) and male (67.4%) high school students reported that they had experienced one or more incidents of unwanted sexual activity in a dating relationship (Jackson et al., 2000). In a national study conducted in South Africa by loveLife (2000) 55% of the 12 to 17 year old sexually experienced girls reported that there are times when I don't want sex, but I do because my boyfriend insists on having sex. This study also reveals that 35% of the sexually experienced

boys and 16% of the sexually experienced girls were not likely to accept their partners' refusal of sex. Therefore, to establish the prevalence of sexual coercion in adolescent relationships, it would be important to consider behaviours ranging from verbal pressure to physical violence.

2.3.2.1 Gender considerations

Although the abovementioned studies are consistent in revealing that young women are more often the victims, male victimisation also needs to be understood if the problem of sexual coercion in adolescent dating relationships is to be comprehensively addressed. Accordingly, it would be useful to examine both young women's and men's experiences of coercion as victims and perpetrators. Nonetheless, it is important to recognise that even though adolescent males and females may be coerced into sex by their partners, the experiences are not the same. Female adolescents appear to be more negatively affected by coercive sexual experiences than adolescent males. The consequences of male physical and sexual aggression differ markedly from the effects of females using similar acts. In studies investigating dating violence, including sexual coercion, adolescent girls are more likely to report serious harm and physical injury compared to boys (Foshee, 1996; Molidor & Tolman, 1998). A qualitative study exploring the meaning of dating violence found that adolescents interpreted male physical and sexual aggression as much more threatening and harmful than female aggression (Hird, 2000). In this respect, Larkin and Popaleni (1994) argue that the fear produced as a result of the potential harm associated with male violence may also be utilised as a coercive strategy by males to obtain sex. In one study to investigate the emotional effects of sexual coercion in adolescent relationships, Jackson and colleagues (2000) found more female than male victims reported feeling dirty, angry, and scared by the experience, while more male than female students indicated that they were not bothered by the experience.

2.4 The relationship between sexual coercion and high risk sexual behaviour

During the past decade, an emerging number of studies focusing on women's sexual and reproductive health have provided evidence linking coercion and violence to

adverse sexual health outcomes such as unintended pregnancies, STIs and HIV infection (Heise, Ellsberg, & Gottmoeller, 2002; Heise & Garcia-Moreno, 2002; Heise et al., 1995; Jewkes et al., 2002; Maman, et al., 2000). According to the abovementioned authors, violence can negatively affect a woman=s sexual health directly through coerced sex and by limiting her ability to use contraception or condoms, as well as indirectly by increasing sexual and HIV risk behaviours among individuals sexually abused in childhood or adolescence. However, much of the research reports on experiences of sexual victimisation in early childhood or sexual coercion and violence against adult women, with fewer studies reporting specifically on the experiences of adolescent females, and particularly adolescent males, within the context of dating relationships. There is a need for research to examine the association between coercive sexual practices and high risk behaviour among South African adolescents.

2.4.1 Female sexual victimisation and high risk sexual behaviour

There is evidence of a link between a history of sexual coercion among young women, and high risk sexual behaviours and outcomes. For example, compared to those who reported nonvictimisation, young adult and adolescent women who report a history of coerced sex were more likely to report a younger age at first sexual intercourse (Molitor, Ruiz, Klausner & McFarland, 2000; Nagy, DiClemente, & Adcock, 1995; Shier et al., 1997), a greater number of lifetime male sexual partners (Molitor et al., 2000), and the non-use of condoms during sex (Molitor et al., 2000; Shier et al., 1997). Associations between forced sex and reported STD-related symptoms and diagnosis have also been found among young women (Molitor et al., 2000). Adolescent girls who reported experiencing forced sex were more likely to report having been pregnant (Nagy et al., 1995; Shier et al., 1997).

One of the few studies examining sexual health correlates specific to dating violence has shown that among African-American female adolescents, victims of physical partner violence were more likely to have a STI, nonmonogamous male partners, less likely to use condoms consistently within the past six months, and were more likely to have ever been pregnant, compared to those who did not report victimisation

(Wingood, DiClemente, McCree, Harrington, & Davies, 2001). Furthermore, this study also provided some support for the association between violence and restrained negotiations concerning safe sexual practices. For example, compared to those who never reported physical abuse by a dating partner, female adolescents with a history of dating violence were significantly more likely to fear the perceived consequences of negotiating condom use, fear talking with their partner about pregnancy prevention, and perceive that they had less control over their sexuality.

It appears that the experience of coercive sex in dating relationships may also be associated with pregnancies among South African female adolescents. For instance, a case control study of teenage pregnancy in Khayelitsha found that 30% of pregnant teenagers reported forced sexual initiation compared to 18% of the controls (Jewkes et al., 2001). The pregnant teenagers were significantly more likely to have experienced forced sexual initiation and were beaten more often by their partners. They were much less likely to have confronted their boyfriend when they discovered he had other girlfriends. Forced sexual initiation and unwillingness to confront an unfaithful partner were strongly associated with pregnancy, suggesting that these teenagers were less likely to discuss the issue of safer sex practices, such as fidelity, with their dating partners. Other South African studies also reveal that young women are not able to raise the issue of contraceptive use or sexual protections with their partners, due to fears of losing their partner (Richter, 1996) as well as being beaten (Wood et al., 1998).

2.4.2 Male sexual victimisation and high risk sexual behaviour

Much less is known about the sexual health implications for males who have experienced coercive sex in dating relationships. However, there is some evidence to suggest that the association of forced sexual contact and high risk sexual behaviour also holds for adolescent males who have been victimised. Studies from the United States have found that male high school students who reported having been pressured or forced to have sexual intercourse were more likely to report a higher number of recent male and female sexual partners, engaging in alcohol or drug use before last sex (Shier et al., 1997), not using a condom at last sex, and involvement in

a pregnancy (Pierre, Shier, Emans & DuRant, 1998; Shier et al., 1997). In another study, Anderson, Reis, and Stephens (1997) found that adolescent males who indicated that they had been coerced into sexual activity also described themselves as having difficulty in communication on sexual issues, such as talking to their partners about safer sex, getting their partner(s) to listen to them, or turning down alcohol or drugs prior to having sex. Although, these studies do not specifically refer to sexual coercion within a dating relationship, they do suggest that coercive sexual experiences among adolescent men may also be associated with adverse sexual health outcomes, and thus point to the need for research on sexual coercion within adolescent dating relationships to also address male victimisation.

2.5 Conclusion

In this chapter, the development and characteristics of adolescent dating relationships were discussed with the focus on both the international and South African literature. Much of the information on the development of early adolescent dating relationships reflects Western research. In this respect, romantic activity during early adolescence tends to focus on the characteristics of the self and the broader peer culture in which it is enacted. Dating relationships also provide important experiences for young people to experiment with and express their developing sexuality and to validate their emerging sense of identity (Brown, 1999; Feiring, 1999). However, it is important to recognise that the nature of dating relationships not only varies across individuals and changes substantially over the course of adolescence, but also differs across cultures and over time.

Quantitative studies from South Africa reveal that dating and sexual initiation occur during the early to middle teens with a tendency for young people to engage in high risk sexual practices, including having multiple sexual partners, engaging in unprotected sex, and by having sex under the influence of alcohol (e.g. Buga et al., 1996; Eaton et al., 2003). As with the international research, local surveys also reveal that a high proportion of adolescents, particularly young women, experience sexual coercion as part of their dating relationships (e.g. loveLife, 2000; Richter, 1996). However, local studies are limited in that they provide little information about the

context of forced sexual encounters and tend to focus exclusively on 'forced' sexual experiences. In order to establish the prevalence of sexual coercion in adolescent dating relationships, it would be important to consider behaviours ranging from verbal pressure to physical violence. Furthermore, fewer studies report on the experiences of adolescent males. Even though the literature is consistent in revealing that young women are more often the victims, male victimisation also needs to be understood if the problem of sexual coercion in adolescent dating relationships is to be comprehensively addressed.

Although not all the studies discussed in this chapter specifically focus on sexual coercion within a dating relationship, they do suggest that coercive sexual experiences may be related to adolescent risk taking behaviours including alcohol abuse, engaging in unprotected sex, and having multiple sexual partners, and thus may expose both female and male adolescents to other health risks, such as unwanted pregnancies, STIs, and HIV infection (e.g. Shier et al., 1997). Therefore, interventions in the form of programmes to prevent coercive practices in adolescent dating relationships are essential to improve adolescent sexual health. In this respect, there is a need for further research to enhance our understanding of the association between coercive sexual practices and high risk behaviour, as well as the factors that contribute to sexual coercion among South African adolescents. Having discussed the characteristics of adolescent dating relationships, including the prevalence of high risk sexual behaviours and sexual coercion, the risk factors for sexual coercion are discussed in the following chapter.