Differentiating Active and Passive Littering : A Two-Stage Process Model of Littering Behavior in Public Spaces

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DIFFERENTIATING ACTIVE AND PASSIVE LITTERING
A Two-Stage Process Model of Littering Behavior in Public Spaces

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ABSTRACT: A two-stage model of littering behavior in public places differentiated two types of littering: active and passive. The distinction between active littering (e.g., someone drops litter on the ground and continues walking) and passive littering (e.g., someone drops litter on a bench while seated and fails to remove it when leaving) depends on the latency between (a) when the litter is placed in the environment and (b) failure to remove that litter when vacating the territory. Results suggested passive littering was more resistant to change than active littering. Posted feedback significantly reduced cigarette littering by 17% (20% reduction in active littering, 6% increase in passive littering) and noncigarette littering by 19% (0% change in active littering due to minimal baseline levels, 25% reduction in passive littering). The probability of littering also increased with the latency between when litter was placed in the area and when the individual vacated the area.

Keywords: *litter; prompts; public places; time; cigarettes*

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Previous research has identified a number of promising interventions for reducing littering in a variety of different settings, such as walkways, cafés, grocery stores, parks, and camping grounds (e.g., Dixon & Moore, 1992; Geller, Witmer, & Tuso, 1977; Kallgren, Reno, & Cialdini, 2000; Oliver, Roggenbuck, & Watson, 1985). Litter reduction interventions commonly function through two general behavioral principles (Geller, Winett, & Everett, 1982): first, by changing the antecedent conditions of littering behavior using interventions such as prompts or the presence or absence of prior litter and second, by changing the consequences of littering behavior through interventions such as rewards or penalties (see Dwyer, Leeming, Cobern, Porter, & Jackson, 1993; Huffman, Grossnickle, Cope, & Huffman, 1995, for reviews). An intervention's effectiveness is then typically assessed using measures based on the products of littering behavior, such as the frequency of accumulated litter, rather than through the continuous observation of behavior (e.g., Bacon-Prue, Blount, Pickering, & Drabman, 1980; Burgess, Clark, & Hendee, 1971; O'Neill, Blanck, & Joyner, 1980; cf. Durdan, Reeder, & Hecht, 1985). Thus, although there is a wealth of research documenting the overall effectiveness of different interventions across different settings, relatively little is known about (a) possible functional differences in types of littering behavior and (b) the relative impact that different interventions may have on the ways in which people perform the act of littering.

A TWO-STAGE PROCESS MODEL OF LITTERING BEHAVIOR

The present research examines functional differences in the ways people litter. It is argued that littering can be seen as a two-stage process involving (a) the placement of litter in a proximal location in the environment and (b) the subsequent failure to remove that litter when vacating the immediate area. Based on this conceptualization, the following four independent types of littering behavior can be identified: active littering, active nonlittering, passive littering, and passive nonlittering (see Table 1). The distinction between active and passive littering behavior depends on the latency between the placement of litter in the environment and vacation of that immediate area. Consider the following example: A person drops some packaging on the ground and continues walking along a path. This could be considered a fairly typical example of littering behavior, and indeed, a number of researchers have examined littering behavior of exactly this type (e.g., Cialdini, Reno, &

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TABLE 1
Definitions of Active and Passive Littering and Nonlittering

	Active	*Passive*
Littering	Litter is kept in hand while occupying an area; when leaving, litter is placed in the area (e.g., persons drop some packaging on the ground and continue walking along a path).	Litter is placed in an area that is occupied; when leaving the area, litter is left behind (e.g., persons place their packaging on the park bench where they are sitting; later, when they vacate the bench, they leave the litter there).
Nonlittering	Litter is kept in hand while occupying an area; when leaving the area, litter is taken (e.g., persons keep hold of their packaging while walking along a path and place it in a litter bin).	Litter is placed in an area that is occupied; when leaving the area, litter is retrieved (e.g., persons place their packaging on the park bench where they are sitting; later, when they vacate the bench, they pick their litter up and take it with them).

Kallgren, 1990). This type of littering behavior can be seen as active because there is no latency between the placement of litter and the vacation of the area. In this sense, active littering may be considered an overt form of behavior because the act of littering occurs the moment the litter is deposited in the environment. In contrast, active nonlittering occurs when the litter is kept in hand the entire time that the territory is occupied and when vacating the area, the litter is either taken or disposed of correctly.

In comparison, passive littering occurs when there is a latency between the placement of litter and vacation of the area. Passive littering is thus more likely to occur in public territories where people maintain temporary ownership of the space they occupy, such as a park bench or a bus stop (see Altman, 1975; Meeker, 1997). Consider the following example: A person places packaging on a park bench where he or she is sitting. Later, when he or she vacates the park bench, he or she leaves the packaging there as litter. In this example, the act of placing the packaging on the park bench does not in itself constitute an act of littering because as long as the person remains seated at the bench, he or she maintains ownership of the packaging placed in that territory. Instead, the act of littering occurs through the omission of behavior when the person vacates the bench and fails to remove the packaging he or she had previously placed there. Passive littering may therefore be considered a more covert and less noticeable form of behavior than is active littering.

IDENTIFYING ACTIVE AND PASSIVE LITTERING IN PREVIOUS RESEARCH

Although not explicitly identified, the majority of previous research on litter reduction has tended to focus on littering behavior in settings that influenced either active or passive littering behavior. For example, Cialdini et al. (1990; Kallgren et al., 2000; Reno, Cialdini, & Kallgren, 1993) measured active littering when they observed whether people littered while walking through various areas such as car parks or paths. Similarly, it is likely that Houghton (1993) measured mainly active littering when he counted the frequency of litter accumulated on pathways. In contrast, previous research on littering in settings such as theatres (e.g., Burgess et al., 1971), cafeterias (e.g., Dixon & Moore, 1992; Durdan et al., 1985; Houghton, 1993), and other seated areas (e.g., Meeker, 1997) or public territories that people tend to occupy for more than a few seconds has probably assessed predominantly passive littering behavior.

Previous research has identified specific instances of passive littering, such as table littering in settings where people are expected to dispose of litter themselves (e.g., Meeker, 1997). Consistent with our more general definition of passive littering, Meeker (1997) defined table littering as the "type of littering behavior that occurs when patrons leave food or beverage-related material on the table surface where it was consumed" (p. 59). Meeker also identified the importance of considering the latency of passive littering when he speculated that people who sat at their tables for longer periods of time may have been more likely to leave their litter there when they eventually left. Unfortunately, Meeker did not measure the latency of passive littering and did not distinguish active table littering (i.e., people who put their litter on the table and then left immediately) from passive table littering or active nonlittering (i.e., people who kept their litter in their hands the entire time they were seated and then took their litter with them when leaving) from passive nonlittering (i.e., people who placed their litter on the table while seated and then picked it up again and took their litter with them when leaving).

Previous research examining the frequency of litter placed in different locations can also be interpreted using an active-passive distinction (e.g., Geller, 1975; Geller et al., 1977; Geller, Witmer, & Orebaugh, 1976; Houghton, 1993). Geller et al. (1976, 1977) examined the effect of different prompts on the frequency of handbills placed in various locations (i.e., in grocery carts, litter bins, on the floor, and on shelves) within grocery stores. One distinction between these locations is that grocery carts may represent a form of public territory (i.e., a grocery cart is yours as long as you are using it), whereas the occupation of other areas (i.e., the floor and shelves) is likely to

be far more transitory. Based on this distinction, it is likely that grocery-cart litter was predominantly passive (i.e., people placed their litter in their cart while shopping and then failed to remove it when subsequently returning the cart). In contrast, the litter placed on the store floor and shelves was more likely to be active.

Geller et al. (1976) reported that the majority of litter incorrectly disposed during baseline was found in shopping carts (57.7%) rather than on the floor (3.3%) or in other areas such as shelves (39%). Furthermore, the use of general prompts (e.g., please dispose of properly) reduced the amount of handbills littered in areas such as the floor (54.6% reduction) and shelves (39.4% reduction) but failed to reduce the amount of litter placed in grocery carts (1.9% reduction[1]). Overall, these findings lend support to our conceptualisation of passive littering as less overt and thus more resistant to change than active littering.

INTERVENTION EFFECTIVENESS AND LITTER TYPE

Another factor that may also influence the rate of littering and resistance to change is the type of item being littered (e.g., Reams, Geaghan, & Gendron, 1996). Cope, Huffman, Allred, and Grossnickle (1993) raised this possibility when they speculated that "there may be substantial normative differences in dropping a cigarette on the ground (a common practice) and dropping larger pieces of more obvious litter (a practice with better established social and legal proscriptions)" (p. 609). However, relatively few studies have directly compared cigarette litter's resistance to change with other types of litter (e.g., packaging and polystyrene cups). Indeed, one of the few studies to distinguish between cigarette and noncigarette litter was Geller, Brasted, and Mann (1980), who compared the amount of appropriate (cigarette litter) and inappropriate (e.g., packaging) litter disposed in ashtrays. If Cope et al. (1993) are correct in their supposition, then littering cigarettes in outdoor public places may be perceived as more socially acceptable than littering other items. It is thus possible that the effectiveness of a given intervention may be partially dependent on an interaction between litter type (i.e., cigarette versus noncigarette litter) and littering behavior (i.e., active versus passive littering).

The present study provided observational data to study a theoretical distinction between active and passive littering behavior based on the latency between when litter is placed in the environment and the failure to subsequently remove that litter when vacating the immediate area (see Table 1). Toward this goal, we attempted to reduce active and passive littering behavior for both cigarette and noncigarette litter using two interventions tried and

tested in previous research. The first intervention posted daily feedback on the percentage of men and women who littered. Feedback has been used extensively to change a variety of behaviors, such as littering (Dixon, Knott, Rowsell, Sheldon, & Moore, 1992), recycling (Katzev & Mishima, 1992), and driver behavior (e.g., Hutton, Sibley, Harper, & Hunt, 2002). For the second intervention, additional litter receptacles and ashtrays were placed in the environment. Litter reduction interventions such as the placement and design of litter receptacles and ashtrays have also been successful in previous research (Burgess et al., 1971; Cope et al., 1993; Finnie, 1973; Geller et al., 1980; O'Neill et al., 1980).

Building on the two-stage process model of littering behavior and the interpretation of previous research (e.g., Geller et al., 1976, 1977; Meeker, 1997), it is argued that passive littering may be more frequent than active littering because (a) the response cost may be lower for a person who places their litter in an area they are occupying than it is for a person who consciously holds onto their litter while occupying an area and (b) passive littering may be a more covert, less noticeable form of behavior, which is thus less likely to entail negative social consequences from other people in the environment. Once a person has placed litter in a public area he or she is currently occupying, it is usually easier for the person to leave the litter there (an omission of behavior) than to pick it up again and take it when he or she leaves.

Furthermore, the probability of a person retrieving the litter when leaving the area may decrease over time due to (a) potential diffusion of responsibility for litter previously placed in the environment when others are also seated in the immediate area and (b) the increased probability of people forgetting their litter (see also Meeker, 1997). The following hypotheses are based on this theoretical distinction between active and passive littering behavior.

Hypothesis 1: Passive littering will be more frequent than active littering for both cigarette and noncigarette litter, although consistent with Cope et al. (1993), cigarettes may be littered at a higher baseline rate than are other types of litter.

Hypothesis 2: In conditions in which both active and passive littering occur, active littering will be easier to reduce (i.e., require less salient litter reduction interventions) than passive littering. Furthermore, it is predicted that littering behavior (i.e., active or passive) will interact with the norms governing different litter types (i.e., cigarette or noncigarette litter), so that active noncigarette littering will occur at lower levels and be easier to reduce than active littering of cigarettes and passive noncigarette littering will occur at lower levels and be easier to reduce than passive cigarette littering.

Hypothesis 3: Passive littering of both cigarette and noncigarette litter will increase directly with the latency between when litter is placed in the area and when the individual vacates that area.

METHOD

PARTICIPANTS AND SETTING

The Victoria University Quad is a large concrete area located in the center of the campus. One side of the quad consists of ascending tiled steps on which students commonly sit when eating lunch or smoking cigarettes. Prior to the environmental design intervention, the area near the quad steps contained four litter bins and no ashtrays.

Participants were the individuals observed with potential litter who sat on the quad steps. During the course of the study, a total of 452 observations were recorded, 181 people (106 males, 72 females) were observed with cigarettes, and 271 people (196 males, 74 females) were observed with other types of litter such as packaging or cups (gender was not recorded for four observations). If individuals had both a cigarette and another form of litter (e.g., a cup or packaging), only the first type of litter they disposed of was recorded.

PROCEDURE

Design. The study used an ABCA design with the following four phases: (a) baseline, (b) feedback, (c) feedback and additional receptacles, and (d) return to baseline. Posted feedback was initiated prior to the introduction of additional litter receptacles to allow this more cost-effective intervention to maximally reduce littering before initiating more expensive and permanent structural changes in the form of additional receptacles.

Baseline. Data were collected by groups of three to four students participating in an undergraduate psychology course. Students were allocated a weekly observation time in which they worked as a group to observe littering behavior and to collect data. Students were trained in observational data collection, and all observations were supervised by the first author. Baseline data were collected through the continuous observation of all individuals seated on the quad steps between 11 a.m. and 2 p.m. Monday through Thursday during one week.

Observers sat in an inconspicuous location overlooking the quad steps. Each observer was responsible for monitoring individuals sitting in a different area of the quad steps. The first author coordinated observers and ensured there was no overlap between the areas being observed. When individuals seated on the steps were observed placing their litter on the steps, a stopwatch

was started. When the individuals stood up and had walked at least a meter from where they had been sitting, the stopwatch was stopped and the time between the placement of litter on the steps and vacation of the area was recorded.[2] If individuals picked up their litter and then put it down again, the stopwatch was restarted. If individuals kept their litter in their hands, then a latency of 0 was recorded. Once individuals had walked at least a meter from where they were sitting, the observer recorded the type of litter, whether they left their litter on the steps or whether they put it in a bin, the time between the placement of litter and vacation of the area, and their gender. Littering behavior was coded as active if individuals kept their litter in hand while sitting (i.e., had a latency of 0). As they left the quad area, all individuals were approached and asked to complete a brief survey. The survey measured various environmental attitudes and beliefs and was included as part of a separate study that is not discussed further.

Feedback. Data collection procedures in the feedback condition were the same as those in baseline. Similar to baseline observations, data were collected between 11 a.m. and 2 p.m. Monday through Thursday of the second week, and the following Monday and Tuesday of the third week. Feedback was provided through two mediums. First, an article was published in the student magazine on the first day of the intervention that detailed the percentages of men and women who littered. Second, a banner (1.3 m by 5 m) that read "Please Keep the Quad Clean. Yesterday, *X*% of Males Littered, and *X*% of Females Littered. You Know the Odds, Now Beat Them!" was hung directly above the quad steps. The percentages of men and women who littered were updated daily. On average, 10% more men littered each day than did women.

Feedback and additional receptacles. Data collection during the additional litter receptacles condition followed the same procedure described previously and occurred from 11 a.m. to 2 p.m. on Wednesday, Thursday, and Friday of the third week. During this condition, two additional gray metal litter bins and 15 ashtrays were installed in the quad. The two additional litter bins were placed 10 m apart and 3 m in front of the steps. The ashtrays consisted of 0.5-m-high gray metal cylinders with an opening in the side for cigarette butts. These ashtrays were bolted to the quad steps at approximately 2.5-m intervals. Feedback on the number of men and women littering continued to be updated daily.

Follow-up. Due to practical limitations unrelated to the data, follow-up observations were limited from 12 p.m. to 1 p.m. for 2 days in the week

following the feedback and environmental design intervention. During this time, the additional litter bins and ashtrays remained in the quad as permanent fixtures; however, feedback was removed. Follow-up observations used the same procedure described previously except people were not approached and asked to complete a survey and the latency between the placement of litter in the environment and vacation of that immediate area was not recorded.

Interobserver reliability. During 18% ($n = 83$; 42 littered, 41 did not litter) of observations, two independent observers each recorded data on all littering behavior observed in the same section of the quad. To assess interobserver reliability, observers recorded additional information on the grid locations where persons observed with potential litter were sitting, what color their clothing was, what their hair color was, and the exact time at which littering behavior occurred. This information was later used to match interobserver reliability observations.

Overall, 94.3% of people who littered and 95.1% of people who did not litter were recorded by both observers. Interobserver reliabilities for identifying passive and active littering behavior were 85.3% and 90.5%, respectively (kappa = 0.66). This kappa value suggests a moderate to high level of reliability (Cohen, 1960). Interobserver reliability for the latency between when litter was placed in the area and when that area was vacated was assessed by creating a difference score between the latencies recorded for each person who passively littered. The mean difference in observed latency was 20.0 seconds ($SD = 75.0$ seconds). This value was not significantly different from 0, $t(29) = 1.498$, $p = .147$, suggesting that there was no difference in independent observations of litter latency.

RESULTS

OVERALL LITTER REDUCTION

Overall, cigarettes were littered at a significantly higher rate (64.4%) than were noncigarette items (20.3%), $\chi^2(1, 639) = 127.94$, $p < .001$.[3] The intervention package significantly reduced the percentage of people littering their cigarettes, $\chi^2(3, 278) = 133.74$, $p < .001$. As can be seen in Figure 1, cigarettes were littered 98.7% of the time during baseline. This decreased to 81.8% when feedback was posted. The percentage of people littering their cigarettes further decreased to 17.3% when ashtrays and additional litter bins were subsequently placed in the quad. During follow-up observations, cigarette

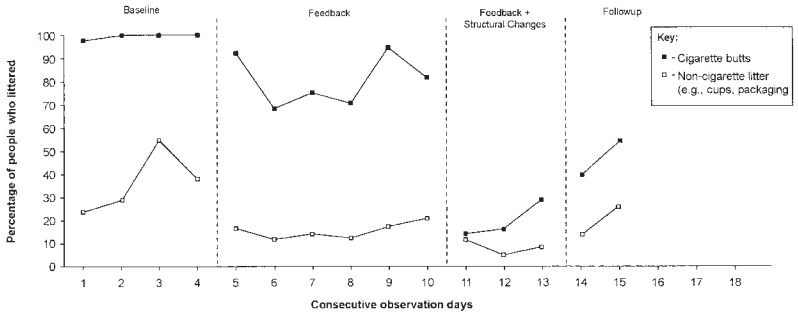

Figure 1: The Percentage of People Observed With Potential Litter (i.e., cigarette butts, cups, packaging) Who Littered Across Conditions

littering increased to 46.2%; however, this remained at less than half the original baseline littering rate. Noncigarette litter was also successfully reduced, $\chi^2(3, 356) = 22.16$, $p < .001$. A total of 35% of people littered their polystyrene coffee cups and other types of packaging during baseline. This decreased to 16% when feedback was posted and was reduced even further to 8.8% during the environmental design intervention component. During follow-up observations, the littering rate of noncigarette items increased to 18.5%, which was about half of its original baseline level.

ACTIVE AND PASSIVE LITTERING BEHAVIOR

Consistent with Hypothesis 1, passive littering accounted for a significant majority of littering behavior, whereas people who correctly disposed of their litter tended to actively nonlitter. As can be seen in Table 2, passive littering was about twice as likely as active littering of cigarettes, $\chi^2(1, 180) = 40.47$, $p < .001$, and more than four times as likely as active littering of other types of litter, $\chi^2(1, 270) = 26.77$, $p < .001$. As also shown in Table 2, 43% of all cigarettes were littered passively. In contrast, the majority of people who disposed of their cigarettes appropriately did so actively (28.2% of total cigarette litter). Similarly, 17.3% of noncigarette litter (e.g., cups or packaging) was littered passively, whereas 34.7% of people who disposed of their noncigarette litter did so actively.

Figure 2 displays the percentages of people who actively or passively littered or did not litter across conditions for both cigarette and noncigarette litter. As suggested by Figure 2, multinomial analysis of variance using a Wald chi-square test (Woodward, Bonnett, & Brecht, 1990) showed a marginally

TABLE 2
Frequency of Active and Passive Littering and Nonlittering for Cigarette and Noncigarette Litter

	Active	*Passive*	
Cigarette litter			
Littered	44 (24.3%)	78 (43.1%)	
Nonlittered	51 (28.2%)	8 (4.4%)	
Total cigarette litter observed			*n* = 181 (100%)
Noncigarette litter			
Littered	10 (3.7%)	47 (17.3%)	
Nonlittered	120 (44.3%)	94 (34.7%)	
Total noncigarette litter observed			*n* = 271 (100%)

significant 3 (baseline, feedback, structural change) by 2 (active or passive) by 2 (littered or did not litter) interaction for cigarette litter, $\chi^2(2, 179) = 5.78$, $p < .06$, and a significant interaction for noncigarette litter, $\chi^2(2, 269) = 25.92$, $p < .05$.

As can be seen in Figure 2, rates of active and passive cigarette littering showed significantly different trends across conditions, $\chi^2(2, 120) = 5.794$, $p < .05$, as did rates of active and passive nonlittering of cigarettes, $\chi^2(2, 57) = 8.859$, $p < .05$. As shown in Figure 2, 42.5% of cigarettes were littered actively during baseline. Consistent with Hypothesis 2, the introduction of posted feedback reduced active cigarette littering by 19.8% from baseline rates. However, also consistent with this hypothesis, there was an increase of 5.4% in passive littering, suggesting that some people may have changed to littering their cigarettes passively rather than correctly disposing of them. Thus, posted feedback reduced active cigarette littering more than passive cigarette littering. The introduction of additional rubbish bins and ashtrays was more effective and further reduced active and passive cigarette littering by a total of 64.5% from the feedback condition. This intervention appears to have been effective because of the 65% increase in the active disposal of cigarette litter, as passive disposal remained consistently low across all three conditions.

As can also be seen in Figure 2, rates of active and passive noncigarette littering also showed significantly different trends across conditions, $\chi^2(2, 55) = 15.272$, $p < .05$, as did rates of active and passive nonlittering of noncigarette items, $\chi^2(2, 212) = 5.932$, $p < .05$. Consistent with Hypothesis 1, 91% of all noncigarette littering during baseline was done passively. The introduction of posted feedback reduced passive noncigarette litter by 25.5%, whereas active noncigarette litter remained unchanged (0.7% increase) due to its already

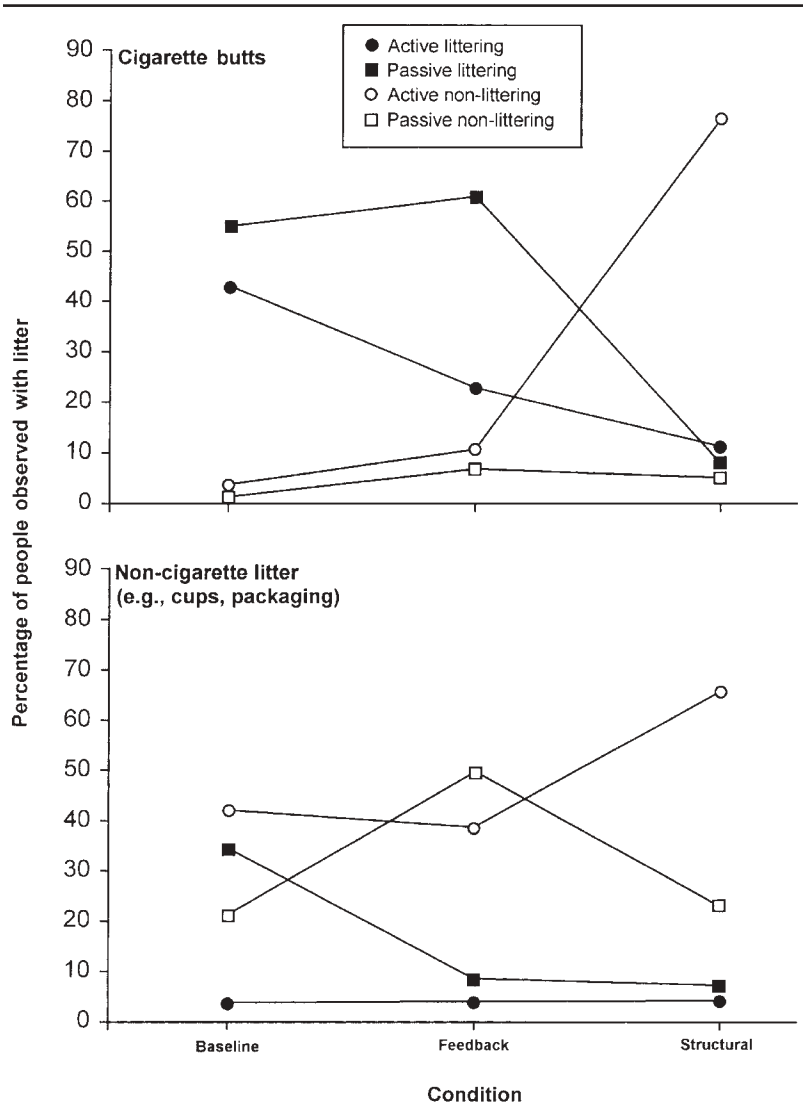

Figure 2: The Percentage of People Who Actively or Passively Littered Cigarette or Noncigarette Litter Across Conditions

minimal baseline levels. Overall, posted feedback reduced noncigarette litter by 19% from baseline levels. This decrease in littering was due primarily to the 28.6% increase in passive nonlittering. The introduction of additional

rubbish bins and ashtrays had a similar effect on cups and packaging to that on cigarette butts, as it further reduced littering by increasing active nonlittering by 27.4%.

LATENCY OF PASSIVE LITTERING

Consistent with the third hypothesis, point-biserial correlations suggested that people who left their litter on the steps for a longer period of time (i.e., had a longer latency between the placement of litter in the environment and vacation of that immediate area) were significantly more likely to leave their litter behind when they subsequently left the area. This was true of both cigarette and noncigarette litter, $r_{pb}(181) = .285$, $p < 0.001$; $r_{pb}(115) = .347$, $p < .001$, respectively.

To more closely examine trends in the probability of littering at different latencies, a median split categorizing passive littering above and below the median latency of 5 minutes was performed. As can be seen in Figure 3, people were less likely to litter their noncigarette (7.7% littering rate) and cigarette (46.3% littering rate) litter actively (i.e., when the latency was 0) than they were during relatively short latencies of less than 5 minutes (noncigarette litter = 26.2%; cigarette litter = 90.9%). The percentage of people engaging in noncigarette littering further increased to 40% during latencies less than 5 minutes, whereas there was only a minimal increase in the percentage of cigarettes littered during latencies longer than 5 minutes (94.3%).

DISCUSSION

This research argued that littering can be seen as a two-stage process of (a) placing litter in a proximal location in the environment and then (b) failing to remove that litter when vacating the immediate area. Based on this conceptualization, functional differences in four types of littering behavior were examined (i.e., active littering, active nonlittering, passive littering, and passive nonlittering). Consistent with our predictions, passive littering occurred at a higher rate and was more resistant to change than active littering. This was true of both cigarette and noncigarette litter, although the effect was more pronounced for cigarette litter due to higher baseline levels of active cigarette littering.

Also consistent with our predictions, an item was more likely to be littered (i.e., left behind) as the latency increased between when the item was placed

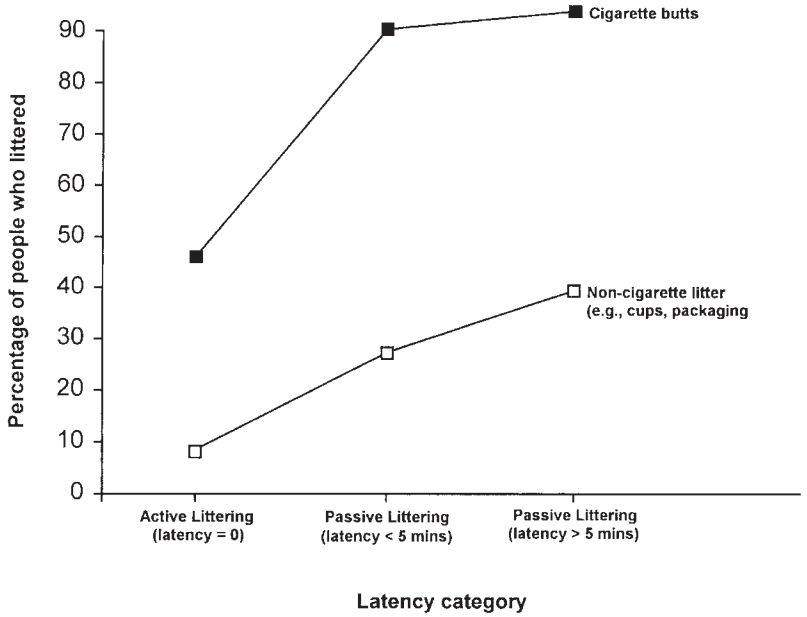

Figure 3: The Percentage of People Observed With Potential Litter (i.e., cigarette butts, cups, or packaging) Who Littered at Different Latencies

in an area and when that area was vacated. Additional analyses also suggested that the combined intervention package reduced littering by prompting the majority of people to actively nonlitter (i.e., more people kept hold of their litter until they left the area), although this effect was more pronounced for cigarette litter.

The finding that passive littering was more resistant to change than active littering is consistent with our interpretation of the active-passive distinction in previous research on litter reduction (e.g., Geller et al., 1976, 1977; Houghton, 1993). For example, Houghton (1993) found that prompts were relatively more effective at reducing the total frequency of litter on pathways (most likely to be active littering) than they were at reducing the frequency of litter in cafés (most likely to be passive littering). The finding that the latency between the placement of litter and the vacating of the area increased is also consistent with previous research (i.e., Meeker, 1997). Overall, these results suggest that once persons have placed their litter in a territory they are currently occupying, it will be relatively more difficult to influence them to pick it up again and take it with them than if they had continued to hold onto it.

Furthermore, people were less likely to retrieve their litter when they left the area if it had been placed in the area for a relatively long period of time.

There are a number of possible reasons for (a) why passive littering is more resistant to change than active littering and (b) why passive littering is more likely at longer latencies. One possibility is that passive littering may be less overt than active littering and thus less likely to entail negative social consequences. In this sense, it is possible that passive littering may function as a strategic form of covert littering that occurs through the omission of behavior. This may make passive littering less salient both to the person littering and to other people in the environment and thus is less likely to entail negative social consequences. A second possibility may be that people are more likely to genuinely forget their litter at longer time delays. Future research is necessary to further examine these two explanations of passive littering behavior.

The feedback and environmental design intervention reduced littering behavior for noncigarette litter (e.g., cups or packaging) by changing nonlittering from passive (i.e., people placed their litter on the steps and then retrieved it when leaving) to active (i.e., people held their litter in their hand while sitting on the steps and also took it with them when leaving). This increase in active nonlittering during the third week suggests that passive littering may be maximally reduced by targeting the first stage of the littering process and stopping people from placing their litter in the territory they are occupying in the first place. It is important to recognize that this interpretation does not hold for cigarette litter. The increase in active nonlittering of cigarette butts most likely occurred because of the large number (i.e., 15) of ashtrays mounted on the quad steps. During this intervention, most smokers were within reaching distance of an ashtray. In contrast, although additional litter bins were also placed in the quad, they were not within reaching distance of people sitting on the quad steps.

The present results also identified several differences between cigarette and noncigarette litter. In contrast to packaging, cups, and other noncigarette items, cigarettes were littered at a higher overall rate and were more resistant to change than noncigarette litter during the posted feedback intervention. Cigarettes were also more likely to be actively littered. Perhaps the most striking difference between cigarette and noncigarette litter was the minimal rates of retrieval (i.e., passive nonlittering) once a cigarette butt had been placed on the ground. Analysis of the probability of littering at long and short latencies revealed a similar effect. As shown in Figure 3, the probability of littering noncigarette litter increased as the latency increased, whereas more than 90% of all cigarettes placed on the ground were littered irrespective of whether the latency was short or long.

Overall, these findings are consistent with Cope et al.'s (1993) claim that cigarette litter and noncigarette litter may be controlled by different contingencies. These results further suggest that the frequency of active and passive littering behavior may be partially mediated by the type of object being littered. Specifically, people may be likely to adopt a more covert passive littering strategy when littering objects such as polystyrene cups and packaging, whereas when littering cigarettes, behavior may tend to be more active and overt.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has two main limitations. The first limitation is the lack of comparison across different settings, thus making it difficult to rule out other possible external influences on littering behavior. The second limitation is the use of an intrusive survey. After littering behavior had been observed, all persons were approached and asked to complete a brief survey on environmental attitudes as they exited the quad. Although this survey was not explicitly linked to litter observations, it may have increased participants' awareness of surveillance over repeated observations. This may have interacted with the other intervention procedures. However, although our design may make it difficult to identify precise changes in littering behavior due to specific intervention components, it did not confound the theoretical distinction between active and passive littering, nor did it bias the comparative resistance to change of active and passive littering.

The distinction between active and passive littering may also raise concerns about the validity of comparing littering behavior across different types of setting. One key aspect of passive littering in public places is that it must necessarily occur in a public territory where individuals may reside for a limited period of time (e.g., a café table, a grocery cart, or a seated area). Thus, research comparing littering behavior across settings should consider the possibility that different settings may encourage different types of littering behavior, which may cause differences in intervention effectiveness across settings (e.g., Houghton, 1993).

There are various avenues for future research examining littering behavior. For example, survey research could examine people's perceptions of the intentionality and perceived responsibility for objects that have been littered either actively or passively at different latencies. This may be useful for determining possible differences in attributions people make about different types of littering behavior and may help clarify the contingencies governing these different behaviors (e.g., is passive littering primarily strategic or is litter simply forgotten at longer latencies?). The active-passive distinction may also be

important for identifying the relative effectiveness of different interventions. Previous research supports the viability of specific prompts targeting different types of littering behavior (e.g., Geller et al., 1976; see also Durdan et al., 1985). Future research could seek to extend research in this area by assessing possible differences in the effectiveness of specifically worded prompts aimed at reducing specific instances of active or passive littering in different settings.

CONCLUSION

In conclusion, this research argued for a conceptual distinction between active and passive littering behavior based on the latency between the placement of litter in the environment and the subsequent vacating of the area where litter was placed. Observational data on the effect of a litter reduction intervention package on rates of change in active and passive littering and nonlittering for cigarette and noncigarette litter supported this proposed theory of littering behavior.

To date, previous research has tended to focus on the applied aspects of littering behavior, such as developing effective interventions for litter reduction (see Geller, 1992; Huffman et al., 1995). Other researchers have also used littering behavior as the medium in which to develop and test general theories, such as a focus theory of normative conduct (Cialdini et al., 1990) and the effect of external conditions on attitude/behavior consistency (Guagnano, Stern, & Dietz, 1995). However, as far as we are aware, a theoretical framework examining the different ways in which littering behavior can be performed and its interaction with the territory in which it occurs has not previously been attempted. This study sought to develop one such theoretical framework in the hope of clarifying our theoretical understanding of the processes underlying littering in different settings and thus improving the likelihood of success for future litter reduction interventions.

NOTES

1. Note that these percentages were calculated from the proportions presented in Table 1 of Geller, Witmer, and Orebaugh (1976).

2. Although somewhat arbitrary, we believe that standing and walking more than a meter from where the litter was originally placed constituted a reliable estimate of passive littering. Of

the 125 individuals who passively littered, no one returned to pick up their litter once they had walked at least a meter away.

3. The reported inferential statistics, such as chi-square tests, assume independence of observations. However, there may be some dependency in our data due to repeated observations across conditions. Nevertheless, these statistics are relatively robust and still provide important additional information when interpreting overall changes in the proportion of people observed littering.

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