ABSTRACT: Maintaining proper tire pressure can decrease fuel costs and increase the longevity of tires. The current study examined the effects of decreasing response effort and receiving task clarification on appropriate tire pressure with 22 participants across 3 work groups. Treatment consisted of receiving tire pressure gauges, task clarification about appropriate tire pressure, and weekly opportunities at their site for participants to fill up tires. Results suggest that the treatment package was effective in increasing tire pressure for most participants.

KEYWORDS: tire pressure, sustainability, safe driving

Practices that preserve our natural resources while decreasing pollution are vital to maintaining the planet. Sustainable practices may be conceptualized as behavior that individuals can engage in on a regular basis that can have a positive impact on the environment. Everyday examples of sustainable behavior that can have a cumulatively significant effect on the environment include recycling, turning off lights when not in use, and carpooling.

Beginning in the 1970s, applications of applied behavior analysis (ABA) in relation to sustainability began emerging in the literature. Examples of sustainability targets include littering (Powers, Osbourne & Anderson, 1973), energy use (Hayes & Cone, 1981) and conserving transportation energy (Reichel & Geller, 1981). Strategies to promote sustainable behavior typically include both antecedent interventions, such as erecting signs as a visual prompt (Van Houten & Nau, 1981) and consequence manipulations, such as giving informational feedback (DeLeon & Fuqua, 1995) or reward systems (e.g., Jacobson, Fairbanks, Poche & Bailey, 1982).

Behavior analysts may be able to impact sustainability if we can encourage individuals to change daily practices. The cumulative effects of increasing everyday pro-environmental behavior could be significant. One such pro-environment behavior is checking tire pressure in personal vehicles. While several different studies have looked at various sustainable practices, none have studied the importance of maintaining appropriate tire pressure in vehicles. Proper tire inflation

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reduces the amount of gasoline required to operate a vehicle (Energy Environmental Analysis Inc., 2001). Additionally, proper tire inflation will increase safety of the vehicle occupants as vehicles with underinflated tires are more likely to be involved in an accident linked to tire problems than those with tires inflated to the correct pressure (NHTSA, 2001). While keeping tires properly inflated is a socially significant target, promoting appropriate tire pressure in employee vehicles would not likely yield financial gain for organizations. So, the current study was designed to increase the maintenance of proper tire pressure in personal vehicles using a low-cost antecedent intervention package.

Method

Participants and Settings

This study was completed at two campuses of a human services organization in a suburban town in the Northeastern United States. One campus was significantly larger than the other and contained groups of employees that were unlikely to interact, and so the main campus was broken down into two employee groups (Daycare and Wolf Harbor). Participants were 22 individuals (17 female, 5 male) who volunteered to participate in the study. Initially, all participants completed a questionnaire which asked them: (1) If they drive the same vehicle to work each day (2) If they were in charge of the general maintenance of the vehicle (3) to list the vehicles description (i.e., make, model, color, and license plate number). Participants were selected if they answered “yes” to questions 1 and 2, and provided a description for question 3. All research procedures were approved by an institutional review board.

Response Measurement

The dependent variable was tire pressure measures for all four tires on a participant’s vehicle. At the start of the study, data were collected on each participant’s appropriate pounds-per-square inch (PSI) for their vehicle by recording the recommended pressure from the vehicle certification label. A measure of absolute difference in tire pressure was calculated for each participant. The absolute difference was calculated by recording number of pounds of pressure away, either under or over, a tire was relative to the prescribed amount of air and then summing the number for all four tires. During the study, data were collected in the work parking lots where participants parked their vehicles during the work day. Tire pressure measures were taken with a Craftsman™ Digital Tire Pressure Gauge throughout the entire study. During treatment, tires were inflated with a Kobalt™ Electric Portable Air Compressor. Inter-observer agreement data were not collected as the digital tire pressure gauge provided an automated readout that would not register if used incorrectly.

Experimental Design and Procedure

The design was a multiple baseline across groups. Immediately following baseline and prior to treatment starting, participants were debriefed about the primary purpose of the study. In order to get accurate readings on tire pressure during baseline, participants were told that the study would be about vehicle maintenance, and not specifically on tire pressure measures. After being debriefed, groups receiving treatment were reminded that the study was ongoing and were asked not to discuss the study with the participants still in baseline condition.
Baseline. Data were collected at the same time per week for all participants plus or minus one day. The participants were informed on the day of data collection when the experimenter would come and collect their keys. Keys were collected initially to access the vehicle certification label on the inside of the car and to obscure the purpose of the data collection. Once in the parking lot, the digital tire pressure gauge was used to record air pressure from each tire on all the vehicles. After data collection was complete, keys were returned back to the participants.

Treatment. The intervention package was staggered across the three work groups. The Daycare group contained 7 participants, Bridgeport Avenue contained 6 participants, and Wolf Harbor contained 9 participants. Intervention consisted of four components. First, the experimenter debriefed the participants about the background and purpose of the investigation and data collection. After debriefing, the experimenter gave verbal and written task clarification about the importance of maintaining appropriate tire pressure in vehicles. The verbal task clarification consisted of a general discussion of how maintaining tires was beneficial for fuel economy, as well as driver safety. The written task clarification consisted of a brochure that gave an overview of tire safety with a task analysis for how to check tire pressure. The third component of the intervention involved providing each participant with a digital tire pressure gauge to keep for their personal use. The last part of the intervention was designed to decrease the response effort by providing a weekly opportunity to fill their tires with a portable air compressor. The air compressor was available one hour per week at both campuses. Participants were notified when the air compressor was going to be available at their work site, and were free to bring their vehicles during the window to fill up their tires; an investigator was on-site if assistance was needed. During the treatment phase, tire pressure data continued to be collected once per week.

Results and Discussion

Figure 1 shows the absolute difference in PSI in vehicle tires across each participant during baseline and intervention phases. The Daycare group consisted of seven participants. While several participants responded immediately to the intervention, at least one participant, represented by open triangles, was unaffected by the intervention. Several more participants, represented by open circles and closed circles responded to the intervention several weeks after it was implemented.

The Bridgeport group consisted of six participants. The absolute difference in tire pressure decreased substantially across all but one participant in this group when the intervention was implemented. Only one participant, represented by closed circles, did not decrease the absolute difference to near zero levels.

The Wolf Harbor group consisted of nine participants. When the intervention was implemented the impact on behavior change influenced participants’ behavior differently. One participant, represented by open squares, did not appear to respond to the intervention. The other participants responded to the intervention or continued to maintain relatively low rates of difference between recommended and actual tire pressure.

These results suggest that for most participants the use of a treatment package consisting of task clarification and decreasing response effort may be effective in increasing behavior related to maintaining appropriate tire pressure. However, several participants did not appear to respond to the intervention. It is possible that for these participants additional consequence-based interventions would be required to influence behavior.

Where the intervention was successful, the components likely influenced behavior in different ways. Task clarification, combining both the literature and verbal discussion about better fuel
Figure 1. Tire pressure measurements across three work locations. Tire pressure is represented as the number of pounds above or below ideal tire pressure (absolute difference) in each participant's vehicle. Each data path represents one participant.
efficiency and safer driving habits, provided both a reminder about saving money and reducing their risk of injury to themselves and their vehicle. Response effort could have been influenced both by receiving a digital tire pressure gauge and by having an opportunities to fill up tires at the work site.

There are several limitations that should be noted in this current study. Because of the treatment package approach, it is difficult to analyze and separate out if there were certain components to the intervention that were more effective than others. This seems especially prudent as at least two participants in the Daycare group took several weeks to respond to the intervention. It is unclear if in these delayed responders the intervention influenced their behavior, and if so why it took a longer period of time. Additionally, no measures were collected on vehicles being serviced during data collection.

During data collection, IOA data were not collected. Due to the digital readout of the tire pressure gauge, errors in accurately recording tire pressures were unlikely. Even though there is precedent for omitting IOA when data collection is automated (Kostewicz, King, Datchuk, Brennan, & Casey, 2016), there is a possibility of measurement error whenever a second observer does not collect reliability data. Additionally, the tire pressure gauge was not calibrated with another air pressure device and so it is possible there was some measurement error.

While it is known that maintaining appropriate tire pressure decreases gasoline consumption, savings could be systematically measured in future investigations. This study demonstrated the use of an antecedent package intervention to increase sustainable behavior that both decreases fossil fuel consumption and saves participant’s money. This intervention required little financial investment, aside from the investigator collecting data, on the part of the sponsoring organization and demonstrates how companies can motivate many employees to engage in more environmentally sustainable behavior. Research along these lines may develop simple, cost effective interventions that can be implemented to improve a wide range of sustainable behavior (checking tire pressure occurs once per week and takes only a few minutes). Taken together, moderate changes in behavior that are relatively easy to effect using behavioral technology could have a large impact on the environment. Environmentally conscious organizations could take the lead by promoting more green behavior in employees.

References