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Gender Differences in Preschool Children's
Declared and Behavioral Compliance with Pedestrian Rules

ABSTRACT

The study examined gender differences in compliance with pedestrian rules among preschool children. Two groups of 5-year-old boys and girls containing a total of 162 children participated in the study. First, the children's compliance was assessed during crossing and walking by observing their pedestrian behaviors. Then, each child was interviewed on pedestrian-danger appraisal, rule knowledge, rule compliance, and rule internalization. As hypothesized, the results showed that girls' behaviors were more compliant than those of boys. However, boys were more compliant than girls in looking at the surrounding environment as they traveled and before crossing. Girls said they were more compliant with rules, had better knowledge of rules, and exhibited greater rule internalization than boys. Danger appraisals, however, were found to be comparable for boys and girls. Moreover, declared compliance was linked to behavioral compliance among girls but not among boys. These findings suggest that girls and boys have different motives for obeying safety rules. The results are discussed in regard to the origins of gender differences in traffic-rule compliance.

Keywords: Preschool children – Pedestrian – Compliance – Gender differences – Behavior – Traffic rules

1. INTRODUCTION

Unintentional injuries still constitute a serious health threat to children in developed countries (Baker, O'Neill, & Ginsburg, 1992). Pedestrian accidents in particular remain one of the most serious health risks children are confronted with (UNICEF, 2001), although the accident rate varies considerably with gender. This difference is particularly marked in the 5-9 year-old group (Thomson, 1991). Boys' accidents are more frequent and more serious than those of girls (Baker et al., 1992; Rivara, Bergman, LoGerfo, & Weiss, 1982; Rivara & Mueller, 1987). The gender difference in risk exposure does not seem to be the only factor that accounts for the difference in unintentional injuries between boys and girls (Routledge, Repetto-Wright, & Howarth, 1974; Waylen & McKenna, 2002). Previous research has explored differences between the two gender groups in risky behaviors and in danger appraisal during childhood. However, compliance with rules has not yet been explored in children's behavior in the streets, whereas gender differences in rule violation are well known in adult drivers and pedestrians (Moyano Diaz, 2002). This study was aimed at helping fill this gap by observing rule compliance among five-year-old boy and girl pedestrians. It focuses on how children behave with respect to rules, and how rule following affects risk-taking in pedestrian situations.

1.1. Gender Differences in Risk-Taking

Previous research has shown that boys tend to take more risks than girls (Byrnes, Miller, & Schafer, 1999; Coppens & Gentry, 1991; Ginsburg & Miller, 1982; Morrongiello & Dawber,

1999; Morrongiello, Guthrie, & Dawber, 1998; Rosen & Peterson, 1990). Moreover, when boys and girls are involved in the same types of activities, boys exhibit more risky behaviors than girls (Morrongiello & Dawber, 1998; Rivara et al., 1982; Van der Molen, 1981, 1983). No matter how old they are, males are found to have more risky attitudes, to be less afraid of danger, and more confident of their own ability to cope with danger, and to have greater comparative optimism facing accident risks than females (DeJoy, 1992; Harré, Brandt, & Dawe, 2000; Peterson, Brazeal, Oliver, & Bull, 1997; Rosenbloom & Wolf, 2002). Also, girls find more dangerous situations in the street than boys (Hill, Lewis, & Dunbar, 2000). However, one study found that a gender difference in danger appraisal showed up in absolute appraisals, i.e., judging the danger of a given situation, but not in relative appraisals, i.e., sorting a series of situations on the basis of how dangerous they are (Hillier & Morrongiello, 1998).

1.2 Gender Differences in Adults' Compliance with Traffic Rules

Safe behaviors on the road depend on more than just attitudes toward risks and the ability to assess road dangers. Road user must also take into account the formal and informal rules that govern social interactions on the road (Björklund & Aberg, 2005). Research on adults has brought out gender difference in compliance with traffic rules. Dangerous behaviors and involvement in accident of adult drivers were shown to be more often due to rule breaking in males than in females (Harré, Field, & Kirkwood, 1996; Simon & Corbett, 1996; Yagil, 1998). Moreover, previous studies have shown that male pedestrians violate more rules than female pedestrians do (Moyano Diaz, 2002; Rosenbloom, Nemrodov, & Barkan, 2004; Yagil, 2000). Underestimation of hazards and comparative optimism may account for some of the gender differences in traffic rule violations. Indeed, the rational-choice theory of offending

predicts that the intention to engage in illegal behavior is inversely related to the perceived costs of the act (Cornish & Clarke, 1986), and several studies have shown that men expect less negative outcomes of traffic violations than women (Parker, Manstead, Stradling, Reason, & Baxter, 1992). But traffic behaviors are likely to be also influenced by attitudes toward rules. Regarding attitudes toward laws and violations, Tyler (1990) argued that there were two different types of motives in obeying the law. Instrumental motives are related to the gains and losses involved in compliance and non-compliance with the law; compliance with the law is linked to external forces. Normative motives result from internalization of the law and a feeling of obligation to obey the law in accordance with personal values. Concerning compliance with traffic rules, Yagil (1998) found that male drivers expressed a lower level of normative motivations to comply with traffic laws than did female drivers.

1.3 Gender Differences in Children's Compliance

Kopp (1982, 1987) and Lytton (1980) argued that compliance is the first step toward internalization in child development. Thus, the development of volition as opposed to mere compliance requires internalization of the social rules by which the child fully acquires social values and prescriptions from external sources and transforms them into personal attributes, values, and self-regulated behaviors (Grolnick, Deci, & Ryan, 1997). Although pedestrian education is usually based on behavioral rule application (Thomson, 1996; Zeedyk, Wallace, Carcary, Jones, & Larter, 2001), we still have a limited understanding of whether differences between the two gender groups in traffic rule compliance and internalization already exist in childhood. Research has shown, however, that compliance is displayed very early. At a very young age, girls comply with requests and demands from parents, teachers, and other authority figures more than same-age boys do (Feingold, 1994). In a meta-analysis, Eisenberg

and Fabes (1998) found that girls displayed more pro-social behaviors than boys when an adult was present. This difference was explained by girls' greater compliance with adult requests (Grusec, Davidov, & Lundell, 2004). In the area of risk-taking, Morrongiello and Dawber (1998) showed that girls complied much more than boys with maternal requests to avoid approaching a dangerous object. More recently, the same authors (Morrongiello & Dawber, 2004) found that children's perception of parental norms about risk-taking was taken into account much more by girls than boys when the children had to choose between three more or less dangerous routes.

Although a number of studies have observed greater compliance with adult requests among girls, our understanding of gender differences in traffic-rule following during childhood is limited. Researchers do not know, for example, how gender differences in rule compliance affect children's pedestrian behaviors. Moreover, psychologists do not know the extent to which rule compliance is due to external forces or is internalized, and if it already plays a role in danger appraisal and danger avoidance. The present study was designed to test the hypothesis that (a) as in the case for adult requests (Feingold, 1994), preschool girls will be more compliant than boys with rules in their pedestrian behaviors, (b) as in the case of parental safety norms (Morrongiello & Dawber, 2004), preschool girls will exhibit more rule-compliance than boys in their danger appraisals, that is to say, they will use pedestrian rules to explain why they avoid a situation they judge dangerous, and (c) like female drivers (Yagil, 1998), girls will internalize pedestrian rules more than boys.

2. METHOD

2.1. Participants

A sample of 162 children participated in the experiment, including 83 boys and 79 girls at the target age range of 5 to 6 years ($M = 5.7$, $SD = 4$ months). Ninety percent of the children lived with both of parents, and 85% of the sample comprised families in the middle to upper income range. Sixty percent of the children were an only child or the first born child and 70% of the children had one or two siblings. Nearly all families were Caucasian and all lived in a large urban area. The parents gave their permission for their child to be observed and interviewed. The study was presented as a research project on road safety in children. The observed children came from nine different nursery schools: three in Lyon and six in Marseille in southeastern France. Eighteen children were observed in each school. The nine schools were similar in terms of traffic density, and every nursery school was in the centre of the city.

2.2. Procedure

The pedestrian behaviors of the children accompanied by an adult were observed on the way home from school. The observations were made by two observers on each site. Danger appraisal and rule compliance were assessed by interviews with each child about several dangerous pedestrian situations. One experimenter conducted the interviews on each site. The interviewers did not participate in the observations, and different observers and interviewers were used for each site.

2.2.1 Behavioral Compliance with Pedestrian Rules

Observation Locations and Method

The observation was done in the cities of Marseille and Lyon in southeastern France, on the way from the child's school to her/his home, in the afternoon (16:30-17:30 p.m.). The children were always accompanied by one adult, either a parent or another person. All observations were unobtrusive; they started when the adult-child pairs came out of the school and finished when they went into their home. The entire travel time was observed. The duration of the observation varied with the length of the route, but never exceeded 10 minutes. Travel time was short for all the children observed (less than 5 minutes for 55% of the children). The number of street crossed varied from 1 to 4 for 72% of the children. The street crossings were not all with traffic lights. Neither the adults nor the children knew what day would be chosen for the observation, although they knew they would be observed. The observer was unknown to both the adults and the children, and the observation always took place before the child was interviewed. Observation and interview did not take place the same day and parents and children agreed for both observation and interview. No instructions were given to the children or the adults before the observation.

Behaviors Coded

The observation grid was constructed after several naïve observations of children walking home from school. It was based on behavioral categories used in previous studies (Rivara, Booth, Bergman, Rogers, & Weiss, 1991; Routledge et al., 1974; Zeedyk & Kelly, 2003). These categories were designed for observing not only crossing behavior but also walking behavior. Six different facets of street-crossing behavior were coded: crossing inside the marked crosswalk, stopping at the curb, checking for approaching traffic by looking right and

left before crossing (looking before crossing), walking and not running during crossing (crossing speed), going straight across and not diagonally (crossing path), taking the adult's hand. Four facets of walking behavior were coded: walking and not running on the sidewalk (walking speed), walking at a steady pace, not walking on the curb side of the sidewalk (position on sidewalk), and checking the surrounding environment while walking (looking while walking).

These 10 different elements of pedestrian behavior were selected because they are thought to be the safest behaviors for child pedestrians. Furthermore, these behaviors comply with the pedestrian rules taught to preschool children in France (French National Ministry of Education, 2002). Two additional behaviors were coded in order to obtain more information about the children's behaviors: (1) who took the other's hand before crossing, the child or the adult, and (2) did the adult stay close to the child or not? For each of these 12 elements, the coding consisted of recording the presence or absence of that element, as already done in other studies (Zeedyk & Kelly, 2003). Because it may be hard to decide when a behavior was occurred or not, thresholds were chosen, based on the behavior the most often showed by the child. For example, did the child generally look at the accompanying adult rather than the pavement or the surrounding? Nearly all participants had the opportunity to display all of the coded behaviors. A total score, called "*behavioral compliance*" was calculated by summing the 9 child behaviors with holding hands and initiative of hand holding but not including the one adult behavior. This score is ranged from 0 to 11 points. To permit comparison with our declared compliance score (see below), a *recalculated behavioral compliance* score ranging from 0 to 1 point was calculated.

Reliability

Two observers gathered the data for each site (Lyon and Marseille). Because the coding behavior was done on a real-time basis, training was conducted prior to the study in order to ensure inter-observer agreement.

Six training sessions were held, in which the two observers observed the same child at the same time. In the first session, 80% agreement was accomplished in regard to the 12 behaviors coded. By the fourth session, 95% agreement was accomplished on all the behaviors. Two additional sessions took place to ensure agreement level was consistent. For the study, the observers conducted their observations separately.

2.2.2 Danger Appraisal and Declared Compliance with Pedestrian Rules

Materials and Method

An interview on danger appraisal and rule knowledge about several pedestrian and vehicle passenger situations was conducted with each child. Twelve 21 x 29.7 cm photographs were presented to the children. Photographs came from the picture library from the French National Ministry of Transports. Situations were chosen by four road safety experts to insure they described the same level of danger. All the situations were selected to show danger children could be confronted with in the street. Five types of dangerous situations were shown: walking on the sidewalk (2 situations), playing in the street (3 situations), crossing (2 situations), choosing a crossing site (2 situations), and attaching one's seatbelt (3 situations).

The experimenter said to each child *"I will present some different photographs to you. Each photograph shows what children do in the street. For each photograph, I will ask you some*

questions about what you think of what the children are doing.” Then the children were asked four questions per photograph:

1/ Danger appraisal. The child was asked to categorize each item in terms of danger (“*Is it dangerous or not dangerous to do that?*”),

2/ Rule compliance. The child was asked if he/she takes the rule into account in his/her own behavior even though the rule was broken in the photograph (“*Would you do that?*”),

3/ Rule knowledge. The child was asked if there was a rule about what to do in this situation (“*Are you allowed to do that?*”),

4/ Rule internalization. This question was based on an interview technique used in research in the social domain theory (Nucci, Guerra, & Lee, 1991; Tisak & Turiel, 1988). If the child had internalized the rule, then his/her behavior would not change if the rule did not exist (Turiel, 1998) (“*If you were allowed to do that, would you do it?*”).

These four questions were asked in the same order for each item (danger appraisal, compliance, rule knowledge, and internalization). The presentation order of the photographs was determined by a random drawing. Children have to give explanation for each answer they gave to make sure a/ children have understood the question correctly and b/ the interviewer has categorized child’s answer accurately.

After being coded, the children’s answers were scored: 1 point was given for each accurate answer. Twelve photographs were presented, so the danger appraisal score (Cronbach’s $\alpha = .64$), the rule compliance score (Cronbach’s $\alpha = .67$), the rule knowledge score (Cronbach’s $\alpha = .76$), and the rule internalization score (Cronbach’s $\alpha = .90$) all ranged between 0 and 12 points. The total score, called “*declared compliance*”, ranged from 0 to 48 points (Cronbach’s $\alpha = .92$). Because the total scores for behavioral compliance (11 points) and for declared compliance (48 points) were dissimilar, the total declared compliance score was converted

into a recalculated declared compliance score ranging from 0 to 1 point, so that it could be compared to the recalculated behavioral compliance score.

3. RESULTS

3.1 Pedestrian Behaviors: Behavioral Compliance

To determine whether we could compare girls' and boys' pedestrian behaviors, we checked to make sure that the two gender groups had the same level of exposure to risk in terms of travel time and number of street crossings. Chi square results showed that travel time was short for both gender groups (less than 5 min for 58% of the boys and 52% of the girls: $\chi^2(1, N = 162) = 0.57, ns$), and that the number of streets crossed was not significantly different (69% of the boys and 67% of the girls crossed from 1 to 4 streets: $\chi^2(1, N = 162) = 1.74, ns$).

(Table 1)

Table 1 shows the percentage of boys and girls who displayed each compliant walking and crossing behavior. The results indicated that compliance with pedestrian rules was quite high for walking (not running) on the sidewalk and looking while walking, crossing inside the crosswalk, going straight across, walking (not running) across the street and holding the adult's hand. However, the children failed to display several compliant behaviors despite the fact that they would contribute to safety. Whereas 54% of the children look around as they walk, only 32% looked in both directions before crossing. Similarly, while 56% of the children used the crosswalk, only 15% stopped at the curb before crossing, and although 52% of the children held the adult's hand to cross, only 34% initiated the hand holding. Overall, these data show that the children did obey with several pedestrian rules, but did not comply with other important rules that would have resulted in safer crossing behavior.

To test for gender differences in behavioral compliance, we used a non-parametric test rather than a parametric test because the data were not normally distributed and because the variances of the two gender samples on each variable did not meet the equality of variance test (Tabachnick & Fidell, 2001). We calculated a total behavioral compliance score on walking and crossing. This score varied between 0 and 11 points ($Mdn = 5$, range = 10) (the score for the adult behavior was not included in the total). There was a significant gender difference in overall behavioral compliance ($U = 2533.50$, $n_1 = 83$, $n_2 = 79$, $p < .01$). As a whole, boys obey rules less than girls in their pedestrian behavior.

A series of Chi-square tests were conducted in order to determine whether there were significant differences in walking-behavior compliance between girls and boys. Three behaviors for which such a difference was obtained were walking speed, steady walking pace, and checking the environment. Girls (91%) were significantly more likely than boys (60%) to walk rather than run on the sidewalk, $\chi^2(1, N = 162) = 20.78$, $p < .01$, Cramér's $V = 0.36$, $p < .01$. Girls (43%) were significantly more likely than boys (24%) to have a steady walking pace, $\chi^2(1, N = 162) = 6.35$, $p < .05$, Cramér's $V = 0.20$, $p < .05$. And finally, boys (65%) were significantly more likely than girls (43%) to check the surrounding environment as they traveled, $\chi^2(1, N = 162) = 7.91$, $p < .01$, Cramér's $V = 0.22$, $p < .01$. Gender differences were not found for any other walking behaviors.

Another series of Chi-square tests were conducted in order to determine whether there were significant differences in crossing-behavior compliance between girls and boys. Five behaviors for which such a difference was obtained were going straight across, walking and not running across the street, hand holding, hand-holding initiative, and looking in both

directions before crossing. Girls (77%) were significantly more likely than boys (53%) to go straight across the street and not diagonally, $\chi^2(1, N = 162) = 10.40, p < .01$, Cramér's $V = 0.25, p < .01$. Girls (81%) were significantly more likely than boys (57%) to walk rather than run across the street, $\chi^2(1, N = 162) = 11.16, p < .01$, Cramér's $V = 0.26, p < .01$. And girls (70%) were significantly more likely than boys (34%) to hold the adult's hand while crossing, $\chi^2(1, N = 162) = 21.78, p < .01$, Cramér's $V = 0.37, p < .01$. Moreover, girls (46%) were significantly more likely than boys (24%) to initiate hand-holding, $\chi^2(1, N = 162) = 6.15, p < .05$, Cramér's $V = 0.23, p < .05$. On the other hand, boys (65%) were significantly more likely than girls (43%) to looking both ways before crossing, $\chi^2(1, N = 162) = 9.92, p < .01$, Cramér's $V = 0.25, p < .01$. Moreover, there was no significant difference across gender in the adult's closeness to the child, $\chi^2(1, N = 162) = 9.92, ns$. Only 49% of accompanying adults stayed close to the child during trip home, whatever the child's gender. Gender differences were not observed for any of the other crossing behaviors.

3.2 Declared Compliance: Danger Appraisal and Rule Compliance

To test for gender differences in danger appraisal and pedestrian rule compliance, we used a non-parametric test rather than a parametric test because the data were not normally distributed and because the variances of the two gender samples on each variable did not meet the equality of variance test (Tabachnick & Fidell, 2001).

(Table 2)

Table 2 gives the median and the range for boys and girls on each subscale of declared compliance. Given that each subscale varied between 0 and 12 points, this table shows that most of the boys and girls got a very high score on every subscale. Thus, a large majority of

the children had good danger appraisal, knew the pedestrian rules well, and complied with and internalized these rules.

(Table 3)

Table 3 gives the non-parametric correlations (Kendall's τ_b) between the danger appraisal score and the rule compliance, rule knowledge, and rule internalization scores. The results showed that the four scores were significantly correlated. There were significant positive correlations between the rule knowledge, compliance, and internalization subscales. Rule knowledge was positively correlated with rule compliance, $\tau_b(159) = .67, p < .001$, and with rule internalization, $\tau_b(159) = .79, p < .001$, and there was a significant positive correlation between rule compliance and rule internalization, $\tau_b(159) = .63, p < .001$. Table 3 also shows that there were positive but less strong correlations between the rule compliance, knowledge, and internalization subscales and the danger appraisal subscale. Thus, when the compliance subscale scores were high, the danger appraisal score was high too.

A series of Mann-Whitney tests were conducted in order to determine whether there were significant gender differences in the compliance subscales and in danger appraisal. A significant difference was found between boys and girls in the total declared compliance score, $U = 2489.50, n_1 = 80, n_2 = 79, p < .05$. Girls more than boys tended to use pedestrian rules to avoid a situation they judged dangerous. The results indicated significant differences between boys and girls in rule knowledge, $U = 2484.50, n_1 = 80, n_2 = 79, p < .05$, rule compliance, $U = 2455.50, n_1 = 80, n_2 = 79, p < .01$, and rule internalization, $U = 2537.50, n_1 = 80, n_2 = 79, p < .05$. Girls had better knowledge of pedestrian rules, greater pedestrian rule compliance, and higher pedestrian rule internalization than boys. On the other hand, there was no significant difference between boys and girls in danger appraisal, $U = 2931.00, n_1 = 80, n_2 = 79, ns$. Thus, whereas boys and girls did not differ significantly in their appraisals of

pedestrian danger, girls tended to have more pedestrian rule knowledge and tended to avoid dangerous pedestrian situations due to pedestrian rule compliance.

3.3 Behavioral and Declared Compliance

A series of non-parametric correlations obtained by Kendall's Tau-b tests were computed in order to determine whether there was a relationship between declared compliance and behavioral compliance. The tests were conducted on the whole sample first, and next on the boy and girl samples separately. There was no significant correlation between the total declared compliance score and the total behavioral compliance score, whether for the whole sample, $\tau_b(159) = .09$, *ns*, the boy sample, $\tau_b(80) = -.01$, *ns*, or the girl sample, $\tau_b(79) = .12$, *ns*. Moreover, Wilcoxon's signed-rank tests on the two reduced scores ranging from 0 to 1 showed that there was a significant difference between declared compliance and behavioral compliance for the whole sample, $z = -8.59$, $N - \text{ties} = 158$, $p < .001$, the boy sample, $z = -6.14$, $N - \text{ties} = 79$, $p < .001$, and the girl sample, $z = -6.03$, $N - \text{ties} = 79$, $p < .001$. Children of both genders tended to be more compliant in their declarations of what they knew than in the behaviors they displayed.

In an attempt to determine the effect of declared compliance on behavioral compliance, the total declared compliance score was converted to a dichotomous variable with two categories on either side of the median (MacCallum, Zhang, Preacher, & Rucker, 2002; Mason, Scirica, & Salvi, 2006).

Table 4 shows the median and the range of behavioral compliance for the boys and girls, and for the whole sample, on the two declared compliance groups. A series of Mann-Whitney tests were conducted in order to test for an effect of declared compliance on behavioral

compliance. The results indicated a significant effect of declared compliance on behavioral compliance, $U = 2551.50$, $n_1 = 83$, $n_2 = 76$, $p < .05$. Children who were above the median on declared compliance had a higher score on behavioral compliance than those who were below the median on declared compliance. Moreover, the results showed that there was an effect of declared compliance on behavioral compliance for girls, $U = 556.50$, $n_1 = 34$, $n_2 = 45$, $p < .05$, but not for boys, $U = 720.00$, $n_1 = 49$, $n_2 = 31$, ns . The girls (but not the boys) who had a higher declared compliance score complied more with pedestrian rules in their behavior. Likewise, there was no significant difference in behavioral compliance between boys and girls when the declared compliance score was below the median, $U = 757.00$, $n_1 = 49$, $n_2 = 34$, ns , but there was a significant gender difference on behavioral compliance when declared compliance was above the median, $U = 470.50$, $n_1 = 31$, $n_2 = 45$, $p < .02$. Thus, girls who had a high declared compliance score were more compliant in their pedestrian behaviors than boys who had a high declared compliance score. This means that declared compliance affected behavioral compliance for girls, but not for boys.

(Table 4)

4. DISCUSSION

By examining gender differences in behavioral and declared compliance with pedestrian rules, the present study provides a number of insights into how boys and girls behave as pedestrians with regard to formal and informal traffic rules, and how gender differences are explained by danger appraisal and rule compliance. The results show that the girls tended to comply with traffic rules more than boys in their pedestrian behavior and in their declared compliance. Furthermore, declared rule compliance does not seem to be related to behavioral

compliance for boys, whereas declared compliance does seem to have an effect on behavioral compliance for girls. But surprisingly, no gender difference was found in danger appraisal. The findings also indicate that the boys tended to comply more than the girls with rules related to looking at the surrounding environment, whether before crossing or during walking, even though girls seem to be generally more compliant with rules in their behavior. Rule knowledge was pretty high for the two gender groups and relation between rule knowledge and rule compliance was quite strong for the children of this study. However, one of the limits of this study is information is lacking on whether these children were actually taught these pedestrian rules. Thereby our findings suggest gender differences in *assumed* compliance with pedestrian rules since we are not sure that these rules have really been taught. In further studies, it would be essential to ask the parents and the preschool centers if they taught the children these rules which could not be the case in this study: lack of compliance must indeed be differentiated from lack of knowledge or from lack of regulation. These and other findings are discussed further below.

4.1 Gender Differences in Behavioral Compliance with Traffic Rules

Consistent with previous findings on adult pedestrians (Moyano Diaz, 2002; Rosenbloom et al., 2004; Yagil, 2000), this study confirms the idea that girls display more behaviors that comply with pedestrian rules than do boys. The boys tended to exercise less control, be more rowdy, and concentrate less on the task of being a pedestrian than the girls. But surprisingly, the boys tended to comply more than the girls with rules related to paying attention to the surrounding environment during crossing and walking.

Higher levels of activity among boys may be related to their greater impulsiveness (Block, 1983; Whitebread & Neilson, 1998). Morrongiello and Dawber (1998) showed in their study

that the boys explored more dangerous objects than the girls: boys readily touched and grasped dangerous objects whereas girls just looked at and pointed at them. However, they found no gender difference when it came to facing unknown but non-dangerous objects.

Moreover, our results showed that the girls held the adult's hand more than boys. Zeedyk and Kelly (2003) explained this gender difference in hand-holding as an effect of the adult belief that girls need more protection or control. More specifically, our results indicated that the girls initiated adult hand-holding more than boys. Other studies have already shown that adults control girls more than boys and that girls are more submissive to adults than boys (Block, 1983; Fagot, 1978; Ruble & Martin, 1998; Turner & Gervai, 1995). For instance, girls receive more positive parental reinforcement when they follow their parents around at home and stay close to them, whereas boys seem to be supervised less and are encouraged more to be autonomous (Fagot, 1974, 1978; Turner & Gervai, 1995). In other respects, numerous studies suggest that children seem to transfer pedestrian responsibilities to the adults who are accompanying them across the street (Grayson, 1975; Sandels, 1975; Van der Molen, 1982; Zeedyk & Kelly, 2003). In addition, previous studies have shown children accompanied by adults have different behaviors as pedestrians than those who are not accompanied. Although children at the age of 5-6 are not allowed to go alone, behaviors as unaccompanied pedestrians of 5-6 years-old children could be different than behaviors observed in this study. For a better understanding of the gender differences in children's pedestrian behaviors, the research should continue to investigate the effect of accompaniment and the relations between adult hand-holding, transfer of responsibility to the adult and environment exploration.

4.2 Gender Differences in Declared Compliance

Consistent with previous findings (Morrongiello & Dawber, 1998; Morrongiello & Dawber, 2004), the girls declared more compliance than boys, despite the fact that there was no gender difference in danger appraisal, contrary to previous studies (Hill et al., 2000; Hillier & Morrongiello, 1998). Specifically, girls displayed more rule knowledge, more rule compliance, and more rule internalization than boys. To our knowledge, this is the first study to document the internalization of traffic rules by children, and few studies have directly examined adult motives for compliance with road safety laws (Yagil, 1998, 2000). Like previous findings (Yagil, 1998, 2000), our results indicated better pedestrian rule internalization by girls. This suggests that pedestrian preschool girls display a higher level of normative motivation to comply with rules than boys.

4.3 Relationship between Declared and Behavioral Compliance

Our results showed that the girls were more compliant with pedestrian traffic rules than boys. Moreover, the results suggest that declared compliance is related to behavioral compliance for girls but not for boys. To our knowledge, this is the first study to document the link between declared and behavioral compliance by both direct and self-reported observations. Studies on adult pedestrians have been conducted either on gender differences in behaviors using direct observations (Rosenbloom et al., 2004) or on declared compliance with pedestrian rules using questionnaires (Moyano Diaz, 2002; Yagil, 1998, 2000). No studies we know of have investigated the relationship between what pedestrians say they do and what they actually do in traffic.

Previous research on gender differences in risk-taking (Byrnes et al., 1999) has found a gap between risky decisions and risky behaviors. Our results show that there may be some

differences between compliant decisions and compliant behaviors. For the boys indeed, there was no link between what they said they would do and what they actually did when walking home from school. Our results suggest that even if boys know the rules well and say they following them, adults cannot be sure that boys will actually react as they say when they are in the street. Children' capability to manage injury risk on their own is not due simply to their ability to recite safety rules (Morrongiello, Ondejko, & Littlejohn, 2004). To a certain extent, boys' behaviors seem to be more independent of traffic rules than those of girls, even though boys seem to be compliant in their speech when they are in front of an adult. In the same way, Morrongiello and Dawber (2004) found that 7-10 year-old children's perception of parental rules concerning risk-taking was not enough to limit boys' risk-taking level, whereas girls' behaviors were coherent with perceived parental norms. The lesser internalization of rules by the boys in our results could explain why there was no link between declared compliance and behavioral compliance for the boys. For boys, pedestrian rule compliance may be related more to external forces and therefore may vary with the observation context and the presence or absence of external forces (Turiel, 1998).

On the other hand, the girls' behavioral compliance tended to be related to their declared compliance. The higher level of normative motivation to comply with rules could also explain why behavioral and declared compliance were linked to a greater extent for the girls.

Interestingly, previous studies (Morrongiello, Midgett, & Shields, 2001; Peterson & Saldana, 1996) have shown that accidents involving 4-6 year-old children can be largely explained by children's compliance with parental rules: degree of compliance, more than rule knowledge, is related to injury (Morrongiello et al., 2001). To a certain extent, if compliance accounts for lesser risk-taking and fewer pedestrian accidents for girls, our results suggest that behavioral

compliance and normative motivation to obey rules provide a better explanation for children's pedestrian accidents than declared compliance.

4.4 Origins of Gender Differences in Compliance

While it is apparent that preschool girls, like adult women, comply more with pedestrian rules than boys or men, researchers lack knowledge of why compliance with rules is greater for females. Most psychologists explain this gender difference in compliance in terms of gender roles (Eagly & Chrvala, 1986; Schwarzwald & Koslowsky, 1999). This account is consistent with gender-based social norms regarding violations (Yagil, 1998). Boys and men perceive more social approval of violations they commit, and experience less control over their behavior than do girls and women (Parker, Manstead, Stradling, & Reason, 1992). Research on parental behaviors has shown indeed that very early boys and girls are treated differently by mothers and fathers (Fagot, 1995). Moreover, children of the two genders are socialized differently on risk-taking. Parents believe risk-taking is more normative for the boys and wait for riskier behaviors from them. They assign boy's risk taking to never-changing attributes and believe this one is innate. On the contrary, mothers plead for active prevention of girl's injury (Morrongiello & Dawber, 1999; Morrongiello & Dayler, 1996; Morrongiello & Hogg, 2004). Thus, in regard to gender differences, studies have to investigate if the boys are less compliant with rules they are taught as consistently as are girls or if boys have less to comply because adults push these rules less with them.

In summary, gender differences in pedestrian rule compliance exist in the preschool years, and boys' behaviors tend to be more independent of the rules and adults than do those of girls. These gender differences seem to be due to difference in motivation to comply in five-year-

old boys and girls. Previous research has suggested that gender differences in compliance and risk-taking can be explained by social pressures on gender role-playing. These results highlight the need for researchers to gain a better understanding of how gender role pressures could lead girls and women to internalize traffic rules more than boys and men.

Our findings suggest in any case that rule internalization already exists during the preschool years, and further research needs to be conducted to investigate how gender role pressure to comply with rules affects behavior, how parental beliefs and practices intervene, and how rule internalization might be increased among boys in order to reduce children's and adults' accident rates.

Our findings suggest also that children can not be assumed to be actually consistently safe in their behavior. Prevention of child's road injury must take into account the implications of children's behavior for other road users. There is evidence that drivers ignore child pedestrians and carry on at pretty much the same speed as usual even though a child is waiting to cross or is playing on the sidewalk (Harré, 2003). Then, drivers do not consider the specificity of child's behavior. Thus, prevention has to re-think the whole way in which society tend to prioritize the right of cars and drivers to move unobstructed by children. The onus has to be placed not only on adjusting child behavior to traffic by training them but also on adjusting adult behavior to child pedestrian by creating more alert drivers and traffic calming zones.

References

- Baker, S. P., O'Neill, B., & Ginsburg, M. J. (1992). *The injury fact book*. New York: Oxford University Press.
- Björklund, G. M., & Aberg, L. (2005). Driver behaviour in intersections: formal and informal traffic rules. *Transportation Research Part F: Traffic Psychology and Behaviour*, 8, 239-253.
- Block, J. H. (1983). Differential premises arising from differential socialization of the sexes: some conjectures. *Child Development*, 54, 1335-1354.
- Byrnes, J. P., Miller, D. C., & Schafer, W. D. (1999). Gender differences in risk taking: a meta-analysis. *Psychological Bulletin*, 125(3), 367-383.
- Coppens, N., & Gentry, L. (1991). Video analysis of play-ground injury-risk situations. *Research in Nursing and Health*, 14, 129-136.
- Cornish, D., & Clarke, R. (1986). *The reasoning criminal: rational choice perspectives on offending*. New York: Springer-Verlag.
- DeJoy, D. M. (1992). An examination of gender differences in traffic accident risk perception. *Accident Analysis & Prevention*, 24, 237-246.
- Eagly, A. H., & Chrvala, C. (1986). Sex differences in conformity: status and gender role interpretations. *Psychology of Women Quarterly*, 10, 203-220.
- Eisenberg, N., & Fabes, R. A. (1998). Prosocial development. In W. Damon & N. Eisenberg (Eds.), *Handbook of Child Psychology* ((5th ed.) ed., Vol. III: Social, emotional and personality development, pp. 701-778). New York: John Wiley & Sons.
- Fagot, B. I. (1974). Sex differences in toddlers' behavior and parental reactions. *Developmental Psychology*, 10, 554-558.

- Fagot, B. I. (1978). The influence of sex of child on parental reactions to toddler children. *Child Development, 49*, 459-465.
- Fagot, B. I. (1995). Parenting boys and girls. In M. Bornstein (Ed.), *Handbook of parenting. Vol. 1. Children and parenting* (pp. 163-183). Hillsdale, NJ: Erlbaum.
- Feingold, A. (1994). Gender differences in personality: a meta-analysis. *Psychological Bulletin, 116*(3), 429-456.
- French National Ministry of Education. (2002). Mise en oeuvre de l'attestation de première éducation à la route dans les écoles maternelles et élémentaires. *Encart du Bulletin Officiel du Ministère de l'Education Nationale, 40*, IX-XXVII.
- Ginsburg, H. J., & Miller, S. M. (1982). Sex differences in children's risk-taking behavior. *Child Development, 53*, 426-428.
- Grayson, G. B. (1975). *Observations of pedestrian behaviour at four sites*. Berkshire: Transport and Road Research Laboratory.
- Grolnick, W. S., Deci, E. L., & Ryan, R. M. (1997). Internalization within the family: the self-determination theory perspective. In J. E. Grusec & L. Kuczynski (Eds.), *Parenting and children's internalization of values* (pp. 135-161). New York: John Wiley.
- Grusec, J., Davidov, M., & Lundell, L. (2004). Prosocial and helping behavior. In P. K. Smith & C. H. Hart (Eds.), *Blackwell Handbook of Childhood Social Development* (pp. 457-474). Oxford: Blackwell Publishing.
- Harré, N. (2003). Discrepancy between actual and estimated speeds of drivers in the presence of child pedestrians. *Injury Prevention, 9*, 38-41.
- Harré, N., Brandt, T., & Dawe, M. (2000). The Development of Risky Driving in Adolescence. *Journal of Safety Research, 31*(4), 185-194.

- Harré, N., Field, J., & Kirkwood, B. (1996). Gender differences and areas of common concern in the driving behaviors and attitudes of adolescents. *Journal of Safety Research*, 27(3), 163-173.
- Hill, R., Lewis, V., & Dunbar, G. (2000). Young children's concepts of danger. *British Journal of Developmental Psychology*, 18(1), 103-119.
- Hillier, L. M., & Morrongiello, B. A. (1998). Age and gender differences in school-age children's appraisals of injury risk. *Journal of Pediatric Psychology*, 23(4), 229-238.
- Kopp, C. B. (1982). Antecedents of self-regulation: a developmental perspective. *Developmental Psychology*, 18, 199-214.
- Kopp, C. B. (1987). The growth of self-regulation: Caregivers and children. In N. Eisenberg (Ed.), *Contemporary topics in developmental psychology* (pp. 34-55). New York: Wiley.
- Lytton, H. (1980). *Parent-child interaction: the socialization process observed in twin and singleton families*. New York: Plenum Press.
- MacCallum, R. C., Zhang, S., Preacher, K. J., & Rucker, D. D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods*, 7(1), 19-40.
- Mason, L., Scirica, F., & Salvi, L. (2006). Effects of beliefs about meaning construction and task instructions on interpretation of narrative text. *Contemporary Educational Psychology*, 31, 411-437.
- Morrongiello, B. A., & Dawber, T. (1998). Toddlers' and mothers' behaviors in an injury-risk situation: implications for sex differences in childhood injuries. *Journal of Applied Developmental Psychology*, 19(4), 625-639.
- Morrongiello, B. A., & Dawber, T. (1999). Parental influences on toddlers' injury-risk behaviors: are sons and daughters socialized differently? *Journal of Applied Developmental Psychology*, 20(2), 227-251.

- Morrongiello, B. A., & Dawber, T. (2004). Identifying factors that relate to children's risk taking decisions. *Canadian Journal of Behavioural Science, 36*(4), 255-266.
- Morrongiello, B. A., & Dayler, L. (1996). A community-based study of parents' knowledge, attitudes and beliefs related to childhood injuries. *Canadian Journal of Public Health, 87*(6), 383-388.
- Morrongiello, B. A., Guthrie, D., & Dawber, T. (1998). Toddlers' and mothers' behaviors in an injury-risk situation: Implications for sex differences in childhood injuries. *Infant Behavior and Development, 21*, 587.
- Morrongiello, B. A., & Hogg, K. (2004). Mother's reactions to children misbehaving in ways that can lead to injury: implications for gender differences in children risk taking and injuries. *Sex Roles, 50*(1-2), 103-118.
- Morrongiello, B. A., Midgett, C., & Shields, R. (2001). Don't run with scissors: young children's knowledge of home safety rules. *Journal of Pediatric Psychology, 26*(2), 105-115.
- Morrongiello, B. A., Ondejko, L., & Littlejohn, A. (2004). Understanding Toddlers' In-Home Injuries: II. Examining parental strategies, and their efficacy, for managing child injury risk. *Journal of Pediatric Psychology, 29*(6), 433-446.
- Moyano Diaz, E. (2002). Theory of planned behavior and pedestrians' intentions to violate traffic regulations. *Transportation Research Part F: Traffic Psychology and Behaviour, 5*(3), 169-175.
- Nucci, L. P., Guerra, N., & Lee, J. (1991). Adolescent judgments of the personal, prudential, and normative aspects of drug usage. *Developmental Psychology, 27*(5), 841-848.
- Parker, D., Manstead, A. S. R., Stradling, S. G., & Reason, J. T. (1992). Determinants of intention to commit driving violations. *Accident Analysis & Prevention, 24*(2), 117-131.

- Parker, D., Manstead, A. S. R., Stradling, S. G., Reason, J. T., & Baxter, J. S. (1992). Intention to commit driving violations: an application of the theory of planned behavior. *Journal of Applied Psychology, 77*(1), 94-101.
- Peterson, L., Brazeal, T., Oliver, K., & Bull, C. (1997). Gender and developmental patterns of affect, belief, and behavior in simulated injury events. *Journal of Applied Developmental Psychology, 18*(4), 531-546.
- Peterson, L., & Saldana, L. (1996). Accelerating children's risk for injury: mother's decisions regarding common safety rules. *Journal of Behavioral Medicine, 19*, 317-331.
- Rivara, F. P., Bergman, A. B., LoGerfo, J., & Weiss, M. (1982). Epidemiology of childhood injury II: sex differences in injury rates. *Developmental and Behavioral Pediatrics, 16*, 362-370.
- Rivara, F. P., Booth, C. L., Bergman, A. B., Rogers, L. W., & Weiss, J. (1991). Prevention of pedestrian injuries to children: effectiveness of a school training program. *Pediatrics, 88*(4), 770-775.
- Rivara, F. P., & Mueller, B. A. (1987). The epidemiology and causes of childhood injury. *Journal of Social Issues, 43*, 13-32.
- Rosen, B. N., & Peterson, L. (1990). Gender differences in children's outdoor play injuries: A review and an integration. *Clinical Psychology Review, 10*(2), 187-205.
- Rosenbloom, T., Nemrodov, D., & Barkan, H. (2004). For heaven's sake follow the rules: pedestrians' behavior in an ultra-orthodox and a non-orthodox city. *Transportation Research Part F: Traffic Psychology and Behaviour, 7*(6), 395-404.
- Rosenbloom, T., & Wolf, Y. (2002). Sensation seeking and detection of risky road signals: a developmental perspective. *Accident Analysis & Prevention, 34*(5), 569-580.
- Routledge, D. A., Repetto-Wright, R., & Howarth, C. I. (1974). The exposure of young children to accident risk as pedestrians. *Ergonomics, 17*(4), 457-480.

- Ruble, D. N., & Martin, C. L. (1998). Gender Development. In W. Damon & N. Eisenberg (Eds.), *Handbook of Child Psychology. Vol.3: Social, Emotional, and Personality Development* (5th edition ed., pp. 933-1016). New-York: John Wiley & Sons.
- Sandels, S. (1975). *Children in traffic*. London: Paul Elek.
- Schwarzwald, J., & Koslowsky, M. (1999). Gender, self-esteem, and focus of interest in the use of power strategies by adolescents in conflict situations. *Journal of Social Issues*, 55(1), 15-32.
- Simon, F., & Corbett, C. (1996). Road traffic offending, stress, age, and accident history among male and female drivers. *Ergonomics*, 39, 757-780.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics* (2nd ed.). New York: Harper Collins.
- Thomson, J. A. (1991). *The facts about child pedestrian accidents*. London: Cassell Educational Ltd.
- Thomson, J. A. (1996). Increasing traffic competence in young children. In B. Gillham & J. A. Thomson (Eds.), *Child safety: problem and prevention from preschool to adolescence* (pp. 86-112). London: Routledge.
- Tisak, M. S., & Turiel, E. (1988). Variation in seriousness of transgressions and children's moral and conventional concepts. *Developmental Psychology*, 24(3), 352-357.
- Turiel, E. (1998). The development of morality. In N. Eisenberg (Ed.), *Handbook of Child Psychology* (Vol. 3: Social, emotional and personality development, pp. 863-932). New York: Wiley.
- Turner, P. J., & Gervai, J. (1995). A multidimensional study of gender typing in preschool children and their parents: personality, attitudes, preferences, behavior, and cultural differences. *Developmental Psychology*, 31(5), 759-772.
- Tyler, T. (1990). *Why people obey the law*. New Haven: Yale University Press.

- UNICEF. (2001). *A league table of child deaths by injury in rich nations. Innocenti report card n°2*. Florence: UNICEF Innocenti Research Centre.
- Van der Molen, H. H. (1981). Child pedestrian's exposure, accidents and behavior. *Accident Analysis & Prevention*, 13(3), 193-224.
- Van der Molen, H. H. (1982). Behaviour of children and accompanying adults at a pedestrian crosswalk. *Journal of Safety Research*, 13(3), 113-119.
- Van der Molen, H. H. (1983). *Pedestrian ethology*. Groningen: University of Groningen.
- Waylen, A., & McKenna, F. (2002). *Cradle attitudes - grave consequences. The development of gender differences in risky attitudes and behaviour in road use*. Reading University: Foundation for Road Safety Research.
- Whitebread, D., & Neilson, K. (1998). *Cognitive and Metacognitive Processes Underlying the Development of Children's Pedestrian Skills. Rapport n°6*. London: Department for Transport, Road Safety Division.
- Yagil, D. (1998). Gender and age-related differences in attitudes toward traffic laws and traffic violations. *Transportation Research Part F: Traffic Psychology and Behaviour*, 1, 123-135.
- Yagil, D. (2000). Beliefs, motives and situational factors related to pedestrians' self-reported behavior at signal-controlled crossings. *Transportation Research Part F: Traffic Psychology and Behaviour*, 3(1), 1-13.
- Zeedyk, M. S., & Kelly, L. (2003). Behavioural observations of adult-child pairs at pedestrian crossings. *Accident Analysis & Prevention*, 35(5), 771-776.
- Zeedyk, M. S., Wallace, L., Carcary, B., Jones, K., & Larter, K. (2001). Children and road safety: increasing knowledge does not improve behaviour. *British Journal of Educational Psychology*, 71(4), 573-594.

Table 1

Percentage of Boys (n=83¹) and Girls (n = 79) Displaying Each Compliant Walking and Crossing Behavior

Behavior	Whole Sample	Boys	Girls
	Walking		
Walking (not running) on sidewalk	75	60	91
Steady walking pace	33	24	43
Safe walking position on sidewalk	49	51	47
Checking the surrounding environment	54	65	43
Crossing			
Crossing inside crosswalk	56	58	54
Going straight across	65	53	77
Stopping at curb	15	12	18
Looking in both directions	32	43	20
Walking across street	68	57	81
Holding hand	52	34	70
Initiating hand-holding	34	24	46
Adult closeness	49	47	51

¹ 80 boys took behavioral and declared compliance tests

Table 2

Danger Appraisal and Rule Compliance Subscales: Median (and Range) for Boys and Girls

Subscale	Boys	Girls
Danger appraisal	10 (10)	10 (8)
Rule following	9 (9)	10 (7)
Rule knowledge	8.5 (10)	10 (10)
Rule internalization	8 (12)	10 (12)
Rule compliance in danger appraisals	32 (39)	39 (28)

Table 3

Intercorrelations^a between Subscales of Rule Compliance and Danger Appraisal

	Internalization	Rule knowledge	Danger appraisal
Compliance	.63(**)	.67(**)	.42(**)
Internalization		.79(**)	.24(**)
Rule knowledge			.31(**)

Note. ^a Kendall's non parametric τ_b correlations

$N = 159$ for all intercorrelations

* $p < .05$, ** $p < .01$

Table 4

Behavioral Compliance Median (and Range) of Boys, Girls, and the Whole Sample, for the Two Declared Compliance Groups

Subscale	Boys	Girls	Whole Sample
Lower declared compliance	5 (8)	5 (9)	5 (10)
Higher declared compliance	4 (9)	6 (9)	5 (9)