



Published in final edited form as:

Perspect Psychol Sci. 2009 November ; 4(6): 578–586. doi:10.1111/j.1745-6924.2009.01166.x.

Monitoring Matters: Meta-analytic review reveals the reliable linkage of parental monitoring with adolescent marijuana use

Andrew Lac and William D. Crano

Claremont Graduate University

Abstract

Parental monitoring is commonly accredited as an important protective factor against risky adolescent behaviors. In this meta-analytic review, associations of adolescents' perceptions of parental monitoring with adolescent marijuana use were collected and quantified across 25 independent samples from 17 empirical studies involving 35,367 unique participants. Applying a random-effects model, the average magnitude of effect was $r = -.21$. The association was significantly stronger in female-only samples ($r = -.31$ vs. $r = -.19$, $p < .001$) and when parental monitoring was defined purely in terms of parental knowledge of the child's whereabouts, activities, and relations ($r = -.24$ vs. $r = -.19$, $p < .05$). Cross-sectional ($r = -.23$) and longitudinal studies ($r = -.10$) disclosed significant effect sizes. To assess publication bias, a file-drawer analysis indicated that 7,358 studies of nil effect size would be necessary to render the association of parental monitoring and reduced marijuana usage nonsignificant. Theoretical and practical implications of parental monitoring are discussed, especially issues concerning the measurement of parental monitoring and the possible utility of the construct in curtailing marijuana use.

Risk-taking behaviors are especially prevalent in adolescence, a transitional period from childhood to adulthood (Galvan, Hare, Voss, Glover, & Casey, 2007). One such behavior, marijuana use, is an unlawful delinquent activity that is relatively common during this stage of life (Watts & Wright, 1990). National data from the Monitoring the Future project, for example, revealed that 14.2% of 8th graders, 31.0% of 10th graders, and 41.8% of 12th graders have experimented with marijuana, the illicit drug most widely used by adolescents (Johnston, O'Malley, Bachman, & Schulenberg, 2008). Such high national usage rates in youth may be explained largely by the perception that experimenting with marijuana is assessed as being of "great risk" by only 32.8% of 8th graders, 22.2% of 10th graders, and 18.6% of 12th graders (Johnston et al., 2008). The paradoxical finding contributing to continued usage is that despite experiencing more detrimental academic and social consequences, adolescent marijuana users perceive lower future marijuana-related risk in these very same domains than do nonusers (Kilmer, Hunt, Lee, & Neighbors, 2007). Clinical health consequences associated with prolonged marijuana use include depression; cognitive impairment; irritability; cardiovascular complications; inhibition of hormone production responsible for reproductive functioning; and even head, neck, and lung cancer (Khalsa, Genser, Francis, & Martin, 2002). As marijuana consumption during adolescence may

eventually lead to a host of long-term detrimental consequences in adulthood, as demonstrated in a fully matched design of heavy and nonheavy users (Stuart & Green, 2008), identifying protective factors in adolescence is an imperative social concern of great relevance to the many medical and behavioral scientists and practitioners involved in prevention.

Parental monitoring, an emergent dyadic property of the parent–child relationship (Crouter, MacDermid, McHale, & Perry-Jenkins, 1990), is commonly viewed as a familial factor that attenuates a variety of challenging adolescent social behaviors, including problematic gambling, sexual activity, unprotected sex, and illicit substance use (Borawski, Ievers-Landis, Lovegreen, & Trapl, 2003; Magoon & Ingersoll, 2006). In addition to serving as insulation against these activities, parental monitoring is a product of positive parent–child relations and is positively associated with family warmth (Fletcher, Steinberg, & Williams-Wheeler, 2004), cohesion (Dillon, Pantin, Robbins, & Szapocznik, 2008), involvement (McKee et al., 2008), familism (Ramirez et al., 2004), and communication (Cottrell et al., 2007). Examining the underlying protective effects of parental monitoring in deterring adolescent at-risk behaviors is not only of practical importance to parents, but of theoretical importance to health, social, developmental, family, and clinical psychologists. As a rough estimate of the relevance of the topic to the social sciences, several theories have incorporated parental monitoring or supervisory behaviors as pivotal concepts: They include problem behavior theory (Jessor, 1987), self-control theory (Gottfredson & Hirschi, 1990), and parenting styles theory (Baumrind, 1967). A common theme underscoring these theories is that parents serve as socialization agents of their offspring by instilling values and worldviews (McHale, Dariotis, & Kahuh, 2003), a fundamental role that cannot be taken lightly.

Despite the variety of research concerning parental monitoring, consensus on the critical repertoire of behaviors that constitute monitoring has yet to evolve. As such, over time, researchers have developed a diverse set of variables to conceptualize this variable. Researchers have acknowledged that the definition of parental monitoring has not been uniformly measured and examined (Crouter & Head, 2002; DiClemente et al., 2001; Shillington et al., 2005). Dishion and McMahon's (1998) narrative review of parental monitoring, for example, recognizing that measurement of parental monitoring has been inconsistent, proposed the more expansive view that monitoring be seen as a constellation of critical parenting practices that involves attention, structuring, and tracking.

A more recent line of research suggests that most parental monitoring measures actually reflect parental knowledge of the child's activities, whereabouts, and relationships and that this more limited and precise definition is most predictive of adolescents' involvement in delinquency and norm violation (Kerr & Stattin, 2000; Stattin & Kerr, 2000). Parental knowledge appears to stem more from the child's willing disclosure of information than from parental solicitation or parental control, though all these factors were found to be interconnected (Stattin & Kerr, 2000). On the basis of such a classification, parental monitoring scales may be described as agglomerations of items that variously may include assessments of parental knowledge ("How often do your parents know where you are after school?"), child self disclosure ("How often do you tell your parents where you are after

school?”), parental solicitation (“How often do your parents ask you where you are after school?”), and parental control (“How often do your parents require you to tell them where you are after school?”). It is not entirely clear, however, whether or not these fine-grained distinctions in operationalizations of parental monitoring translate broadly across diverse samples. Nor has it been clearly established that parental knowledge is the most useful of the monitoring components, in that it is most strongly associated with lower marijuana use. The question also remains as to whether any form of parental monitoring, regardless of the precise manner in which researchers have defined the concept, is better than none at all (Parsai, Voisine, Marsiglia, Kulis, & Nieri, 2009).

The overarching goal of this quantitative review is to synthesize the empirical research specifically examining the relationship between parental monitoring and adolescent marijuana use. Although it stands to reason that parental monitoring may be associated with lower marijuana use in adolescents, the strength of relationship between monitoring and usage may be weaker than expected, or even nonexistent, for a number of reasons. In comparison with licit substances (at least for older adolescents) such as alcohol and cigarettes, adolescents are considerably more likely to conceal marijuana use from their parents (Schwartz & Voth, 2003). Further, during this developmental transition from childhood to adulthood, adolescents often seek to become more independent from their parents, redirecting their interpersonal resources and goals toward establishing and maintaining relationships with their peers (Erikson, 1959; Steinberg & Silverberg, 1986), who may be considerably more likely than parents to provide illicit substances for their use. In combination, these factors would foster clandestine behavior and operate against willing acknowledgement to caregivers of drug use. As such, it is possible that monitoring activities may appear unrelated to marijuana usage in adolescents.

Despite these troublesome possibilities, millions of dollars are spent every year on the production and airing of mass media prevention communications that urge parents to monitor their adolescent children’s behavior. Sponsored by the White House’s Office of National Drug Control Policy (2008), the “Parents: The Anti-Drug” campaign is a multimillion dollar mass-media intervention program based on the premise that parental monitoring is a powerful deterrent to teenage drug abuse (see www.theantidrug.com). As yet, however, there has been no thorough quantitative analysis of research concerned with the association of parental monitoring and adolescent marijuana use. Clearly, establishing a systematic cross-study quantitative link between parental monitoring and adolescent marijuana use could provide useful information and more conclusive evidence of the wisdom (or foolishness) of these expenditures. Such an analysis would allow a more direct appraisal of the advisability of further investments in interventions that are premised on the mitigating effects of parental monitoring on substance use. In the absence of a thoroughgoing systematic review of evidence underscoring the link of parental monitoring and adolescents’ drug use, the wisdom of these massive expenditures remains unresolved.

Several research questions are addressed in this examination of the association of parental monitoring and adolescent marijuana use. Of central importance is the magnitude of effect across research samples. Is the overall effect statistically significant, regardless of how parental monitoring is defined? Is it sufficiently robust that the problem of publication bias

does not render the findings statistically nonsignificant? And does the effect size justify the massive expenditures made to this point?

In addition to addressing these central issues, theoretically and practically relevant moderators also will be investigated. Specifically, we will assess whether gender (female-only samples); race (nonwhite samples); and a particularly restricted consideration of parental monitoring involving measures that tap only knowledge of activities, whereabouts, and relationships are statistically reliable moderators of the association of parental monitoring and adolescent marijuana use. Past research has shown that adolescent girls typically are monitored more closely than adolescent boys (Webb, Bray, Getz, & Adams, 2002), possibly leading to greater protective effects of monitoring in girls. Research also suggests that parental monitoring might be more effective among youth of minority racial status (Tragesser, Beauvais, Swaim, Edwards, & Oetting, 2007), potentially due to the culturally bound familism experienced in minority households (Ramirez et al., 2004). Such results often have been mixed, with one study showing, for example, that neither gender nor ethnicity moderated the effectiveness of parental monitoring on reducing sexual risk-taking (Huebner & Howell, 2003). Finally, we test an important methodological concern with respect to measurement of this construct (Crano & Brewer, 2002)—namely, the association of monitoring and adolescent marijuana use when the parental monitoring construct is restricted to parents' knowledge of the adolescent's activities, whereabouts, and relationships (rather than more inclusive measures that might assess adolescent self-disclosure, parental solicitation, and parental control, among others). Some research suggests that parental monitoring may more predictive of adolescent delinquent outcomes when characterized as parental knowledge (Kerr & Stattin, 2000). Additional moderators to be coded in the analysis include age and whether the study design was cross-sectional or longitudinal.

METHOD

Search Parameters

Databases consulted in our electronic search included PsycINFO, PubMed, and ERIC. The terms used to qualify the search were *parental monitoring* or *parent monitoring* together with *marijuana*, *cannabis*, or *hashish*. Keyword, title, abstract, and full text fields were searched. To ensure that studies were of sufficient quality, only peer-reviewed journal articles were included. If electronic copies were unavailable, paper copies were obtained.

Criteria for Study Inclusion

Once the articles were collected, we examined the full text to gather information necessary to estimate effect sizes and code for moderator variables. Study inclusion criteria were as follows: (a) Participants were adolescents (for our purposes, adolescents are defined as respondents in samples averaging 10 to 19 years in age), and if no mean age was provided, the study was included if the word *adolescent* was used to describe the sample; (b) the author(s) labeled the parental measure specifically as *parental monitoring* or *parent monitoring* in the method or results section; (c) marijuana use was not included in an omnibus composite containing other types of substances, which would make it impossible to

disentangle the measurement of marijuana consumption from other licit and illicit drugs; (d) consistent with much of the literature, data were based on adolescent self-reports, not parents' reports of the diligence of their monitoring activities; and (e) effect sizes could be directly obtained or derived from formulas detailed in Lipsey and Wilson (2001) or Rosenthal (1991b).

Moderators

In addition to general sample information and effect size, we coded for several relevant moderator variables.

1. Gender. Samples in which all the participants were female were identified.
2. Racial minority. This moderator variable was concerned with whether or not the sample consisted of all racial minority (non-White) participants.
3. Parental knowledge. This moderator variable was concerned with the measurement of parental monitoring. Did the construct consist entirely of items that assessed parental knowledge or awareness of the child's activities, whereabouts, and relationships? If so, it was coded as a pure assessment of parental knowledge. If the measure contained items that tapped other features of monitoring (e.g., items on parental control), it was coded as an exemplar of more general parental monitoring (not exclusively parental knowledge). Sometimes the study provided only a sampling of items from the parental monitoring scale, or the scale referenced in the study could not be obtained. In these cases, we were required to estimate this particular moderator information on the basis of the items that were listed.

For each of these three moderator variables, all other samples that did not satisfy the moderator criterion served as the reference group. This all-or-none contrast approach was used because the studies did not always provide sufficient information on gender and racial distribution (sometimes these factors were not even reported). Female-only and minority-only samples could be easily identified because the literature reviews of such studies focused specifically on these specialized groups. Finally, we coded for mean age of the sample and whether the design was cross-sectional or longitudinal. The design was considered longitudinal when marijuana use was measured some time after the measurement of parental monitoring.

Meta-Analytic Model

The Pearson r was selected as the effect size indicator because of its properties in capturing relationships assessing r_{xy} , r_{pb} , and r_{phi} (Rosenthal, 1991b). A higher negative r value represents a stronger association between parental monitoring and reduced marijuana use. The more statistically conservative random-effects analytic model was adopted, as it treats each independent sample as the unit of analysis and therefore allows our meta-analytic results to be generalized to the population of studies (Rosenthal, 1995). Such a model also prevents extremely large samples from overcontributing to the estimation of the overall effect size. Effect sizes were inverse variance weighted. To avoid duplication and to ensure the independence of participants, only one study that made use of the same dataset was included in the analysis. Problems of duplication occur when the same data (usually from

publicly available data archives) form the basis of multiple investigations. Such data usually are identifiable by articles that refer to the same project or dataset name. When such instances were encountered, the study that provided the most complete information in determining the effect size and moderators was included in the analysis. If a study contained more than one independent sample (i.e., participants did not appear in both samples), the effect size was calculated separately for each sample.

The most common reason for exclusion of studies was lack of information necessary to derive the effect size. The second most common reason was researchers' use of composites that tapped global substance usage, making it impossible to examine marijuana separately. Our research suggests that the factors that appear to foster use of one drug are not necessarily the same as those that stimulate usage of other drugs (e.g., Crano, Gilbert, Alvaro, & Siegel, 2008; Crano, Siegel, Alvaro, Lac, & Hemovich, 2007; Crano, Ting, & Hemovich, 2009; Ramirez et al., 2004). This research strongly suggests that factors that influence moderation or abstinence might not be identical across substances; as such, whenever possible it is preferable to use indicators of specific drugs, rather than global indices that amalgamate usage across a variety of different substances.

RESULTS

Key characteristics from 25 independent samples drawn from 17 empirical studies involving 35,367 unique participants are summarized in Table 1. Though we did not limit the search by year, research examining the relationship between parental monitoring and marijuana use that provided obtainable effect sizes is of relatively recent vintage (2000–2008). Sample sizes were variable and ranged from 77 to 8,012; the median sample size was 1,054. Apparently, research assessing the relationship of parental monitoring and adolescent marijuana use usually involves relatively large respondent samples. Across samples, participants' mean ages ranged from 10.5 to 18.7 years; the median respondent age was 15.6 years.

Effect sizes ranged from .01 to $-.36$. Across samples, the average magnitude of effect (according to a random effects model) of parental monitoring on adolescent marijuana use was $r = -.21$ ($k = 25$, $Z = -10.01$). The two statistically nonsignificant effect sizes emerged from the two smallest sample sizes and from the same study. The vast majority of the effect sizes were statistically significant. Z values ranged from .09 to -15.47 . The Z value was negative in 24 of the 25 independent samples and statistically significant in 23 of these cases, indicating that greater parental monitoring was associated with substantially less marijuana use by their offspring.

This strong pattern of results suggests either that the linkage of parental monitoring with adolescent marijuana use is extremely reliable or that there a strong bias exists in favor of publishing only statistically significant results in this area of research. To assess this possibility, a file-drawer analysis was conducted to assess the potential impact of publication bias on these results (Rosenthal, 1991b). The analysis revealed that at least 7,358 studies of nil effect size would be necessary to render the obtained relationship between parental monitoring and adolescent marijuana use nonsignificant ($p > .05$).

A stem and leaf plot displaying the distribution of effect sizes is presented in Figure 1. The effects sizes were found to be heterogeneous, Q test = 333.23 ($df = 24$), $p < .001$, indicating substantial sample-to-sample variability in effect sizes. As such, analyses were conducted to assess potential moderators of the relationship (Rosenthal, 1995). An analysis of female-only samples ($r = -.31$, $k = 5$, $Z = -16.69$) versus all other samples ($r = -.19$, $k = 20$, $Z = -9.10$) disclosed that sex moderated the magnitude of relationship ($p < .001$). The relationship between parental monitoring and adolescent marijuana use was significantly stronger in female-only samples. The effect size of racial minority-only samples ($r = -.22$, $k = 9$, $Z = -6.33$) did not significantly differ from all other samples ($r = -.20$, $k = 16$, $Z = -7.94$; $p > .05$). Samples that construed parental monitoring as involving only parental knowledge ($r = -.24$, $k = 9$, $Z = -7.93$) yielded significantly larger effect sizes than did samples that employed more expansive definitions ($r = -.19$, $k = 16$, $Z = -7.34$; $p < .05$).

No difference in effect size was detected between samples in which the mean age was at or above 15.6 years ($r = -.22$, $k = 13$, $Z = -7.69$) and those in which the mean age was below 15.6 years ($r = -.22$, $k = 10$, $Z = -6.76$). Four samples (Cleveland, Gibbons, Gerrard, Pomery, & Brody, 2005; Pedersen, Mastekaasa, & Wichstrom, 2001; Rodgers-Farmer, 2000; White et al., 2006) were identified as longitudinal. In all four longitudinal samples, marijuana use was assessed at least 6 months after the assessment of parental monitoring. The meta-analysis disclosed that the association between monitoring and marijuana use found in the longitudinal designs was statistically significant ($r = -.10$, $k = 4$, $Z = -5.96$). This effect was significantly smaller in magnitude than the association that emerged in the analysis of the cross-sectional designs ($r = -.23$, $k = 21$, $Z = -11.27$; $p < .001$).

DISCUSSION

This meta-analytic review examined the relationship between parental monitoring and marijuana use among adolescents. Drawing on 25 independent samples involving more than 35,000 participants, the analysis disclosed a robust link between parental monitoring of adolescents and lower marijuana consumption in adolescents. A file-drawer analysis demonstrated that an implausibly large number of unpublished studies of zero effect size would be required to compromise the obtained relationship. Except for two nonstatistically significant samples drawn from the same study, the relationship of monitoring and adolescent marijuana use was as expected: More intense monitoring was associated invariably with less adolescent marijuana use. The consistency of this result was impressive; across 25 independent samples, 24 relationships were in the expected direction, and 23 of these were statistically significant. Parental monitoring is commonly viewed as a protective factor in attenuating youth marijuana use, and it has formed the basis of a nationwide mass-media prevention campaign stressing that parents serve as the antidrug (Office of National Drug Control Policy, 2008). In fact, a section on their campaign website is devoted entirely to advice for parents on how to develop their monitoring skills (http://www.theantidrug.com/advice/advice_monitor.asp). Although the findings do not unequivocally support the wisdom of the campaign, they certainly do support the assumed association of these factors.

Moderation analyses elucidate the relationship of parental monitoring and adolescent marijuana use. Gender was found to be a statistically significant moderator. Larger effect

sizes were observed in female-only samples. The apparent double standard of monitoring based on the child's gender reinforces research that shows that parents are perceived by children to be more likely to impose an earlier curfew for girls and to require more indoor chores of them (Peters, 1994). Perhaps it is the less intense monitoring of boys that renders them significantly more likely than girls to engage in serious conduct problems (e.g., stealing cars), aggression (e.g., quarreling with teachers), and illegal covert acts (e.g., sneaking into cinemas; Pedersen et al., 2001). However, research also suggests that this difference is not universal, as allowance, receipt of gifts, and use of the family car was not perceived to be associated with the child's gender (Peters, 1994). It is important to keep in mind that research has shown that adolescent gender differences in the insulating effect of parent monitoring varied as a function of the particular adolescent behavior under investigation (Svensson, 2003).

Minority-only status and age did not emerge as statistically significant moderators of the critical relationship. The limitations of this result must be considered carefully. Race and age might better moderate the effect of parental monitoring on other behaviors or on usage of other substances such as alcohol and tobacco, and they should be investigated in future research. Other moderators not considered in this research also might explain the monitoring-usage association. For example, Huebner and Howell (2003) discovered that the level of parent-child communication enhanced the effectiveness of parental monitoring on reducing sexual activity. Higher consciousness or higher agreeableness, found to be heritable personality traits (Jang, Livesley, & Vernon, 1996), occurring in both parent and child also might yield stronger associations of parental monitoring with adolescent marijuana use.

The overall magnitude effect size $r = -.21$ deserves close scrutiny. A binomial effect-size display analysis (BESD; Rosenthal & Rubin, 1982) provides an indication of the practical significance of this result given certain restrictive assumptions. If we assume a median split on both parental monitoring and marijuana use, then there is approximately a 21% decrease of adolescents in the high marijuana usage group when comparing households with high parental monitoring to those with low monitoring (Rosenthal & Rubin, 1982). If, indeed, close parental monitoring is associated with a 21% reduction of marijuana use in youth, then current preventive campaigns touting parents as the antidrug appear well justified. A decrease of this size nationwide would massively reduce many of the documented problems associated with adolescents' use of marijuana, including increased school dropout, riskier sexual behavior, depression, delinquency, cognitive impairment, cardiovascular complications, and the like.

BESD analysis has been criticized as misleading when the symmetry assumption on the two relevant variables is untenable (e.g., Hsu, 2004; Strahan, 1991). However, the assumption of an approximate 50-50 split on marijuana use/nonuse in adolescents appears reasonable (Johnston et al., 2008). Parental monitoring, too, is reasonably divided into high and low groups. Even if this were not the case, Rosenthal (1991a) has shown that deviations from the assumed symmetry used in computing the BESD do not affect analytic outcomes substantially.

The functional difference suggested in the BESD may have important preventive implications in mitigating marijuana use, an illicit activity that might extend into adulthood and potentially result in incarceration, physical and psychological morbidity, and other serious problems. Though ostensibly not a striking effect size, such an effect is more impressive when interpreted in terms of the social implications involved in discouraging the many millions of adolescent children from marijuana use. Perhaps even more practically noteworthy, in all the studies analyzed, parental monitoring was defined in omnibus terms (e.g., “Do your parents typically know what you are doing?”) rather than in more specific language concerning the delinquent behavior of interest (e.g., “Do your parents typically know whether you are using marijuana?”). The finding that conceptually broad and nonspecific measures of parental monitoring mapped onto the more precise and limited indicators of adolescent marijuana use points to the utility of the parental monitoring construct. One may logically surmise that the effect size would have been even larger if parental monitoring measures had been directed more specifically to the monitoring of adolescent marijuana use (Ajzen & Fishbein, 2005).

Stattin and Kerr (2000) contended that most parental monitoring constructs actually measure parental knowledge of the child’s activities, whereabouts, and relationships, and they argued that parental knowledge was the critical factor responsible for the association of parental monitoring and positive child behavior. Our analysis provides substantial support for this argument, as the majority of the samples in our review used scales involving at least some item that tapped parental knowledge. Scales containing items concerning child self-disclosure, parental solicitation, parental control, and other parental items were used relatively infrequently when compared with parental knowledge. Stattin and Kerr (2000) also reported that knowledge-based monitoring scales were most predictive of reduction in children’s antisocial or delinquent behaviors. Our moderation results lent support to this possibility as well, as pure knowledge measures were found to yield a larger magnitude of effect than did measures that adopted a more expansive definition of monitoring. This result suggests that some monitoring-based approaches may be more effective than others, especially when it comes to adolescent marijuana use. Two trends relating to measuring parental monitoring, and parental knowledge in particular, bear close consideration. A number of samples that could not be defined as being based purely on parental knowledge nonetheless contained some items that reflected knowledge. Further, even in scales deemed operationally to define parental monitoring only with parental knowledge, some studies focused on the adolescent’s whereabouts rather than activities or relationships, whereas other studies assessed all three (e.g., Shillington et al., 2005). This variability in the measurement of the parental-monitoring construct across studies makes it difficult to pin down exactly which aspect of monitoring is associated most strongly with lower adolescent marijuana use. Future research might seek to isolate the components of parental monitoring that are most strongly associated with marijuana misuse and abuse. Research in which parental monitoring is defined in terms of parental knowledge might assess if knowledge of the child’s activities, whereabouts, or relationships is the most crucial predictor of the behavior under consideration. As such, researchers would be well advised to assess these three dimensions separately.

Our review should be considered in light of a number of limitations. Consistent with the predominant literature, the studies we collected involved parental monitoring measured from the youth's viewpoint (Crano, Siegel, Alvaro, & Patel, 2007). The self-report perspective represents the most critical indicator of the extent to which adolescents perceive they are being monitored by their parents, as it is this view that is likely to impinge most upon their own behavior. Also, as might be expected, we did not encounter any experimental studies concerning the effects of manipulated parental monitoring on adolescent marijuana usage. As such, we are unable to state that parental monitoring lowers marijuana use in adolescents. One alternative explanation is that usage of marijuana may produce lower perceptions of being monitored. Though we cannot definitely rule out such a possibility, this alternative interpretation is inconsistent with much of the parental-monitoring literature (Crouter & Head, 2002). Even if such a reversed pathway might be contemplated, an explanation that physiological and psychological effects of marijuana compromised perceptions of parental monitoring is unlikely. A more plausible possibility is that in efforts to avoid parental detection, adolescent marijuana users might go out of their way to evade their parents and consequently might assume (and report) low parental monitoring. This perspective is consistent with the controversial view that parenting behavior is largely evoked in reaction to children's behavior (Harris, 1995). The effect size that was obtained, however, remains the same regardless of the directionality of the association. It should be noted that the issue of causation is not simply limited to our review but is a concern inherent to all empirical and meta-analytic investigations that examine nonexperimental relationships.

As parental monitoring is a malleable behavior (Dishion & McMahon, 1998), future research may seek to address the causal effects of monitoring on marijuana use by randomly assigning parents either to a strategy-focused intervention that contrasts a parental monitoring training approach or to other parental prevention training approaches that do not stress monitoring. One aspect of our review might shed some light on the directionality of this relationship. We documented that longitudinal designs examining the prediction of parental monitoring on subsequent marijuana use was statistically significant, albeit small in magnitude ($r = -.10$). This result might suggest, on the one hand, that parental monitoring has a relatively weak prospective influence on marijuana use and that parents matter very little, at least in the long run (Harris, 1995). On the other hand, such a finding also might suggest that parental monitoring should be an ongoing, consistent, and enduring process, as a snapshot perception of monitoring by adolescents at a prior time point is insufficient and does not provide a true picture of the preventive effects of this complex set of behaviors on long-term prevention of adolescent marijuana use. The implication derived from this point is that adolescents must feel and believe that they are being monitored consistently by their parents: Parenting is not a one-shot deal.

Our meta-analytic review supplies a number of theoretical and applied considerations that might be useful in understanding the relationship between parental monitoring and marijuana use among adolescents. We also addressed an important measurement concern with respect to content, construct validity, and predictive validity (Crano & Brewer, 2002) and suggest that researchers carefully contemplate the ways they choose to define parental monitoring operationally. Our review suggests that parents are far from irrelevant, even

when it comes to an illegal and often secretive behavior on the part of their adolescent children. Information derived from this quantitative synthesis may prove useful in marijuana-based prevention programs and campaigns targeting parents, and might offer insight on how to alleviate a risky behavior that is all too common at an important transitional stage between childhood and adulthood.

Acknowledgments

Preparation of this research was supported by a grant from the U.S. National Institute on Drug Abuse (5R01DA020879-02). The contents of this article are solely the responsibility of the authors and do not necessarily reflect the views of the Institute.

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Stem	Leaf
.0	1
-.0	8, 9
-.1	0, 2, 2, 3, 3, 5, 7
-.2	1, 1, 2, 3, 4, 5, 6, 6, 8
-.3	0, 1, 1, 1, 2, 6

Fig. 1.
Stem and leaf plot of effect sizes.

Table 1
 Samples Examining the Relationship Between Parental Monitoring and Adolescent Marijuana Use

Study #	Authors (year)	Sample #	N	Age	Female only	Racial minority only	Knowledge only	Items in "Parental Monitoring"	r	Z value
1	Borawski et al. (2003)	1	692	15.7				PK, CD, PC, other	-.21	-5.61**
2	Cleveland et al. (2005)	2	714	10.5	x	x	x	PK	-.09	-2.41*
3	Cottrell et al. (2003)	3	270	13.9				PK, CD	-.21	-3.48**
4	Crano et al. (2008)	4	2,111	13.4			x	PK	-.15	-7.16**
5	DiClemente et al. (2001)	5	522	16.0	x	x	x	PK	-.22	-3.88**
6	Dillon et al. (2008)	6	77	15.6	x	x		PK, other	.01	0.09
6	Dillon et al. (2008)	7	113	15.6	x	x		PK, other	-.12	-1.26
7	LeDoux et al. (2002)	8	1,054	15.5			x	PK	-.28	-9.33**
7	LeDoux et al. (2002)	9	1,008	15.5	x	x	x	PK	-.30	-9.81**
7	LeDoux et al. (2002)	10	1,249	15.5			x	PK	-.26	-9.39**
7	LeDoux et al. (2002)	11	1,334	15.5	x	x	x	PK	-.36	-13.75**
8	Parsai et al. (2008)	12	1,087	12.5				PS	-.13	-4.30**
9	Pedersen et al. (2001)	13	2,410	13.5				PK, other	-.12	-6.01**
10	Ramirez et al. (2004)	14	1,094				x	PK	-.25	-8.44**
11	Reboussin et al. (2007)	15	488	11.8	x	x		CD, other	-.24	-3.60**
12	Rodgers-Farmer (2000)	16	8,012					PC	-.08	-7.17**
13	Shillington et al. (2005)	17	185	17.3			x	PK	-.26	-3.33**
14	Shope et al. (2001)	18	2,071	15.7				PK, PC	-.31	-14.58**
14	Shope et al. (2001)	19	2,232	15.6	x	x		PK, PC	-.31	-15.47**
15	Stewart (2002)	20	419	16.5		x		PS	-.32	-6.76**
15	Stewart (2002)	21	406	16.5	x	x		PS	-.31	-6.43**
16	Tragesser et al. (2007)	22	2,500	16.5				PC	-.10	-5.01**
16	Tragesser et al. (2007)	23	2,500	16.5	x	x		PC	-.13	-6.53**

Study #	Authors (year)	Sample #	N	Age	Female only	Racial minority only	Knowledge only	Items in "Parental Monitoring"	r	Z value
16	Tragesser et al. (2007)	24	2,500	16.5		x		PC	-.23	-11.70**
17	White et al. (2006)	25	319	18.7				PK, CD	-.17	-3.05*

Note. PK = parental knowledge (e.g., "How often do your parents know where you are after school?"); CD = child disclosure (e.g., "How often do you tell your parents where you are after school?"); PS = parental solicitation (e.g., "How often do your parents ask you where you are after school?"); PC = parental control (e.g., "How often do your parents require you to tell them where you are after school?").

* $p < .05$.

*** $p < .001$.