

A REVIEW OF METHODS TO CHANGE BELIEFS

FHWA/MT-22-002/8882-444-19

Final Report

prepared for

CALIFORNIA	IOWA	MISSISSIPPI
CONNECTICUT	KANSAS	MONTANA
GEORGIA	KENTUCKY	NEVADA
IDAHO	LOUISIANA	TEXAS
ILLINOIS	MICHIGAN	UTAH
INDIANA	MINNESOTA	VERMONT
		WASHINGTON

in cooperation with

THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

April 2022

prepared by

Nicholas J. Ward, Ph.D.
Jay Otto, M.S.
Kari Finley, Ph.D.

Center for Health and Safety Culture
Montana State University - Bozeman



RESEARCH PROGRAMS



MONTANA
Department of Transportation

You are free to copy, distribute, display, and perform the work; make derivative works; make commercial use of the work under the condition that you give the original author and sponsor credit. For any reuse or distribution, you must make clear to others the license terms of this work. Any of these conditions can be waived if you get permission from the sponsor. Your fair use and other rights are in no way affected by the above.

A Review of Methods to Change Beliefs

Prepared by:

Nicholas Ward, Jay Otto, Kari Finley

Prepared for:

MONTANA DEPARTMENT OF TRANSPORTATION

in cooperation with the

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

April 2022

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. FHWA/MT-22-002/8882-444-19	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle A Review of Methods to Change Beliefs		5. Report Date April 2022	
		6. Performing Organization Code	
7. Author(s) Nicholas J. Ward, Ph.D. (http://orcid.org/0000-0002-2792-8082), Jay Otto, M.S. (http://orcid.org/0000-0003-0975-0249), Kari Finley, Ph.D. (http://orcid.org/0000-0002-0887-4939)		8. Performing Organization Report No.	
9. Performing Organization Name and Address Center for Health and Safety Culture Montana State University P.O. Box 170548, Bozeman, MT 59717-054		10. Work Unit No.	
		11. Contract or Grant No. 8882-444-19	
12. Sponsoring Agency Name and Address Research Programs Montana Department of Transportation (SPR) http://dx.doi.org/10.13039/100009209 2701 Prospect Avenue, PO Box 201001 Other sponsoring agencies: California DOT, Connecticut DOT, Georgia DOT, Idaho Transportation Department, Illinois DOT, Indiana DOT, Iowa DOT, Kansas DOT, Kentucky DOT, Louisiana DOT and Development, Michigan DOT, Minnesota DOT, Mississippi DOT, Nevada DOT, Texas DOT, Utah DOT, Vermont Agency of Transportation, and Washington State DOT		13. Type of Report and Period Covered Final Report (March 2021 – April 2022)	
		14. Sponsoring Agency Code 5401	
15. Supplementary Notes Conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration. This report can be found at https://www.mdt.mt.gov/research/projects/trafficsafety.shtml . DOI: https://doi.org/10.21949/1518321 Preferred citation: Ward, Nicholas J., Jay Otto, and Kari Finley. 2022. A Review of Methods to Change Beliefs. Helena, MT: Montana Department of Transportation. https://doi.org/10.21949/1518321 .			
16. Abstract Because road user behavior is a common factor in traffic crashes, we must explore ways to encourage safer behaviors. Traffic safety culture recognizes that intentional behavior is influenced by the values, beliefs, and attitudes shared among a group of people. Therefore, to change behavior within a group, it is necessary to change beliefs. However, changing beliefs is difficult. The aims of this project were to (1) understand the processes and conditions that influence belief formation and change and (2) provide guidance to safety stakeholders in the design of effective strategies to change traffic safety culture. A literature review was conducted to provide a narrative synthesis of relevant information. These results were used to create a resource for traffic safety practitioners about belief change. The resource distilled the results into an assessment with information about what the guidance was, how it can be helpful, how to use the guidance, and an assessment with 11 questions. Two key conclusions from this narrative review included that (1) we may form a new belief when we perceive an event (i.e., a precursor event) that we cannot explain and (2) we may form a belief because it makes us feel good (i.e., the belief generates a positive emotion). This implies that effective strategies to change beliefs – and therefore behavior – should alert the perceiver to the unexpected consequences and contradictions of their beliefs and demonstrate positive emotions that may be experienced with alternative beliefs.			
17. Key Words adjustment (psychology), attitudes, behavior, behavior modification, beliefs, belief change, countermeasures, safety campaigns, traffic safety, traffic safety culture, traffic safety education, traffic safety strategies		18. Distribution Statement No restrictions.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 66	22. Price

Disclaimer

This document is disseminated under the sponsorship of the Montana Department of Transportation (MDT) and the United States Department of Transportation (USDOT) in the interest of information exchange. The State of Montana and the United States assume no liability for the use or misuse of its contents.

The contents of this document reflect the views of the authors, who are solely responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the views or official policies of MDT or the USDOT.

The State of Montana and the United States do not endorse products of manufacturers.

This document does not constitute a standard, specification, policy or regulation.

Alternative Format Statement

Alternative accessible formats of this document will be provided on request. Persons who need an alternative format should contact the Office of Civil Rights, Department of Transportation, 2701 Prospect Avenue, PO Box 201001, Helena, MT 59620. Telephone 406-444-5416 or Montana Relay Service at 711.

Table of Contents

1	Introduction	1
2	Background.....	2
3	Materials and Methods	3
4	Results	5
4.1	Introduction	5
4.2	What are beliefs?.....	6
4.3	How are beliefs formed?	7
4.4	How do beliefs influence behavior?.....	11
4.5	Why do we change our beliefs?	13
4.6	How can we facilitate belief change in others?.....	15
4.7	Guidance.....	21
5	Conclusions	22
6	References	23
7	Appendix	1
7.1	Appendix A – Guidance Document	1

List of Figures

Figure 1. Phases of work to understand and apply traffic safety culture.....	2
Figure 2. Multi-stage model of believing process (based on Connors & Halligan, 2015)	8
Figure 3. Illustration of representational and emotional functions that beliefs may fulfill (based on Boden et al., 2016).....	10
Figure 4. Behavioral Model	11
Figure 5. Elaboration Likelihood Model (ELM) describing two cognitive pathways for belief change (adapted from (Petty & Cacioppo, 1986)).....	16

List of Tables

Table 1. Definitions of Components Used in Behavioral Model.....	12
--	----

1 INTRODUCTION

Many of us – as traffic safety stakeholders – have the goal to reduce the number of traffic fatalities and serious injuries to zero. Because road user behavior is a common factor in traffic crashes, we must explore ways to encourage safer behaviors. Traffic safety culture recognizes that intentional behavior is influenced by the values, beliefs, and attitudes shared among a group of people. Therefore, to change behavior within a group, it is necessary to change beliefs. However, changing beliefs is difficult. To be successful, we need a better understanding of how beliefs are formed and changed so that we can develop more effective traffic safety culture strategies.

By better understanding the processes and conditions that form and change beliefs, traffic safety stakeholders can become more effective in developing and implementing strategies to change traffic safety culture. Growing a more positive traffic safety culture is necessary to achieve and sustain a vision of zero traffic fatalities and serious injuries.

The aims of this project were to:

1. Understand the processes and conditions that influence belief formation and change.
2. Guide traffic safety stakeholders in the design of effective strategies to change traffic safety culture.

This report provides a narrative summary of the main conclusions supported by a review of literature. This narrative is organized around the key questions that this process suggested were relevant for understanding how to change beliefs.

Based on this review, guidance for practitioners was developed and is included in a separate resource that can easily be shared.

2 BACKGROUND

Previously, the Traffic Safety Culture Transportation Pooled Fund Program has focused on defining traffic safety culture – “the shared belief system of a group of people, which influences road user behaviors and stakeholder actions that impact traffic safety” (Ward et al., 2019) – including its measurement and relationship to road user behavior (Figure 1). In the next cycle of research, it is necessary to shift to the next phase of the work, which focuses on growing a positive traffic safety culture.



Figure 1. Phases of work to understand and apply traffic safety culture.

To grow a positive traffic safety culture, we first need a better understanding of the cognitive processes that form and change beliefs – along with the factors that influence these processes. Gathering and synthesizing this information are critical for informing the design and implementation of effective traffic safety culture strategies. By reviewing the relevant research from social sciences, we can better understand how beliefs are formed and identify conditions and processes that encourage belief change.

3 MATERIALS AND METHODS

A literature review was conducted to provide a narrative synthesis (Juntunen & Lehenkari, 2021) of relevant information that answered several fundamental questions:

1. What are beliefs?
2. How are beliefs formed?
3. How do beliefs influence behavior?
4. Why do we change our beliefs?
5. How can we support belief change in others?

The review was based on publicly available and peer-reviewed literature published in English after 2006. For efficiency, an emphasis was placed on published literature reviews that included meta-analyses.

After exploring available search engines, we chose to use Research Rabbit, which is a new search platform with smart functions to construct, apply, and organize literature services. For example, this platform automatically sends email updates about new literature that has been published on specific topics of interest.

Research Rabbit uses Microsoft Academic as its primary search engine, which is a new tool for conducting literature reviews that uses algorithms based on artificial intelligence. As an example, its searches are based on the semantic meaning of chosen keywords rather than just the specific words used.

The review of literature was based on a choice of relevant keywords for each question this project tried to answer. The initial set of keywords included: “what are beliefs” and “how do beliefs change.” The initial set of keywords was then adjusted and expanded in an iterative process based on relevant keywords listed in the identified literature.

The final search focused on processes and conditions that govern the formation and change of beliefs that influence intentional behaviors. In this report, we provide a narrative summary of the main conclusions supported by this literature review process. This narrative is organized around the key questions that this process suggested were relevant to understanding how to change beliefs.

This review was used to identify 11 recommendations for improving the effectiveness of traffic safety culture strategies that seek to change people’s behaviors by changing their beliefs. The recommendations were shifted to the following questions that stakeholders could apply to a specific traffic safety culture strategy:

1. How well does the strategy seek to change specific beliefs that are linked to specific behaviors?
2. How well does the strategy foster slow thinking? (See page 10)
3. How well does the strategy create cognitive dissonance (without shame)? (See page 11)
4. How well does the strategy grow perceived self-efficacy?
5. How is emotion used in the strategy?
6. How does the strategy use a narrative?
7. How vivid is the strategy?
8. How credible is the source?

9. To what degree might the strategy evoke psychological reactance? (See page 17)
10. To what degree does the strategy grow misperceptions of normative beliefs (See page 9) or behaviors?
11. To what degree does the strategy stigmatize certain people?

Information about each of the recommendations follows the questions. The information includes background, why the guidance matters, and examples/suggestions.

4 RESULTS

4.1 Introduction

Beliefs and the act of believing have been prominent topics for discussion and debate in psychology, philosophy, and religious studies (Boden et al., 2016). Beliefs are important because they influence our behavior (Castelfranchi & Paglieri, 2007). By understanding how beliefs form and later change, we can be more effective in developing strategies to change behaviors.

Believing is arguably one of the most important things we do. Our beliefs are a core aspect of our identity; they define and shape our relationships with others and enhance our ability to survive by making the world more predictable (Boden et al., 2016).

Before delving into beliefs, it is important to explore how we think. Humans process information from the environment using two distinct modes of thinking sometimes referred to as “fast” and “slow” thinking (Grayot, 2020). These two modes differ in the amount of mental effort used and level of scrutiny applied to the processed information (Kahneman, 2011).

Fast thinking is characterized as “reactive, automatic, intuitive, heuristic, associative, and preconscious” (Grayot, 2020, p. 112). Fast thinking is fast because it uses little or no mental effort to quickly (milliseconds) provide just an impression of the information. In some cases, this impression is based on the emotional content of the information or familiarity based on past experiences.

In contrast, slow thinking is characterized as “controlled, reflective, serial, rule-based, and conscious” (Grayot, 2020, p. 112). Slow thinking is slow because processing requires greater mental effort to provide a more detailed analysis of the information, which requires significantly more time than fast thinking.

Humans try to avoid mental effort. If possible, we most often rely on fast thinking, which may provide sufficiently accurate beliefs that are also emotionally satisfying (Grayot, 2020; Kahneman, 2011).

However, because of the low effort and superficial analysis of fast thinking, we can be misled or make mistakes (Boden et al., 2016; Cooper, 2019). For example, in fast thinking, we use mental shortcuts (“heuristics”) such as estimating the likelihood of an outcome based on how easy it is to remember similar events in the past (Tversky & Kahneman, 1973). As a result, if there is a highly publicized and traumatic event published in the newspaper (such as a fatal plane crash), we will mistakenly believe that plane crashes are more common than they truly are.

When mistaken fast thinking leads to unexpected or adverse outcomes, our awareness may shift us to slow thinking to review and revise our beliefs so they more accurately and reliably represent reality (Grayot, 2020; Harmon-Jones et al., 2015).

With this brief background on thinking, the next sections explore what beliefs are, how beliefs are formed, how beliefs influence behavior, and how beliefs are changed.

4.2 What are beliefs?

Beliefs support our inherent need to understand our physical and social environment because such understanding is necessary for our survival (Boden et al., 2016; Nilsson, 2014). Our minds function as “belief engines” that automatically seek meaning from our environments (Alcock, 1995; Grayling, 2011). Beliefs represent the lessons learned from our interactions within these environments.

Beliefs are mental representations of meaningful information embedded in the environment. They result from “reaching out into the world to pick out, name, designate, apply to, or denote different things” (Britanica, 2017). They allow us to make meaning of signals in the environment and assess their personal relevance, which can trigger associated emotions (Angel et al., 2017; Connors & Halligan, 2015; Seitz & Angel, 2020).

Beliefs provide understanding of past behaviors and expectations of future behaviors (Seitz & Angel, 2020). They allow us to describe what is salient in the environment, justify our behaviors, and predict the outcomes. Eventually, the integration of these beliefs forms our internalized model of reality (Nilsson, 2014). “Our beliefs play important roles in perceiving a current situation, in identifying appropriate actions, and in predicting the effects of these actions” (Nilsson, 2014, p. 15).

Importantly, beliefs support higher-order cognitive functions such as planning and decision making. Without beliefs, we would not be able to set goals, avoid threats, or regulate our behavior.

Beliefs also provide a framework with which to explain other beliefs, reconcile inconsistencies among beliefs, and form new beliefs by integrating new experiences. This ability allows us to understand our changing environment. It also allows us to maintain a sense of continuity in our beliefs – and therefore ourselves – over time.

Finally, beliefs that are shared among a group of people serve several social functions. In addition to defining our social identity and group culture (Walton & Cohen, 2007), the sharing of beliefs provides common understanding about shared environments (Boden et al., 2016; Seitz et al., 2018). This is necessary for effective collaboration and social governance in a challenging and changing environment (Castelfranchi & Paglieri, 2007; Nilsson, 2014; Seitz et al., 2018).

Psychologists have identified several characteristics of beliefs (Boden et al., 2016; Castelfranchi & Paglieri, 2007; Connors & Halligan, 2015):

- Beliefs themselves can be structured as propositions (i.e., statements) about the world (Schwitzgebel, 2019). The essence of any belief can be distilled into a sentence that references some characteristic of the world (Boden et al., 2016). For example, the perception that “Everyone I know drives above the speed limit” could be distilled into the sentence: “Most people speed.” Indeed, researchers and philosophers have suggested that beliefs exist in our minds as sentences or some other language-based format (Nilsson, 2014; Schwitzgebel, 2019).¹
- Beliefs can vary in scope (Connors & Halligan, 2015). Beliefs can represent propositions about specific events or general classes of events.

¹ The neurological basis of our beliefs probably resides in the parietal cortex region of the brain near the area responsible for high level cognitive functioning such as planning and decision making (Seitz & Angel, 2020).

- Beliefs are “infinitely variable” (Boden et al., 2016). Because of variability in environments and experiences of them, the number and variety of beliefs that can be formed by a person or group of people is unlimited.
- Beliefs are held with varying degrees of “conviction.” Conviction refers to the perceived (subjective) probability the proposition conveyed by the belief is accurate (i.e., correctly reflects the actual environment). Without some degree of conviction, a belief does not exist.²
- Beliefs are not static (Boden et al., 2016). After forming, belief content and conviction can change based on new experiences, reinterpretation of past experiences, and modifications to address inconsistencies among beliefs.
- Beliefs are not always conscious (Boden et al., 2016). Beliefs may be held unconsciously and not come into awareness until a relevant goal becomes salient and brings attention to it (Boden et al., 2016; Castelfranchi & Paglieri, 2007).
- Beliefs vary in terms of shared adoption (Connors & Halligan, 2015). Beliefs can be formed by an individual based on a unique experience or shared among a group of people.
- Group beliefs are formed and maintained through communication and culturally relevant activities such as storytelling (Bietti et al., 2019). Shared beliefs among group members may arise from shared experiences (i.e., group members are participating in the same experience). Communication (e.g., storytelling) can also produce shared beliefs based on the experiences of one or a few, which are then shared with other group members. This form of sharing is particularly adaptive for survival relevant information and beliefs. Conversely, isolated experiences without shared, effective communication tend to produce idiosyncratic beliefs held by individuals.

4.3 How are beliefs formed?

Humans have an inherent need and the innate ability to form beliefs based on their sensory information from the environment (Nilsson, 2014).³ The beliefs we form can be considered personal theories (hypotheses) about the environment (Nilsson, 2014; Seitz et al., 2018). Together, these beliefs represent a mental model of our environment (Nilsson, 2014). Later experiences can serve to bolster or reject the beliefs embodied by this model. However, we generally only seek evidence to evaluate accuracy of our beliefs when needed (e.g., provoked by unexpected or negative outcomes from our behaviors). Moreover, in these instances, we are biased to find only evidence that confirms our original beliefs (Boden et al., 2016).

The formation of beliefs depends on our ability to accurately perceive (comprehend) the meaning of sensory information and our capacity to derive emotional value (meaning) from those

² Without any conviction, we may hold a different form of mental representation other than a “belief” such as an idea or hypothesis (Boden et al., 2016).

³ Much research on child development has focused on specific cognitive and belief abilities at different ages and the nuances the affect children’s mental representations. Despite disagreement about the exact age at which children’s belief formation processes match adults’, there is general consensus that it occurs by age 6 and that from then on, children can separate their own mental representations from reality and from the mental representations of others (Keysar et al., 2003). Therefore, this review is focused on belief formation and change without specifically differentiating between children and adults.

perceptions (Seitz et al., 2018; Seitz & Angel, 2020). This sensory information comes from our experiences. Experiences that give rise to beliefs can result from direct interaction with the external environment or indirectly by seeing others interacting within that environment (Bandura, 2001).

Our experiences can also include internal deliberation about our existing beliefs or external communication about beliefs shared with others. For example, participation in conversations or other forms of communication (e.g., social media, books, etc.) often reference our existing and shared beliefs. In this context, the ability to effectively communicate beliefs has an important personal and social function (Connors & Halligan, 2015). Some experiences are designed to convey and reinforce specific beliefs, for example, during socialization and indoctrination practices such as rituals (Boden et al., 2016; Seitz et al., 2018).

We do not always recall the original source of our beliefs. A belief created through personal experience and one adopted after communicating with someone else can be experienced and function the same way (Boden et al., 2016; Nilsson, 2014).

Beliefs are formed through a process called “believing” (Seitz et al., 2018). As shown in Figure 2, the believing process can be described as a multi-stage model (Connors and Halligan, 2015).

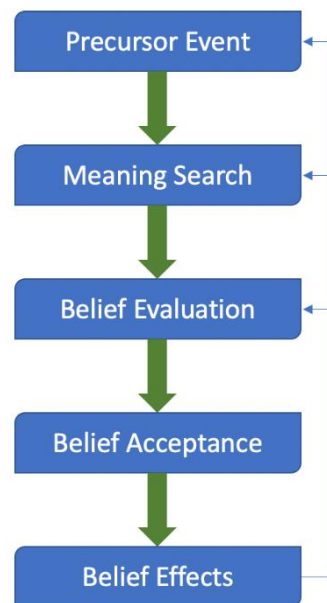


Figure 2. Multi-stage model of believing process (based on Connors & Halligan, 2015)

According to this model, the formation of a belief begins with a Precursor Event that we perceive as a perturbation in our perception of the world. Examples of such perturbances include the perception of information that (1) conveys novel information not currently represented by existing beliefs, (2) contradicts expectations derived from an existing belief, or (3) represents emotionally salient information that is self-relevant. Such events may (but not always) shift us into the slow mode of thinking to analyze the situation more deeply to better understand the available information in the environment.

In the next stage of believing (Meaning Search), we try to understand the meaning of this event, which means to explain its occurrence. However, our ability to find meaning in an event is

constrained by our existing beliefs and the specific context of the experience. As a result, our search for the meaning of the precursor event may be personal and vary across circumstances.

From this search for meaning, we may generate plausible explanations of the event. Initially, these are considered “proto-beliefs” (or precursors to beliefs) because they are hypothetical explanations without knowing their representational accuracy.

It is not until the next stage (Belief Evaluation) that we actually evaluate our proto-beliefs in terms of their explanatory accuracy. We also evaluate these proto-beliefs in terms of their internal consistency with other existing beliefs.⁴

Proto-beliefs that survive the scrutiny of this evaluation stage become accepted beliefs. Our conviction in an accepted belief may depend not only on its accuracy in explaining the event and its alignment with other beliefs but also its role in regulating our emotional state.

In the last stage (Belief Effects), future events that violate expectations based on the new belief will be perceived as perturbances, thereby triggering the belief formation process again (see Figure 2). Moreover, the new belief will influence the search for meaning in future precursor events and contribute to the evaluation of other proto-beliefs.

To demonstrate this model, consider this example:

- **Precursor Event:** Despite sleeping well, a driver is surprised by his difficulty staying awake during his morning drive to work.
- **Meaning Search (proto-beliefs):** The driver considers all the possible reasons for his fatigue. For example, was the unusual fatigue the result of (1) him skipping his morning coffee routine, (2) his new anxiety medication, or (3) the large meal he had for breakfast.
- **Belief Evaluation:** The driver explores the plausibility of each of these possible explanations: (1) he has skipped coffee before without any fatigue effects, (2) the drug bottle does warn of fatigue symptoms, and (3) he has had larger meals and still felt alert.
- **Belief Acceptance:** The most plausible explanation is the new anxiety drug, so the driver accepts this is the reason for his unusual fatigue. The driver now believes that drugs such as this can cause him to feel extremely fatigued.
- **Belief Effects:** As a result of this belief, the driver may decide to take his medication in the evening rather than the morning. Or he may request a change in medication from his doctor. In the future, he may also be more cautious about the effects of medications.

It is important to note that we may not be aware of these processes (i.e., they may be unconscious). The process may involve only fast thinking. Awareness of a belief may only be evident when events make us reflect on the belief and shift to slow thinking.

As mentioned previously, beliefs and emotions are connected. The American Psychological Association defines emotions as “a complex reaction pattern, involving experiential, behavioral

⁴ Because we are motivated to avoid contradictory beliefs, we are biased to accept proto-beliefs that are internally consistent (coherent) more than we are motivated to ensure proto-beliefs are necessarily accurate. In such situations, the desire to avoid uncomfortable emotions associated with being internally inconsistent is more salient than the need to represent the environment accurately.

and physiological elements” (American Psychological Association, 2022). Therefore, beliefs are not just “cold” representations of reality – they are also “hot” sources of emotion (Rao et al., 2009).

Just as beliefs can be evaluated in terms of their accuracy compared to the observed world, beliefs also can be evaluated in terms of the positive or negative emotions they evoke (see Figure 3). Therefore, beliefs can serve two functions: to help us understand the world (representational accuracy) and to influence how we feel (emotional control).

Some beliefs may support one function more strongly than the other. Belief acceptance may depend on which functional goal – being accurate or feeling good – is most important in a particular context (Boden et al., 2016).

Sometimes, a belief can satisfy both functions (complementary). For example, the belief that “I failed my driver’s license test because I did not practice enough” may accurately represent the reason the person failed and help the individual avoid despair by not accepting they may just be a bad driver.

However, in some cases, adopting a belief that aligns with one function may undermine the other function. For example, a driver who believes “I drive better after smoking cannabis” may feel better about their decision to drive after using cannabis (DUIC) but is also denying the reality that cannabis increases the risk of causing a fatal crash (Drummer, 2009).

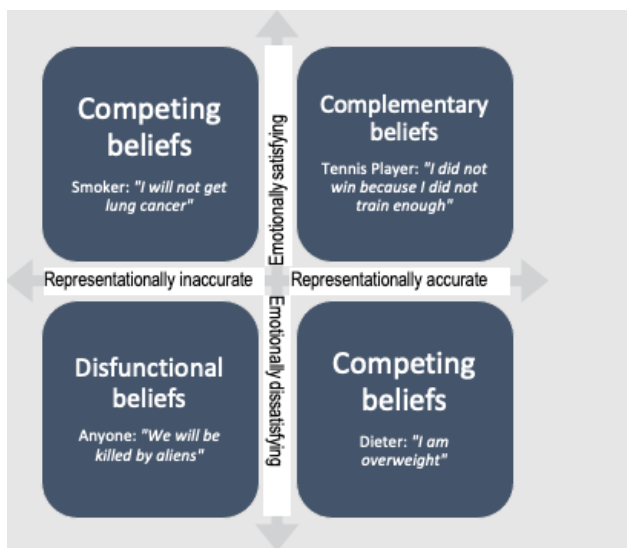


Figure 3. Illustration of representational and emotional functions that beliefs may fulfill (based on Boden et al., 2016).

The notion that beliefs have two primary functions may explain the wide variation in beliefs among people and over time (Boden et al., 2016). First, beliefs are evaluated differently by people depending on which function is most salient to them in a particular situation. Second, people with different functional goals may adopt different beliefs about the same experience. Third, the emotional benefit of some beliefs may explain why they persist without supporting evidence (or with contradicting evidence) about their representational accuracy.

In summary:

- We may form a new belief when we perceive an event (i.e., a precursor event) that we cannot explain. These types of events tend to be unexpected because we do not yet have

any beliefs that enable us to predict them. In this instance, our goal is to form a belief that accurately represents the event.

- We may form a belief because it makes us feel good (i.e., the belief generates a positive emotion). This also includes forming a belief that removes an existing negative emotion. In this instance, our goal is to regulate our emotions.

4.4 How do beliefs influence behavior?

It is almost unanimously agreed that beliefs deeply affect our actions.

(Castelfranchi & Paglieri, 2007, p. 237)

Various models have been developed that represent the predicted relationship between beliefs and deliberate behaviors. Deliberate behaviors are different from reflexive behaviors (like a startle response to a loud noise), which involve much less cognitive processing. Figure 4 represents a model relating beliefs to behaviors based on the theory of reasoned action (Fishbein & Ajzen, 2010), the prototype willingness model (Gerrard et al., 2008), and the role of values (Oreg & Katz-Gerro, 2006). Table 1 summarizes the definitions of the components in the behavioral model.

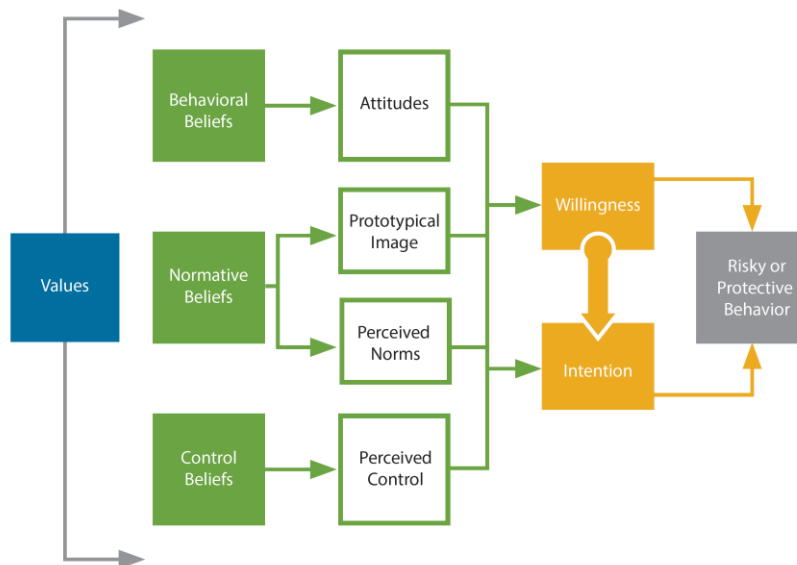


Figure 4. Behavioral Model

Researchers have used controlled experiments (many with random assignment) to change beliefs and then assessed subsequent changes in behaviors. It is beyond the scope of this project to review all these studies. Nonetheless, there is experimental evidence supporting the causal relationship between these beliefs and behaviors.

For example, extensive studies have explored the relationship between perceived norms and behavior. People typically want to behave in ways that are considered normal and acceptable (Rhodes et al., 2020); however, people often misperceive the norms of their peers, and these

misperceptions can lead people to align their behaviors with the misperceived norms (Amialchuk et al., 2019). Research suggests social norms interventions seeking to change normative beliefs are effective (Miller & Prentice, 2016; Rhodes et al., 2020).

Strategies that seek to modify people’s beliefs and behaviors by correcting misperceptions are known as social norms interventions (Lewis & Neighbors, 2006; Miller & Prentice, 2016). Social norms interventions are divided into two groups: social norms marketing and personalized normative feedback (Lewis & Neighbors, 2006; Miller & Prentice, 2016).

Social norms marketing involves providing actual norms of the behavior by disseminating the information widely usually through media, posters, and other large channels of dissemination. Personalized normative feedback is more individualized and seeks to change normative misperceptions by creating discrepancies among a person’s behavior, the perceived typical behavior of their peers, and the actual typical behavior of their peers (Lewis & Neighbors, 2006).

Table 1. Definitions of Components Used in Behavioral Model

Construct	Definition
Values	Ideals to which we aspire that define the goals for our behavioral choices and direct the formation of our belief systems (e.g., “I must protect my family,” “I desire a life without stress”).
Behavioral Beliefs	Expectations about the physical and social consequences of a behavior (e.g., “If I speed, I will likely get an expensive fine,” “If I drink and drive, my friends will exclude me”).
Attitudes	Subjective evaluation of an object or behavior in terms of emotional reaction (e.g., “Speeding is exciting”) and perceived utility (e.g., “Seat belts are useless”).
Normative Beliefs	Beliefs about what behaviors are most common in a group (e.g., “All my friends speed”) and what important people in that group expect (e.g., “My parents expect me to wear a seat belt”).
Perceived Norms	The behavior believed to be common and expected in a given context (e.g., wearing a seat belt when driving with parents).
Prototypical Image	The stereotype of people perceived to typically engage (or not engage) in the behavior (e.g., “People who speed are cool”).
Control Beliefs	Beliefs about an individual’s ability to engage or not engage in the behavior based on factors that are either internal or external to oneself (e.g., “Crashes are determined by fate,” “I am comfortable not speeding even if everyone around me is”).
Perceived Control	Perception of our ability to determine our own behaviors (e.g., “I can choose my own speed in traffic”).
Intention	The deliberate decision to commit a behavior in an anticipated situation (e.g., “I intend to wear my seat belt every time I am in a vehicle”).
Willingness	The predisposition to commit a behavior if an unexpected situation arises (e.g., “I am more willing to speed if everyone else around me is speeding”).

4.5 Why do we change our beliefs?

One of the most important things to say about beliefs is that they are (or at least should be) tentative and changeable.

(Nilsson, 2014, p. 4)

We are most likely to change an existing belief when doing so improves the perceived accuracy of our beliefs (representational function) or helps regulate our emotions (emotional function). However, it is easier to change beliefs that do not strongly serve either function because a belief without a purpose is less resistant to change (Boden et al., 2016).

We may change a belief to regulate our emotional state. This is more likely to happen in ambiguous situations to reduce feelings of uncertainty or confusion (Boden et al., 2016). In such cases, we are motivated to revise beliefs to experience more pleasant emotions. For example, we may accept a belief that makes us feel better or reject a belief that would make us uncomfortable. In this section, we discuss “cognitive dissonance” as a special case of changing beliefs to reduce the emotional discomfort.

Often what leads to changing our beliefs is cognitive dissonance. Cognitive dissonance is a state of emotional discomfort resulting from our awareness that we have a belief that is inconsistent with other beliefs important to us or the behaviors we exhibit (Cooper, 2019; Harmon-Jones et al., 2015). Our awareness of this inconsistency may come as a result of an adverse outcome of a (freely chosen) behavior that was based on the belief. For example, a driver who values safety and believes they can drive safely while texting is involved in a crash while texting. They are upset because their belief that they can drive safely while texting is inconsistent with the experience of being in a crash. In such cases, we are motivated to change one or more beliefs to remove the perceived contradiction.

Inconsistency among beliefs that influence behavior may interfere with our perceptions of behavioral control, which will result in cognitive dissonance.⁵ This dissonance motivates us to adjust our beliefs to become more internally consistent, especially in relation to control of behavior. We can do this by changing the inconsistent belief (in the previous example, the driver now believes texting while driving may be dangerous) or by adopting a belief that explains away the apparent contradiction.

For example, consider a person who has decided that it is dangerous to drive under the influence of alcohol (DUIA). Now imagine this person is in a situation where they had to make the short drive home after drinking at a restaurant. In this case, the belief that it is dangerous to drive under the influence of alcohol is inconsistent with the behavior of driving after drinking.⁶ The behavior cannot be changed after the fact, so to reduce the apparent inconsistency, the person can change contradicting beliefs (“A small amount of alcohol is not enough to impair me”) or adopt

⁵ This presumes that the person has not chosen or been forced to behave inconsistently (Cooper, 2019).

⁶ The behavior of driving home after drinking implies the belief that alcohol does not impair driving, which contradicts the belief the person already holds that DUIA is dangerous.

new beliefs to reduce the contradiction (“There is very little danger from driving such a short distance on a route I know very well”).

Another way to explain away the apparent contradiction between our beliefs and outcome is to change relevant beliefs about our responsibility for an outcome and the nature of that outcome (in the previous example, the driver does not believe it was the texting that caused the crash but rather the poor driving of the other driver) (Harmon-Jones et al., 2015).

Especially when our responsibility is ambiguous, we are motivated to change our beliefs to portray others as being responsible for our behavior and convince ourselves the adverse outcome was unforeseeable (Cooper, 2019). Here, the motivation for changing beliefs is to reconceptualize the behavior and outcome as non-aversive – even desirable (Cooper, 2019).

The fundamental attribution error (also called correspondence bias) is another mental shortcut that humans often unconsciously make when assigning responsibility for adverse outcomes (Hooper et al., 2015; Ross, 1977). When bad things happen to other people, we tend to assign responsibility to the individual or their character. However, when we experience adverse outcomes ourselves, we assign responsibility to the situation or circumstance. For example, we see a crash involving other drivers, and we attribute the crash to their poor driving. However, when we are involved in a crash, we blame the road design, the weather, or the other driver. In this way, the fundamental attribution error serves a self-protective function and reduces the likelihood that we easily or willingly attribute responsibility for adverse outcomes to ourselves.

Cognitive dissonance can also be experienced vicariously. We can learn about the experience of someone from a social group we identify with behaving in ways that contradict our own beliefs, and this other person’s experience can lead us to change our beliefs (Cooper, 2019). Humans are social beings, which means belonging to social groups is an important part of our identity (Abrams & Hogg, 1990; Brown, 2000; Chen & Li, 2009). Indeed, forming a social identity by belonging to groups is an important determinant of our health and emotional wellbeing (Steffens et al., 2021; Walton & Cohen, 2007).

The process of “belonging” to a group involves sharing the beliefs that define the culture of the group (Weller & Baer, 2002; Zou et al., 2009). When we identify with a group and espouse “our” shared culture, we may experience cognitive dissonance when we see a group member contradict those beliefs and look to resolve that dissonance in ourselves.

For example, in a study by Norton et al. (2003), a student (actually, a confederate in this experiment) who belonged to a group that shared the belief that university fees should not be raised followed the request to write a strongly worded statement in support of raising fees. It was evident that this statement might be used by the university to support their proposal to raise fees. The point of this experiment was to examine how the other students reacted to the observation of one of their fellow students writing the statement that contradicted the group’s beliefs. In this case, the observing students also changed their beliefs to be more favorable toward the statement to reduce their own vicarious dissonance with the confederate’s behavior. Moreover, the stronger the identification with the group, the greater the change in beliefs.

Cognitive dissonance occurs when we experience (directly or vicariously) a contradiction between our beliefs and our experience. We may feel uncomfortable because greater representational accuracy of our beliefs allows us to be more effective – with fewer adverse outcomes – during our interactions within our environment (Harmon-Jones et al., 2015).

Deciding the accuracy of our representational beliefs requires that we shift into our “slow” analytical mode of thinking (Nilsson, 2014). Slow thinking may prompt us to understand and revise our beliefs as we seek to achieve the accuracy necessary to reliably choose actions that produce intended outcomes.

Slow thinking may also help us better understand (i.e., form new beliefs about) the larger environment. We can only form beliefs about the environment we know. The explanations we form and the consequences we expect are limited to that known environment (see Figure 5). However, when we are made aware of the larger environment, we may recognize there is more complexity to explain and learn that the consequences of our actions affect other parts of the environment (Stroth, 2015). Such experiences show us that our beliefs need to expand to account for our interactions within this larger system. For example, we may have beliefs about not speeding in our own neighborhood but frequently speed in areas outside our neighborhood. But when we realize that our speeding in these areas increases the risk of a fatal crash to the residents of those neighborhoods, we may change our beliefs about speeding across the transportation system.

4.6 How can we facilitate belief change in others?

Efforts to change beliefs in others often involve presenting information to the person to substantiate the change (e.g., facilitating cognitive dissonance). This information could be presented by an individual (e.g., a friend, family member, healthcare provider, counselor, etc.) or be provided in a message (e.g., a public service announcement, a booklet, information on the internet, etc.). The Elaboration Likelihood Model describes two pathways for processing this information that can lead to belief change depending on the motivation and ability of the individual (Petty & Cacioppo, 1986).

As summarized in Figure 5, if the individual is motivated and able to attend to the information, they may engage in slow thinking to analyze information and elaborate by recalling or generating related information (e.g., consider the quality of the arguments presented). If the elaboration leads to thoughts favorable toward the conveyed information, sustainable belief change may happen that reliably influences future behavior.

However, without sufficient motivation or ability, the person will instead use a peripheral pathway based on their fast mode of thinking that only recognizes superficial aspects of the information such as only the number of arguments in the information. In this case, belief change will likely be temporary and unlikely to influence future behavior.

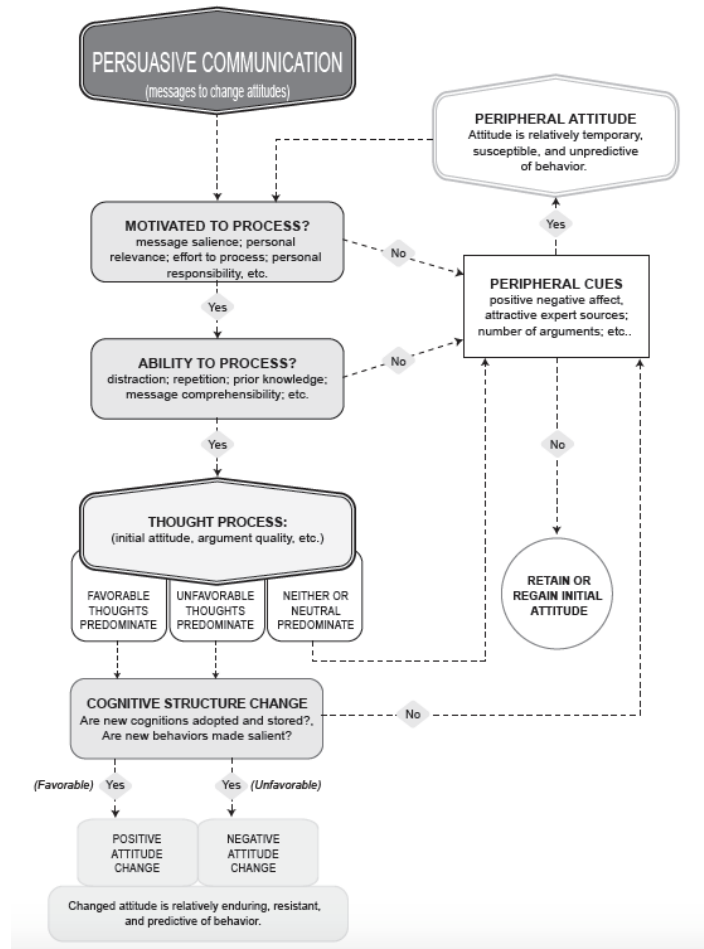


Figure 5. Elaboration Likelihood Model (ELM) describing two cognitive pathways for belief change (adapted from (Petty & Cacioppo, 1986)).

The Elaboration Likelihood Model implies that both motivation (e.g., personal relevance) and ability (e.g., focused attention) are necessary preconditions for information to change a person’s beliefs and future behavior. There are internal and external factors that research has shown can facilitate belief change and the adoption of behavior influenced by that belief. Internal factors include emotions, perceived self-efficacy, and locus of control. External factors include framing, narratives, vividness, and credibility. This section concludes with factors that may inhibit belief change.

4.6.1 Emotions

The emotional state of the person receiving the information intended to change beliefs can influence how that information is processed (Petty & Briñol, 2015). Emotions vary by the pleasantness or unpleasantness of their experience, which is referred to as “emotion valence.” For example, happiness is a pleasant and desirable emotion, while fear can be unpleasant and undesirable. However, the effect of the emotion depends on which pathway the person is using to process the message (see Figure 5). If the person is using the peripheral pathway, the valence of their emotion can be misattributed to the information and influence its interpretation and later acceptance. For example, a person who is currently fearful may automatically dislike the information and reject it.

Fear is a specific emotion with a negative valence. A common strategy in messaging to change beliefs that influence behavior is to evoke fear by portraying the negative consequences of the behavior. The earlier discussion suggests that this approach would only be effective if the peripheral pathway for processing these messages can be avoided.

Indeed, there is evidence that fear-based messages can be effective, but only under certain conditions. For example, (Tannenbaum et al., 2015) concluded that fear-based messages can be effective but only when they (1) advocate for one-time behaviors (rather than ongoing behaviors), (2) convey high susceptibility to severe outcomes, (3) prove the efficacy of the desired copying behaviors to reduce susceptibility and outcome severity, and (4) communicate to an audience with a substantial percentage of women.

In the context of traffic safety, these conditions associated with the apparent effectiveness of fear-based messages have led other researchers to conclude: “While fear arousal appears important for attracting attention, its contribution to behavior change appears less critical than other factors, such as perceptions of vulnerability and effective coping strategies” (Lewis et al., 2007a). Indeed, the influence fear-based messages have on belief change is usually “relatively weak” (Witte & Allen, 2000). Moreover, fear-based messages can have several undesired effects as well, including denial of the issue communicated by the message (Simpson, 2017). Thus, it is important to also explore the use of positive valence emotions in messaging strategies to change beliefs including hope and joy (Lewis et al., 2007b).

There is also evidence that the emotional state of a person can influence which pathway they use to process information (Petty & Briñol, 2015). Specifically, the emotional contentment resulting from feeling happy can dissuade people from investing the effort to analyze and elaborate information compared to more neutral emotions (fast thinking). In contrast, negative emotions such as sadness may imply problems in the environment that motivate efforts to analyze and elaborate information to improve the current situation (slow thinking).

However, the influence of emotions is different when people are motivated and able to consciously analyze and elaborate information using slow thinking:

- If a goal of the information is to instill an emotion, then it will be evaluated as more effective if the person is already experiencing that emotion. The current emotional state of the person is interpreted as evidence that the presented information is valid. For example, a seat belt message framed to be sad may be evaluated as more effective by people who themselves feel sad than by those feeling happy. This effect is opposite of what would be expected if these people were using the peripheral pathway shown in Figure 6 to process the message.
- The emotional state of the recipient can bias the elaboration process. Our emotional state biases the information we recall from memory. We are more likely to recall information that shares an association with our current emotion. This process influences the information we recall when analyzing and elaborating the information conveyed by a message. Specifically, if a person is happy, they will be biased toward evaluating the message more favorably because they are inclined to elaborate the message based on happy (positive) recalled information.

4.6.2 Perceived Self-Efficacy

Perceived self-efficacy includes people's beliefs about their skills, abilities, and capabilities to perform in specific situations. Research on self-efficacy suggests that what we think we can do in each situation, not what we can do, has important implications and influence on a wide range of behaviors (Bandura, 1982; Bauman et al., 2012; Gwaltney et al., 2009; Miao et al., 2017; Taubman – Ben-Ari, 2016). Our decisions about what actions to take are influenced by our evaluation of self-efficacy (Bandura, 1982, 1993). For example, if a person judges themselves to be competent to intervene as a bystander, they are more likely to intervene than if they judge their skills to be inadequate.

Information that strengthens an individual's perception of self-efficacy can influence behavior change (Bandura, 1982). For example, messages that show people how to do a behavior through seeing others and modeling can increase beliefs of efficacy (Bandura, 1982). Similarly, messages that are encouraging (i.e., "You can do it," "I believe you are capable," "You're going to do great.") can bolster beliefs of efficacy to engage in a behavior (Bandura, 1982, 1993).

4.6.3 Locus of Control

Locus of control refers to people's beliefs about how much control they have over the outcomes they experience. Locus of control is considered a cognitive disposition (Ajzen, 2002), and is a key predictor of a variety of behavioral outcomes (Galvin et al., 2018). Perceptions that one's own behavior and personal attributes drive outcomes are referred to as an internal locus of control, while perceptions that external conditions outside of oneself drive outcomes are referred to as an external locus of control (Galvin et al., 2018). External locus of control beliefs often attribute outcomes to luck or powerful others (Jang & Baek, 2018). Locus of control is correlated with attitudes, motivation, and a variety of other outcomes related to performance (Ng et al., 2006).

Locus of control is often viewed in the literature as a trait, but researchers have also suggested that locus of control is changeable (Galvin et al., 2018; Kong & Shen, 2011) and should be considered when designing information or messages to influence beliefs related to behavior (Kong & Shen, 2011). Information can be tailored to locus of control beliefs (Jang & Baek, 2018). Information that provides specific skills and knowledge may enhance internal locus of control (Jang & Baek, 2018), which can mitigate the fundamental attribution error and increase an individual's sense of responsibility. Likewise, messages emphasizing individual autonomy and individual responsibility ("It's up to you.") may result in more favorable attitudes toward the messages among those with an internal locus of control (Jang & Baek, 2018; Kong & Shen, 2011; Williams-Piehotka et al., 2007).

As a result, traffic safety messages that emphasize personal autonomy and bolster skills about how engaging in a specific traffic safety behavior may be more suited to those with an internal locus of control. Messages that offer advice, make recommendations, or encourage a specific behavior from well-known messengers may influence those with a more external locus of control (Jang & Baek, 2018; Williams-Piehotka et al., 2007). Further, messages that are designed with a social-responsibility frame may produce more favorable attitudes among individuals with an external locus of control beliefs (Kong & Shen, 2011). For example, messages that use a

prosocial frame that emphasizes engaging in a specific traffic safety behavior for important others may be advantageous for those with an external locus of control.

4.6.4 Framing

Strategies to change beliefs related to behaviors can focus on what is gained or lost by engaging in that behavior. This focus on gain or loss is referred to as framing. A gain frame focuses on obtaining something desired or removing something undesired. For example, a message to influence beliefs associated with voting could be phrased as “Get higher wages – Vote for Smith” or “Lower your taxes – Vote for Smith.”

Similarly, a loss frame focuses on obtaining something undesired or removing something desired. For example, a message to change teen driver beliefs could be phrased as “If you speed, you will be grounded” or “If you speed, you cannot use the car.” In this context, evidence suggests that gain-framed messages are more effective in changing beliefs and associated behaviors than loss-framed message (O’Keefe & Jensen, 2007).

However, the impact of the message frame on effectiveness is small and has been proven only in a small number of public health domains (O’Keefe & Jensen, 2007). Moreover, the apparent effect of message framing is more evident on behavior than associated beliefs, which has most often been limited to studying attitude change (Gallagher & Updegraff, 2012). This suggests the need to understand the effect of message framing on more types of beliefs including perceived norms and perceived control.

4.6.5 Narratives

Whereas information may include factual information or rhetorical arguments that support belief change, a narrative is a form of story that immerses us in an experience that gives context to belief change (Shen et al., 2015). Examples of narratives include personal stories, anecdotes, testimonials, and contextual accounts of events. Narratives are a typical form of communication among people in groups and may therefore feel natural to both the teller and the listener. The use of narratives as part of public health strategies to change beliefs and associated behaviors has been found to have a “small but significant effect” (Shen et al., 2015). The effectiveness of narratives is greater when delivered by audio or video compared to text, as these communication channels are more likely to elicit emotions connected to the narrative. Moreover, narratives are more effective for increasing preventative behaviors than reducing harmful behaviors.

4.6.6 Vividness

Vividness has been defined as a quality of communicated information that attracts our attention, evokes emotions, and provokes imagination. Strategies to change beliefs need to attract attention and provoke imagination so that we are motivated to analyze and elaborate messages (i.e., shift us to slow thinking). Increasing the vividness of communication strategies can increase effectiveness in changing beliefs (Blondé & Girandola, 2016). Specifically, vividness increases the recall of memories that can elaborate a message but only when the form of vividness creates positive emotions that elicit positive thoughts. For example, a narrative based on a “concrete” testimonial is more vivid than an “abstract” story (Blondé & Girandola, 2016).

4.6.7 Credibility

Perceptions of the credibility of information have important implications for changing beliefs and influencing behavior (Ismagilova et al., 2020). Factors associated with the source of the information and the information itself influence credibility (Metzger et al., 2003). Credibility is influenced by the trustworthiness of the source, the perceived expertise (in the topic area) of the source, and whether the source is viewed as similar to the audience (i.e., shares attitudes, values, preferences, and demographic characteristics) (Ismagilova et al., 2020; Metzger et al., 2003).

Attention to the source is an important element of creating messages that influence beliefs and behaviors. Sources considered highly credible are likely to be more persuasive than sources that are perceived to be of low credibility (Pornpitakpan, 2004). In an online format, it has been suggested that making information about the source readily available to the audience, updating profile pages to include details that would support trustworthiness, showcasing the expertise of the staff, and finding ways to build a positive online community that highlights social similarities can provide evidence of credibility (Ismagilova et al., 2020).

Credibility is also influenced by factors associated with the information itself. The structure, content, and delivery of the information influence perceptions of credibility (Metzger et al., 2003). For example, how information is structured, organized, and whether it flows logically affect perceptions of credibility (Metzger et al., 2003). Further, the content of the information, how interesting it is to the audience, and its perceived validity are associated with credibility (Metzger et al., 2003). Using opinionated language decreases credibility compared to information that uses less intense language (Metzger et al., 2003). Information that is familiar, closely aligned, or that supports the views of the audience is viewed as more credible than information that has discrepancies (Metzger et al., 2003). Finally, the way in which information is delivered, including how hesitant or assertive the communication style, influences perceptions of credibility (Metzger et al., 2003).

4.6.8 Factors That May Inhibit Belief Change

Some factors can inhibit belief change. When we engage in fast thinking (which we unconsciously do most of the time), we are less aware (concerned) of the accuracy of our beliefs (i.e., how well our beliefs actually represent the world around us). Indeed, we are biased to create justifications after an experience to confirm our beliefs. If information presented to an individual is only processed using fast thinking, it is less likely to be analyzed deeply enough (with slow thinking) to affect belief change.

Recall that beliefs can have two functions: to enable us to function in the observed world and to regulate emotions. If a person holds a belief because of emotional benefits, efforts to change that belief based on challenging the representational accuracy of the belief may not be effective. Additionally, people are unlikely to know or acknowledge why they hold certain beliefs and may not recognize the emotional benefits of certain beliefs, making those beliefs even more resistant to change.

When people perceive that being persuaded to do something (e.g., through a message) threatens their freedom, they may experience psychological reactance. Psychological reactance is “an unpleasant motivational arousal that emerges when people experience a threat to or loss of their free behaviors” (Steindl et al., 2015, p. 205). Psychological reactance often shows up as anger or counterarguing (Rains, 2013).

When messages elicit reactance, they may motivate the person to do the opposite of what the message intended (Brehm & Brehm, 1981). Messages that use strong, directive, or controlling language like “You must” or “You should” can increase psychological reactance (Miller et al., 2007; Shen, 2015). Further, messages framed as a loss can elicit stronger psychological reactance than messages using a gain frame (Shen, 2015).

4.7 Guidance

These results were used to create a resource for traffic safety practitioners about belief change. The resource distilled the results into an assessment that practitioners could use with an existing or potential strategy or countermeasure. The guidance included introductory information about the guidance, how it can be helpful, and how to use the guidance. The introduction was followed by an assessment with 11 questions based on the results:

1. How well does the strategy seek to change specific beliefs that are linked to specific behaviors?
2. How well does the strategy foster slow thinking?
3. How well does the strategy create cognitive dissonance (without shame)?
4. How well does the strategy grow perceived self-efficacy?
5. How is emotion used in the strategy?
6. How does the strategy use a narrative?
7. How vivid is the strategy?
8. How credible is the source?
9. To what degree might the strategy evoke psychological reactance?
10. To what degree does the strategy grow misperceptions of normative beliefs or behaviors?
11. To what degree does the strategy stigmatize certain people?

Following the questions, supportive guidance was provided that included background on each question, relevance to changing beliefs and behaviors, and suggestions/examples. A full copy of the final guidance document is included in Appendix A.

5 CONCLUSIONS

In this report, we provide a narrative summary of the main conclusions supported by the review of literature.

To the extent that the behaviors we want to change are based on our beliefs, we need to understand how such beliefs form and change in order to design effective behavior change strategies. This narrative review of the literature helps to support that understanding. Two key conclusions from this narrative review include:

- We may form a new belief when we perceive an event (i.e., a precursor event) that we cannot explain. These types of events tend to be unexpected because we do not yet have any beliefs that enable us to predict them. In this instance, our goal is to form a belief that accurately represents the event.
- We may form a belief because it makes us feel good (i.e., the belief generates a positive emotion). This also includes forming a belief that removes an existing negative emotion. In this instance, our goal is to regulate our emotions.

This implies that effective strategies to change beliefs – and therefore behavior – should alert the perceiver to the unexpected consequences and contradictions of their beliefs and demonstrate positive emotions that may be experienced with alternative beliefs.

These results were used to develop guidance for practitioners. The guidance used 11 questions that practitioners could apply to a strategy or countermeasure that is seeking to change beliefs or behaviors. Appendix A includes the full guidance.

Admittedly, the majority of available literature on belief formation and belief change is based on research in Western societies and so predominately reflects Western thinking (Seitz et al., 2017). Therefore, this review may be limited and not reflect the process of belief formation in various other societies and cultures.

6 REFERENCES

- Abrams, D., & Hogg, M. A. (Eds.). (1990). *Social identity theory: Constructive and critical advances* (Vol. viii). Springer-Verlag Publishing.
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology, 32*(4), 665–683. <https://doi.org/10.1111/j.1559-1816.2002.tb00236.x>
- Alcock, J. (1995). The belief engine. *Skeptical Inquirer, May/June*.
- American Psychological Association (2022). Emotion, *APA Dictionary of Psychology*, <https://dictionary.apa.org/emotion>
- Amialchuk, A., Ajilore, O., & Egan, K. (2019). The influence of misperceptions about social norms on substance use among school-aged adolescents. *Health Economics, 28*(6), 736–747. <https://doi.org/10.1002/hec.3878>
- Angel, H.-F., Oviedo, L., Paloutzian, R. F., Runehov, A. L. C., & Seitz, R. J. (Eds.). (2017). *Processes of believing: The acquisition, maintenance, and change in creditions* (Vol. 1). Springer International Publishing. <https://doi.org/10.1007/978-3-319-50924-2>
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 122–147. <http://dx.doi.org.proxybz.lib.montana.edu/10.1037/0003-066X.37.2.122>
- Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28*(2), 117–148. https://doi.org/10.1207/s15326985ep2802_3
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*, 1–26.
- Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J. F., & Martin, B. W. (2012). Physical activity 2: Correlates of physical activity: why are some people physically active and others not? *The Lancet, 380*(9838), 258–271.
- Bietti, L. M., Tilston, O., & Bangerter, A. (2019). Storytelling as adaptive collective sensemaking. *Topics in Cognitive Science, 11*(4), 710–732. <https://doi.org/10.1111/tops.12358>
- Blondé, J., & Girandola, F. (2016). Revealing the elusive effects of vividness: A meta-analysis of empirical evidences assessing the effect of vividness on persuasion. *Social Influence, 11*(2), 111–129. <https://doi.org/10.1080/15534510.2016.1157096>
- Boden, M. T., Berenbaum, H., & Gross, J. J. (2016). Why do people believe what they do? A functionalist perspective. *Review of General Psychology, 20*(4), 399–411. <https://doi.org/10.1037/gpr0000085>
- Brehm, S. S., & Brehm, J. W. (1981). *Psychological reactance: A theory of freedom and control*. Academic Press. <https://www.elsevier.com/books/psychological-reactance/brehm/978-0-12-129840-1>
- Britannica, T. E. of E. (2017). Semantics. In *Encyclopedia Britannica: Vol. May 1*. <https://www.britannica.com/science/semantics>

- Brown, R. (2000). Social identity theory: Past achievements, current problems and future challenges. *European Journal of Social Psychology*, 30(6), 745–778.
[https://doi.org/10.1002/1099-0992\(200011/12\)30:6<745::AID-EJSP24>3.0.CO;2-O](https://doi.org/10.1002/1099-0992(200011/12)30:6<745::AID-EJSP24>3.0.CO;2-O)
- Castelfranchi, C., & Paglieri, F. (2007). The role of beliefs in goal dynamics: Prolegomena to a constructive theory of intentions. *Synthese*, 155(2), 237–263.
<https://doi.org/10.1007/s11229-006-9156-3>
- Chen, Y., & Li, S. X. (2009). Group identity and social preferences. *The American Economic Review*, 99(1), 431–457.
- Connors, M. H., & Halligan, P. W. (2015). A cognitive account of belief: A tentative road map. *Frontiers in Psychology*, 5. <https://doi.org/10.3389/fpsyg.2014.01588>
- Cooper, J. (2019). Cognitive dissonance: Where we've been and where we're going. *International Review of Social Psychology*, 32(1), 7. <https://doi.org/10.5334/irsp.277>
- Drummer, O. H. (2009). Epidemiology and traffic safety: Culpability studies. In J. C. Verster, S. R. Pandi-Perumal, J. G. Ramaekers, & J. J. de Gier (Eds.), *Drugs, Driving and Traffic Safety* (pp. 93–106). Birkhäuser. https://doi.org/10.1007/978-3-7643-9923-8_7
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach* (1 edition). Psychology Press.
- Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Annals of Behavioral Medicine*, 43(1), 101–116. <https://doi.org/10.1007/s12160-011-9308-7>
- Galvin, B. M., Randel, A. E., Collins, B. J., & Johnson, R. E. (2018). Changing the focus of locus (of control): A targeted review of the locus of control literature and agenda for future research. *Journal of Organizational Behavior*, 39(7), 820–833.
<https://doi.org/10.1002/job.2275>
- Gerrard, M., Gibbons, F. X., Houlihan, A. E., Stock, M. L., & Pomery, E. A. (2008). A dual-process approach to health risk decision making: The prototype willingness model. *Developmental Review*, 28(1), 29–61. <https://doi.org/10.1016/j.dr.2007.10.001>
- Grayling, A. C. (2011). How we form beliefs. *Nature*, 474(June), 446–447.
- Grayot, J. D. (2020). Dual process theories in behavioral economics and neuroeconomics: A critical review. *Review of Philosophy and Psychology*, 11(1), 105–136.
<https://doi.org/10.1007/s13164-019-00446-9>
- Gwaltney, C. J., Metrik, J., Kahler, C. W., & Shiffman, S. (2009). Self-efficacy and smoking cessation: A meta-analysis. *Psychology of Addictive Behaviors*, 23(1), 56–66.
<http://dx.doi.org.proxybz.lib.montana.edu/10.1037/a0013529>
- Harmon-Jones, E., Harmon-Jones, C., & Levy, N. (2015). An action-based model of cognitive-dissonance processes. *Current Directions in Psychological Science*, 24(3), 184–189.
<https://doi.org/10.1177/0963721414566449>
- Hooper, N., Erdogan, A., Keen, G., Lawton, K., & McHugh, L. (2015). Perspective taking reduces the fundamental attribution error. *Journal of Contextual Behavioral Science*, 4(2), 69–72. <https://doi.org/10.1016/j.jcbs.2015.02.002>

- Ismagilova, E., Slade, E., Rana, N. P., & Dwivedi, Y. K. (2020). The effect of characteristics of source credibility on consumer behaviour: A meta-analysis. *Journal of Retailing and Consumer Services*, 53, 101736. <https://doi.org/10.1016/j.jretconser.2019.01.005>
- Jang, K., & Baek, Y. M. (2018). How to effectively design public health interventions: Implications from the interaction effects between socioeconomic status and health locus of control beliefs on healthy dietary behaviours among US adults. *Health & Social Care in the Community*, 26(5), 664–674. <https://doi.org/10.1111/hsc.12577>
- Juntunen, M., & Lehenkari, M. (2021). A narrative literature review process for an academic business research thesis. *Studies in Higher Education*, 46(2), 330–342. <https://doi.org/10.1080/03075079.2019.1630813>
- Kahneman, D. (2011). *Thinking fast and slow*. Farrar, Straus and Giroux.
- Kong, Y., & Shen, F. (2011). Impact of locus of control on health message effectiveness. *Health Marketing Quarterly*, 28(4), 354–371. <https://doi.org/10.1080/07359683.2011.623114>
- Lewis, I., Watson, B., Tay, R., & White, K. M. (2007a). The role of fear appeals in improving driver safety: A review of the effectiveness of fear-arousing (threat) appeals in road safety advertising. *International Journal of Behavioral Consultation and Therapy*, 3(2), 203–222.
- Lewis, I. M., Watson, B., White, K. M., & Tay, R. (2007b). Promoting public health messages: Should we move beyond fear-evoking appeals in road safety? *Qualitative Health Research*, 17(1), 61–74. <https://doi.org/10.1177/1049732306296395>
- Lewis, M. A., & Neighbors, C. (2006). Social norms approaches using descriptive drinking norms education: A review of the research on personalized normative feedback. *Journal of American College Health: J of ACH*, 54(4), 213–218.
- Metzger, M. J., Flanagin, A. J., Eyal, K., Lemus, D. R., & Mccann, R. M. (2003). Credibility for the 21st Century: Integrating perspectives on source, message, and media credibility in the contemporary media environment. *Annals of the International Communication Association*, 27(1), 293–335. <https://doi.org/10.1080/23808985.2003.11679029>
- Miao, C., Qian, S., & Ma, D. (2017). The relationship between entrepreneurial self-efficacy and firm performance: A meta-analysis of main and moderator effects*. *Journal of Small Business Management*, 55(1), 87–107. <https://doi.org/10.1111/jsbm.12240>
- Miller, C. H., Lane, L. T., Deatruck, L. M., Young, A. M., & Potts, K. A. (2007). Psychological reactance and promotional health messages: The effects of controlling language, lexical concreteness, and the restoration of freedom. *Human Communication Research*, 33(2), 219–240. <https://doi.org/10.1111/j.1468-2958.2007.00297.x>
- Miller, D. T., & Prentice, D. A. (2016). Changing norms to change behavior. *Annual Review of Psychology*, 67(1), 339–361. <https://doi.org/10.1146/annurev-psych-010814-015013>
- Ng, T. W. H., Sorensen, K. L., & Eby, L. T. (2006). Locus of control at work: A Meta-Analysis. *Journal of Organizational Behavior*, 27(8), 1057–1087.
- Nilsson, N. J. (2014). *Understanding beliefs*. MIT Press.

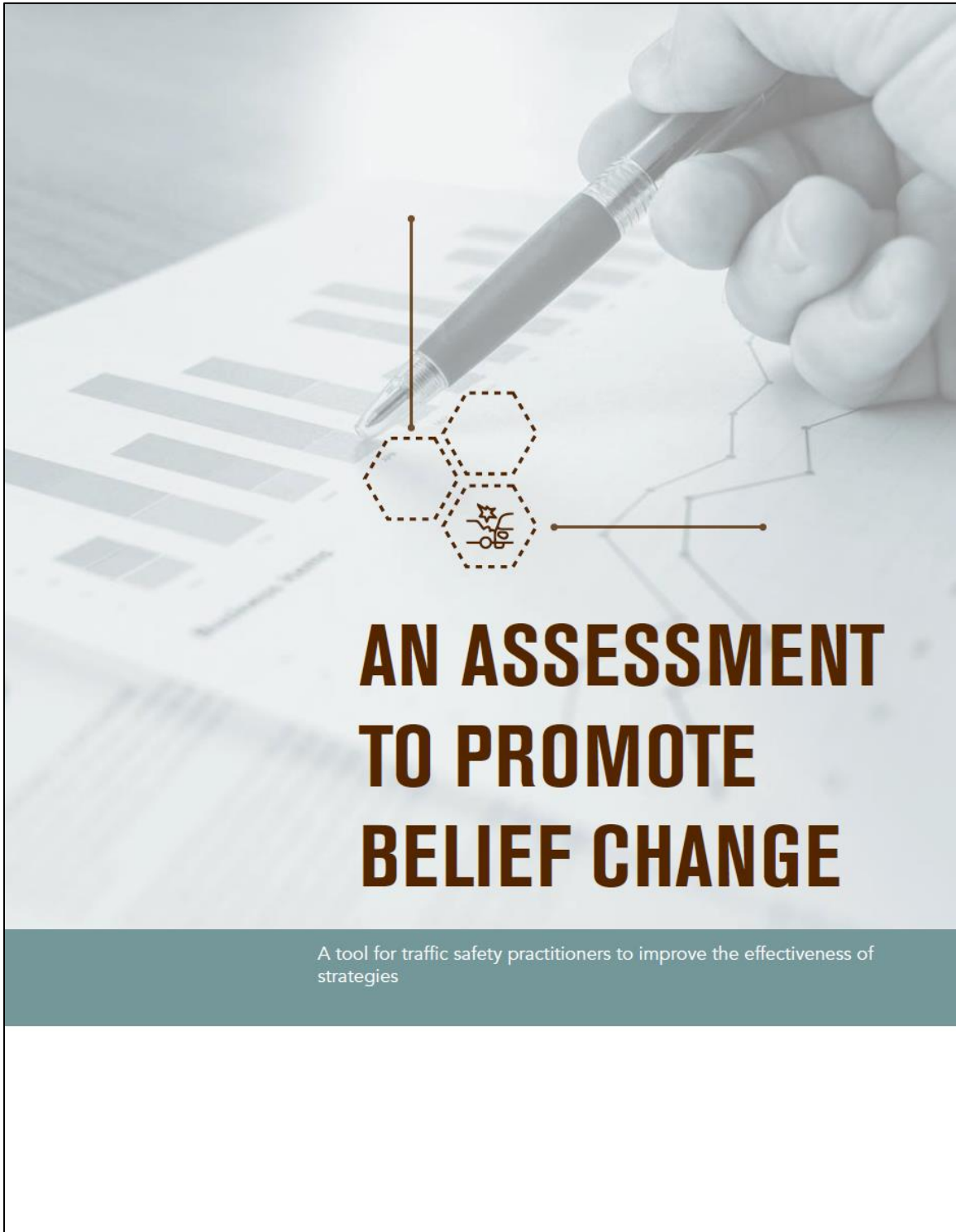
- Norton, M. I., Monin, B., Cooper, J., & Hogg, M. A. (2003). Vicarious dissonance: Attitude change from the inconsistency of others. *Journal of Personality and Social Psychology*, 85(1), 47–62. <https://doi.org/10.1037/0022-3514.85.1.47>
- O’Keefe, D. J., & Jensen, J. D. (2007). The relative persuasiveness of gain-framed loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. *Journal of Health Communication*, 12(7), 623–644. <https://doi.org/10.1080/10810730701615198>
- Oreg, S., & Katz-Gerro, T. (2006). Predicting proenvironmental behavior cross-nationally values, the theory of planned behavior, and value-belief-norm theory. *Environment and Behavior*, 38(4), 462–483. <https://doi.org/10.1177/0013916505286012>
- Petty, R. E., & Briñol, P. (2015). Emotion and persuasion: Cognitive and meta-cognitive processes impact attitudes. *Cognition and Emotion*, 29(1), 1–26. <https://doi.org/10.1080/02699931.2014.967183>
- Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology* (Vol. 19, pp. 123–205). Elsevier. [https://doi.org/10.1016/S0065-2601\(08\)60214-2](https://doi.org/10.1016/S0065-2601(08)60214-2)
- Pornpitakpan, C. (2004). The persuasiveness of source credibility: A critical review of five decades’ evidence. *Journal of Applied Social Psychology*, 34(2), 243–281. <https://doi.org/10.1111/j.1559-1816.2004.tb02547.x>
- Rains, S. A. (2013). The nature of psychological reactance revisited: A meta-analytic review. *Human Communication Research*, 39(1), 47–73. <https://doi.org/10.1111/j.1468-2958.2012.01443.x>
- Rao, Sathyanarayana T. S., Asha, M., Rao, Jagannatha K. S., & Vasudevaraju, P. (2009). The biochemistry of belief. *Indian Journal of Psychiatry*, 51(4), 239. <https://doi.org/10.4103/0019-5545.58285>
- Rhodes, N., Shulman, H. C., & McClaran, N. (2020). Changing norms: A meta-analytic integration of research on social norms appeals. *Human Communication Research*, 46(2–3), 161–191. <https://doi.org/10.1093/hcr/hqz023>
- Ross, L. (1977). The intuitive psychologist and his shortcomings: Distortions in the attribution process. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology*, 10, pp. 173–220. Academic Press. [https://doi.org/10.1016/S0065-2601\(08\)60357-3](https://doi.org/10.1016/S0065-2601(08)60357-3)
- Schwitzgebel, E. (2019). Belief. In *Stanford Encyclopedia of Philosophy*. <https://plato.stanford.edu/archives/fall2019/entries/belief/>
- Seitz, R. J., & Angel, H.-F. (2020). Belief formation – A driving force for brain evolution. *Brain and Cognition*, 140, 105548. <https://doi.org/10.1016/j.bandc.2020.105548>
- Seitz, R. J., Paloutzian, R. F., & Angel, H.-F. (2017). Processes of believing: Where do they come from? What are they good for? *F1000Research*, 5, 2573. <https://doi.org/10.12688/f1000research.9773.2>
- Seitz, R. J., Paloutzian, R. F., & Angel, H.-F. (2018). From believing to belief: A general theoretical model. *Journal of Cognitive Neuroscience*, 30(9), 1254–1264. https://doi.org/10.1162/jocn_a_01292

- Shen, L. (2015). Antecedents to psychological reactance: The impact of threat, message frame, and choice. *Health Communication, 30*(10), 975–985. <https://doi.org/10.1080/10410236.2014.910882>
- Shen, F., Sheer, V. C., & Li, R. (2015). Impact of narratives on persuasion in health communication: A meta-analysis. *Journal of Advertising, 44*(2), 105–113. <https://doi.org/10.1080/00913367.2015.1018467>
- Simpson, J. K. (2017). Appeal to fear in health care: Appropriate or inappropriate? *Chiropractic & Manual Therapies, 25*(1), 27. <https://doi.org/10.1186/s12998-017-0157-8>
- Steffens, N. K., LaRue, C. J., Haslam, C., Walter, Z. C., Cruwys, T., Munt, K. A., Haslam, S. A., Jetten, J., & Tarrant, M. (2021). Social identification-building interventions to improve health: A systematic review and meta-analysis. *Health Psychology Review, 15*(1), 85–112. <https://doi.org/10.1080/17437199.2019.1669481>
- Steindl, C., Jonas, E., Sittenthaler, S., Traut-Mattausch, E., & Greenberg, J. (2015). Understanding psychological reactance: New developments and findings. *Zeitschrift Für Psychologie, 223*(4), 205–214. <https://doi.org/10.1027/2151-2604/a000222>
- Stroth, D. P. (2015). *Systems thinking for social change*. Chelsea Green Publishing.
- Tannenbaum, M. B., Hepler, J., Zimmerman, R. S., Saul, L., Jacobs, S., Wilson, K., & Albarracín, D. (2015). Appealing to fear: A meta-analysis of fear appeal effectiveness and theories. *Psychological Bulletin, 141*(6), 1178–1204. <https://doi.org/10.1037/a0039729>
- Taubman – Ben-Ari, O. (2016). Parents’ perceptions of the Family Climate for Road Safety: Associations with parents’ self-efficacy and attitudes toward accompanied driving, and teens’ driving styles. *Transportation Research Part F: Traffic Psychology and Behaviour, 40*, 14–22. <https://doi.org/10.1016/j.trf.2016.04.006>
- Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology, 5*(2), 207–232. [https://doi.org/10.1016/0010-0285\(73\)90033-9](https://doi.org/10.1016/0010-0285(73)90033-9)
- Walton, G. M., & Cohen, G. L. (2007). A question of belonging: Race, social fit, and achievement. *Journal of Personality and Social Psychology, 92*(1), 82–96. <https://doi.org/10.1037/0022-3514.92.1.82>
- Ward, N., Otto, J., & Finley, K. (2019). *Traffic Safety Culture Primer*. Center for Health and Safety Culture (Montana State University). https://www.mdt.mt.gov/other/webdata/external/research/docs/research_proj/tsc/TSC_PRIMER/PRIMER.pdf
- Weller, S. C., & Baer, R. (2002). Measuring within- and between-group agreement: Identifying the proportion of shared and unique beliefs across samples. *Field Methods, 14*(1), 6–25. <https://doi.org/10.1177/1525822X02014001002>
- Williams-Piehot, P., Schneider, T. R., Pizarro, J., Mowad, L., & Salovey, P. (2007). Matching health messages to health locus of control beliefs for promoting mammography utilization. *Psychology & Health. https://doi.org/10.1080/08870440310001652678*

- Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective p[ublic health campaigns. *Health Education & Behavior*, 27(5), 591–615.
<https://doi.org/10.1177/109019810002700506>
- Zou, X., Tam, K.-P., Morris, M. W., Lee, S., Lau, I. Y.-M., & Chiu, C. (2009). Culture as common sense: Perceived consensus versus personal beliefs as mechanisms of cultural influence. *Journal of Personality and Social Psychology*, 97(4), 579–597.
<https://doi.org/10.1037/a0016399>

7 APPENDIX

7.1 Appendix A – Guidance Document





Prepared by:
Center for Health and Safety Culture
Montana State University
P.O. Box 170548
Bozeman, MT, 59717-0548



Prepared for:
Montana Department of Transportation
2701 Prospect Avenue
P.O. Box 201001
Helena, MT 59620-1001

February 2022

Disclaimer This document is disseminated under the sponsorship of the Montana Department of Transportation (MDT) and the United States Department of Transportation (USDOT) in the interest of information exchange. The State of Montana and the United States assume no liability for the use or misuse of its contents. The contents of this document reflect the views of the authors, who are solely responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the views or official policies of MDT or the USDOT. The State of Montana and the United States do not endorse products of manufacturers. This document does not constitute a standard, specification, policy or regulation.

Printing This document is printed at state expense. Information on the cost of producing this publication may be obtained by contacting the Department of Administration.

Alternative Format MDT attempts to provide accommodations for any known disability that may interfere with a person participating in any service, program, or activity of the Department. Alternative accessible formats of this information will be provided upon request. For further information, call 406/444.7693, TTY 800/335.7592, or Montana Relay at 711

Other Sponsoring Agencies California DOT, Connecticut DOT, Georgia DOT, Idaho Transportation Department, Illinois DOT, Indiana DOT, Iowa DOT, Kansas DOT, Kentucky DOT, Louisiana DOT and Development, Michigan DOT, Minnesota DOT, Mississippi DOT, Nevada DOT, Texas DOT, Utah DOT, Vermont Agency of Transportation, and Washington State DOT

Suggested citation:
Center for Health and Safety Culture (2021). *An Assessment to Promote Belief Change*. Montana Department of Transportation, Helena, MT. Retrieved from: <https://www.mdt.mt.gov/research/projects/trafficsafety.shtml>.

TABLE OF CONTENTS



1 INTRODUCTION

3 ASSESSMENT

5 SUPPORTIVE GUIDANCE

How well does the strategy seek to change specific beliefs that are linked to specific behaviors?	5
How well does the strategy foster slow thinking?	7
How well does the strategy create cognitive dissonance (without shame)?	9
How well does the strategy grow perceived self-efficacy and an internal locus of control?	11
How is emotion used in the strategy?	14
How does the strategy use a narrative?	16
How vivid is the strategy?	17
How credible is the source?	18
To what degree might the strategy evoke psychological reactance?	20
To what degree does the strategy grow misperceptions of normative beliefs or behaviors?	22
To what degree does the strategy stigmatize certain people?	24

26 REFERENCES



INTRODUCTION

WHAT IS THIS GUIDANCE?

This document provides guidance for traffic safety practitioners on ways to improve the effectiveness of strategies seeking to change people's beliefs and behaviors. Strategies may include countermeasures, training programs, media campaigns, and other activities that seek to change people's traffic safety-related behaviors.

This guidance specifically focuses on strategies that seek to address intentional behaviors (like distracted driving, not using a seat belt, driving after drinking, establishing family traffic-safety rules, etc.). These strategies often focus on growing beliefs that support safer behaviors.

Our beliefs are a core aspect of our identity; they define and shape our relationships with others (Boden et al., 2016). Changing beliefs can lead to changes in behaviors. Achieving zero deaths and serious injuries on our roads will require changing behaviors.

1

HOW THIS GUIDANCE CAN HELP YOU

Changing beliefs and behaviors is complex. Some strategies, including media campaigns, are ineffective; some have even been harmful (Hornik et al., 2008; Erceg-Hurn, 2008). This guidance is to help traffic safety practitioners be more effective implementing strategies that change beliefs and behaviors.

This document can also inform the development of new strategies. However, creating strategies that are effective is complex. Therefore, we encourage seeking additional guidance about creating effective strategies.

HOW SHOULD THIS GUIDANCE BE USED?

The guidance includes a one-page assessment with criteria that can be used to review a particular strategy (e.g., countermeasure, training, intervention, campaign) with the goal of revealing opportunities to improve effectiveness. Explanations of each criterion follow the assessment.

The assessment can be completed by an individual or by a group. A group could complete the assessment individually first and then discuss each criterion and develop a better understanding of the strategy and identify ways to improve it.

While it is unlikely that any single strategy will meet all the criteria, keeping all the criteria in mind may lead to more effective strategies and better outcomes. These criteria may also help with selecting or planning future strategies.

Because deploying effective strategies to improve traffic safety is complex and research is always revealing new understanding and opportunities, we also encourage you to review other resources about traffic safety culture at: <https://www.mdt.mt.gov/research/projects/trafficsafety.shtml>.

In particular, there is a resource to bolster evaluating traffic safety culture strategies that guides practitioners through ideas about evaluative thinking as a way to improve strategies over time (see https://www.mdt.mt.gov/other/webdata/external/research/docs/research_proj/tsc/EVALUATION/GUIDANCE.pdf).

2



ASSESSMENT

INSTRUCTIONS

- Consider one specific strategy (e.g., countermeasure, training, intervention, campaign). If working with a group, make sure the strategy is clearly defined so everyone is thinking about the same strategy.
- Rate how well the strategy meets each criterion. See the pages following this assessment for more information. It is okay to say, "I do not know." Briefly add some notes about why you gave it the rating. If in a group, work independently first so each person can come up with their own opinion before sharing as a group.
- As appropriate, identify ways to improve the strategy based on the guidance.

3

CRITERIA	RATING (low, medium, high)
1. How well does the strategy seek to change specific beliefs that are linked to specific behaviors? Why did you rate it this way?	
2. How well does the strategy foster slow thinking? Why did you rate it this way?	
3. How well does the strategy create cognitive dissonance (without shame)? Why did you rate it this way?	
4. How well does the strategy grow perceived self-efficacy? Why did you rate it this way?	
5. How is emotion used in the strategy? Why did you rate it this way?	
6. How does the strategy use a narrative? Why did you rate it this way?	
7. How vivid is the strategy? Why did you rate it this way?	
8. How credible is the source? Why did you rate it this way?	
9. To what degree might the strategy evoke psychological reactance? Why did you rate it this way?	
10. To what degree does the strategy grow misperceptions of normative beliefs or behaviors? Why did you rate it this way?	
11. To what degree does the strategy stigmatize certain people? Why did you rate it this way?	

IDEAS FOR IMPROVEMENTS

SUPPORTIVE GUIDANCE

HOW WELL DOES THE STRATEGY SEEK TO CHANGE SPECIFIC BELIEFS THAT ARE LINKED TO SPECIFIC BEHAVIORS?

BACKGROUND

Research has revealed a relationship between beliefs and deliberate behaviors (Fishbein & Ajzen, 2010; Gerrard et al., 2008; Oreg & Katz-Gerro, 2006). Various behavioral models have identified different kinds of beliefs including:

- Values
 - Ideals to which we aspire that define the goals for our behavioral choices and direct the formation of our belief systems (e.g., “I must protect my family,” “I desire a life without stress”).
- Behavioral Beliefs
 - Expectations about the physical and social consequences of a behavior (e.g., “If I speed, I will likely get an expensive fine,” “If I drink and drive, my friends will exclude me,” “If I text and drive, I may hit a vehicle or pedestrian”).
- Normative Beliefs
 - Beliefs about what behaviors are most common in a group (e.g., “All my friends speed”) and what important people in that group expect (e.g., “My family expects me to wear a seat belt”).
- Control Beliefs
 - Beliefs about an individual’s ability to engage or not engage in the behavior based on factors that are either internal or external to oneself (e.g., “Crashes are determined by fate,” “I am comfortable not speeding even if everyone around me is,” “I am comfortable asking someone else to use a seat belt”).

5

WHY THIS MATTERS

Strategies seeking to change behavior are more effective (and sustained) when they change specific beliefs associated with the behavior. Understanding what beliefs to change and then making sure the strategy addresses these beliefs increases outcomes.

SUGGESTIONS / EXAMPLES

- High visibility enforcement seeks to reduce risky behaviors by increasing people’s perceptions that they will get caught if they engage in the risky behavior. The perception of getting caught is a behavioral belief (i.e., a negative consequence from engaging in a behavior). It is critical to recognize that this is different than just trying to catch people who are engaging in the risky behavior. High visibility enforcement is about increasing the perception of getting caught among a large portion of the population – a much larger portion of the population than will actually be arrested or cited by the enforcement effort.
- Efforts to decrease distracted driving may seek to increase the perception that people who drive distracted are more likely to crash (a behavioral belief). Other beliefs that could be addressed include the perception of whether it is acceptable to drive distracted or that most people don’t drive distracted (normative beliefs). Furthermore, strategies could seek to enhance people’s sense of awareness to choose not to drive distracted – for example by clarifying that it is okay not to answer your cell phone while driving if a family member calls (control beliefs).
- For any strategy, ask the following questions:
 - What beliefs is this strategy trying to change?
 - How do we know that changing these beliefs will result in changes in behaviors?
 - How effective is this strategy at changing these beliefs?

HOW WELL DOES THE STRATEGY FOSTER SLOW THINKING?

BACKGROUND

Humans process information from the environment using two distinct modes of thinking— sometimes referred to as “fast” and “slow” thinking (Grayot, 2020). These two modes differ in the amount of mental effort used and level of scrutiny applied to the processed information (Kahneman, 2011).

Fast thinking is characterized as “reactive, automatic, intuitive, heuristic, associative, and preconscious” (Grayot, 2020, p. 112). Fast thinking is fast because it uses little or no mental effort to quickly (in milliseconds) provide just an impression of the information. In some cases, this impression is based on the emotional content of the information or familiarity based on past experiences.

In contrast, slow thinking is characterized as “controlled, reflective, serial, rule-based, and conscious” (Grayot, 2020, p. 112). Slow thinking is slow because processing requires greater mental effort to provide a more detailed analysis of the information, which requires significantly more time than fast thinking.

Humans try to avoid mental effort. If possible, we rely on fast thinking, which may provide sufficiently accurate beliefs that are also emotionally satisfying (Grayot, 2020; Kahneman, 2011).

However, because of the low effort and superficial analysis of fast thinking, we can be misled or make mistakes (Boden et al., 2016; Cooper, 2019). Furthermore, fast thinking is occurring all the time and often without our awareness.

When fast thinking leads to unexpected or adverse outcomes, our awareness may shift us to slow thinking to review and revise our beliefs so that they more accurately represent reality (Grayot, 2020; Harmon-Jones et al., 2015).

People have to be motivated and have the ability to process information in order to shift into slow thinking and change their beliefs. Without motivation, people will not expend the effort to reflect on their beliefs. The ability to engage in slow thinking requires not being distracted by other thoughts, having enough existing knowledge to make meaning of the new information, and being able to comprehend whatever is seeking to cause the change (Petty & Cacioppo, 1986).

7

WHY THIS MATTERS

Many strategies are designed to change people's beliefs as a way to change their behaviors. For example, a media campaign may seek to convince people that not using a seat belt increases the likelihood of being ejected from a vehicle in a crash and seriously injured or killed.

Changing existing beliefs requires slow thinking. In other words, people need to pause and reflect in order to change their existing beliefs.

Strategies that do not shift people into slow thinking may be less effective at changing beliefs.

SUGGESTIONS / EXAMPLES

- Strategies that foster conversations are more likely to shift people into slow thinking. These may be conversations that people have with others, but they also could be conversations that people have with themselves (i.e., reflecting internally). Conversations could be triggered by questions or could be facilitated by the strategy itself. For example, strategies like workplace trainings can include opportunities for people to talk with others about a question focusing on important beliefs or to take a moment and reflect on their own beliefs and behaviors.
- Slow thinking takes time. Creating time for people to reflect is important.
- Changing beliefs may not happen quickly. Therefore, repetition over time is important.
- Strategies need to motivate people to engage in slow thinking. Motivation could include underlying values like wanting to be safe or caring about friends or family.
- Strategies that trigger psychological reactance may inhibit slow thinking about beliefs about the desired behavior, are less likely to result in belief change, and may make existing beliefs less likely to change and existing risky behaviors worse. See "Does the strategy evoke psychological reactance?" for more information (page 20).

HOW WELL DOES THE STRATEGY CREATE COGNITIVE DISSONANCE (WITHOUT SHAME)?

BACKGROUND

Often what leads to changes in beliefs is cognitive dissonance. Cognitive dissonance is a state of emotional discomfort resulting from our awareness that we have a belief that is inconsistent with other beliefs important to us or our behaviors (Cooper, 2019; Harmon-Jones et al., 2015).

Our awareness of this inconsistency may come as a result of an adverse outcome of a (freely chosen) behavior that was based on the belief. For example, a driver who values safety and believes they can drive safely while texting is involved in a crash while texting. They are upset because their belief that they can drive safely while texting is inconsistent with the experience of being in a crash. In such cases, we are motivated to change one or more beliefs to remove the perceived contradiction.

Inconsistency among beliefs may reduce our sense of being in control, which will result in cognitive dissonance. This dissonance motivates us to adjust our beliefs to become more internally consistent, especially in relation to our sense of being in control. We can do this by changing the inconsistent belief (in the previous example, the driver now believes texting while driving may be dangerous) or by adopting a belief that explains away the apparent contradiction (in the previous example, the driver believes the crash was just “bad luck”).

For example, consider a person who has decided that it is dangerous to drive under the influence of alcohol. Now imagine this person is in a situation where they believe they have to make a short drive home after drinking at a restaurant. In this case, the belief that it is dangerous to drive under the influence of alcohol is inconsistent with the behavior of driving after drinking. After the fact, the behavior cannot be changed.

To reduce the apparent inconsistency, the person might change contradicting beliefs (“A small amount of alcohol is not enough to impair me”) or might adopt new beliefs to reduce the contradiction (“There is very little danger from driving such a short

9

distance on a route I know very well"). A safer response might be to reconnect with values about safety, avoid shameful thinking, and instead recommit to engaging in safer behaviors in the future (like planning alternative ways to get home that do not require driving or choosing not to drink when driving).

WHY THIS MATTERS

Using a strategy to create cognitive dissonance may be an effective way to shift a person into slow thinking and facilitate changes in their beliefs.

However, raising cognitive dissonance has to be done carefully. Highlighting how certain behaviors contradict core values could elicit shame and trigger defensiveness or denial, which reduce the chances of belief change.

SUGGESTIONS / EXAMPLES

- Getting people to think about what matters to them (i.e., their values) while considering a risky behavior may generate cognitive dissonance. For example, getting people to think about their children and what it would be like for their family if they (themselves) were injured or killed may trigger cognitive dissonance as they reflect on not using a seat belt.
- Using questions can foster cognitive dissonance. For example, workplaces often consider safety as an important value. Asking a question like "How does this action, for which there are safety concerns, align with our organization's value of safety?" may foster important conversations and subsequent changes.

HOW WELL DOES THE STRATEGY GROW PERCEIVED SELF-EFFICACY AND AN INTERNAL LOCUS OF CONTROL?

BACKGROUND

Perceived self-efficacy includes people's beliefs about their skills, abilities, and capabilities to perform in specific situations. Research on self-efficacy suggests that what we think we can do (as opposed to what we are actually capable of) has important implications and influence on a wide range of behaviors (Bandura, 1982; Bauman et al., 2012; Gwaltney et al., 2009; Miao et al., 2017; Taubman – Ben-Ari, 2016). For example, if a person is confident that they can ask someone else to use a seat belt, they are more likely to intervene than if they lack confidence.

Information that strengthens an individual's perception of self-efficacy can influence behavior change (Bandura, 1982). For example, strategies that show people how to do a behavior by seeing others model the behavior can increase beliefs of efficacy (Bandura, 1982). Similarly, strategies that are encouraging (i.e., "You can do it," "I believe you are capable," etc.) can bolster beliefs of efficacy to engage in a behavior (Bandura, 1982, 1993).

Locus of control refers to people's beliefs about how much control they have over the outcomes they experience. Perceptions that one's own behavior and personal attributes drive outcomes are referred to as an internal locus of control. Perceptions that external conditions outside of oneself drive outcomes are referred to as an external locus of control (Galvin et al., 2018). People with an external locus of control often attribute outcomes to luck or powerful others (Jang & Baek, 2018).

Locus of control should be considered when strategies seek to influence beliefs related to behavior (Kong & Shen, 2011). Strategies that provide specific skills and knowledge may enhance an internal locus of control (Jang & Baek, 2018) and increase an individual's sense of responsibility. Likewise, strategies that emphasize individual autonomy and individual responsibility ("It's up to you") may result in more favorable attitudes toward the strategy among those with an internal locus of control (Jang & Baek, 2018; Kong & Shen, 2011; Williams-Piehota et al., 2007).

11

Traffic safety strategies that emphasize personal autonomy and grow skills about how to engage in a specific traffic safety behavior may be more suited to those with an internal locus of control. Strategies that offer advice, make recommendations, or encourage a specific behavior from well-known messengers may influence those with a more external locus of control (Jang & Baek, 2018; Williams-Piehota et al., 2007).

Strategies that invoke a sense of social-responsibility (like engaging in a behavior for the sake of others) may produce more favorable attitudes among individuals with an external locus of control (Kong & Shen, 2011).

WHY THIS MATTERS

Growing perceived self-efficacy and an internal locus of control increases the likelihood that individuals will engage in behaviors to improve traffic safety.

We need to grow many different behaviors to achieve zero deaths and serious injuries on our roads. Examples include planning to avoid driving after drinking, establishing family rules about safe driving, establishing workplace policies and conducting training on those policies, and many more. Growing these kinds of behaviors may benefit from growing perceived self-efficacy and an internal locus of control.

SUGGESTIONS / EXAMPLES

- Strategies can take steps to grow perceived self-efficacy and an internal locus of control. Even messages in media campaigns can influence perceived self-efficacy by showing examples and modeling desired behaviors.
- Using language that seeks to empower people like “We can do this” or “It’s up to you” can help bolster perceived self-efficacy and an internal locus of control.
- Consider whether the strategy includes guidance on how to do something (not just why or what to do).
- While sometimes awkward, practicing makes a big difference in whether people actually engage in a behavior. Strategies that create time for people to practice a new behavior (even in simulated environment like a training room) will increase people’s perceived self-efficacy (and the likelihood that they will engage in the behavior in the future).
- People learn from seeing other people engage in certain behaviors. Consider ways to encourage modeling even after a specific strategy. For example, having supervisors model desired behaviors like intervening to ask others to use a seat belt or not drive distracted will increase the chances that other employees will engage in the same behaviors.

HOW IS EMOTION USED IN THE STRATEGY?

BACKGROUND

Emotions vary by pleasantness or unpleasantness. For example, happiness is a pleasant and desirable emotion; fear is unpleasant and undesirable.

The emotional state of the person receiving information can influence how that information is processed (Petty & Briñol, 2015). Sometimes, people will associate an emotion with the information. The emotion can then influence how the information is perceived and if it is accepted. For example, a person who is currently fearful may automatically feel disagreeable toward the information and reject it.

WHY THIS MATTERS

Understanding the role of emotions in belief change is important. Some strategies used to change beliefs evoke fear by portraying the negative consequences of the behavior. This may negatively impact the effectiveness of the strategy.

Fear-based messages can have several undesired effects including denial of the issue communicated by the message (Simpson, 2017). Traffic safety researchers have stated that “while fear arousal appears important for attracting attention, its contribution to behavior change appears less critical than other factors, such as perceptions of vulnerability and effective coping strategies” (Lewis et al., 2007a, p. 203). Thus, it is important to explore the use of emotions like hope and joy in messaging strategies to change beliefs (Lewis et al., 2007b).

Strategies can evoke more than one emotion. For example, strategies could evoke a sense of concern and a sense of confidence (or perceived self-efficacy) to take steps to alleviate the sense of concern.

SUGGESTIONS / EXAMPLES

- Ask a variety of people what emotions a strategy evokes; be aware that emotions may vary with different people.
- If the strategy does not evoke any emotions, consider what could be done to evoke emotion. Strategies that do not evoke any emotions may not engage people.
- Strategies can evoke emotions by raising concern and connecting that concern to people's values. For example, most people value their safety and the safety of others. Connecting with these values and then discussing certain behaviors that challenge these values can evoke emotions of concern.
- Be careful about going too far. Some people will push back against strong emotional appeals as they may feel they are being manipulated.
- Evoking overwhelming sadness can be too traumatic for some people and can cause harm.

HOW DOES THE STRATEGY USE A NARRATIVE?

BACKGROUND

A narrative is a form of story that immerses us in an experience and gives context to information that may include facts or arguments to support belief change (Shen et al., 2015).

Examples of narratives include personal stories, anecdotes, testimonials, and contextual accounts of events. Narratives are a typical form of communication among people in groups and may therefore feel natural to both the teller and the listener.

WHY THIS MATTERS

Using narratives in public health strategies to change beliefs and behaviors has a “small but significant effect” (Shen et al., 2015, p. 108). The effectiveness of narratives is greater when delivered by audio or video than by text, as aural and visual communication are more likely to elicit emotions connected to the narrative.

Narratives may be more effective for increasing protective behaviors than reducing harmful behaviors.

SUGGESTIONS / EXAMPLES

- Not all strategies can use narratives, but many can. Consider ways to include a story or something personal that makes the information more relevant and about the people participating in the strategy.
- For example, workplace training can be introduced by a leader who tells a personal story about why safety is important or how they have engaged in certain behaviors to improve safety.
- Media messages can use local voices telling personal stories that particularly resonate with a community.
- Strategies can encourage participants to share stories. For example, parents can talk to their children about their own experiences involving traffic safety and why they have decided to take protective steps like using a seat belt.
- Be cautious about using stories of individuals who engaged in a risky behavior and wished they had made different choices. These stories can inadvertently normalize engaging in risky behaviors.

HOW VIVID IS THE STRATEGY?

BACKGROUND

Vividness has been defined as a quality of communicated information that attracts attention, evokes emotions, and provokes imagination.

Vividness increases the recall of memories that can help make meaning of a message but only when the form of vividness creates positive emotions that elicit positive thoughts. For example, a narrative based on a “concrete” testimonial is more vivid than an “abstract” story (Blondé & Girandola, 2016).

WHY THIS MATTERS

Strategies to change beliefs need to attract attention and provoke thinking (i.e., shift to slow thinking). Increasing the vividness of strategies can increase effectiveness in changing beliefs (Blondé & Girandola, 2016).

SUGGESTIONS / EXAMPLES

- Consider ways to make strategies more vivid.
 - Connect to important values like safety or caring for others
 - Use beautiful images or powerful voices in media
 - Use stories to create an image in people’s minds
 - Create situations where people can really focus by removing other distractions (this might be asking people to put away their phones during a training)
- Avoid going too far and using too much emotion or trying too hard to attract attention as this may have the opposite effect and turn people away.
- Avoid sacrificing clarity or focus on critical beliefs for beauty. For example, an advertisement that is beautiful but people have no idea what it is about is not effective.

HOW CREDIBLE IS THE SOURCE?

BACKGROUND

Credibility of the source of the strategy is influenced by the trustworthiness of the source, the perceived expertise (in the topic area) of the source, and whether the source is viewed as similar to the audience (i.e., shares attitudes, values, preferences, and demographic characteristics) (Ismagilova et al., 2020; Metzger et al., 2003).

Factors associated with the source of the information and the information itself influence credibility (Metzger et al., 2003). Sources considered highly credible are likely to be more persuasive than sources that are perceived to be of low credibility (Pornpitakpan, 2004).

Credibility is also influenced by factors associated with the information itself. The structure, content, and delivery of the information influence perceptions of credibility (Metzger et al., 2003). For example, how information is conveyed, organized, and whether it flows logically affect perceptions of credibility (Metzger et al., 2003).

Further, the content of the information, how interesting it is to the audience, and its perceived validity influence credibility (Metzger et al., 2003). Using opinionated language decreases credibility compared to information that uses less intense language (Metzger et al., 2003).

Information that is familiar, closely aligned, or that supports the views of the audience is more credible than information that has discrepancies (Metzger et al., 2003).

Finally, the way in which information is delivered, including how hesitant or assertive the communication style, influences perceptions of credibility (Metzger et al., 2003).

WHY THIS MATTERS

Perceptions about credibility have important implications for changing beliefs and influencing behavior (Ismagilova et al., 2020). Strategies with low credibility are less effective than strategies with high credibility.

18

SUGGESTIONS / EXAMPLES

- Perceived credibility of sources may vary with different audiences. You may need to test which sources are considered most credible among the audiences you are trying to reach.
- Sometimes, those leading health and safety efforts spend time establishing their credibility first before trying to change people's beliefs or behaviors.
- Communicating about shared values and the "why" behind the strategy can help bolster credibility. If people perceive that someone is trying to get them to change their beliefs or behaviors just to exert power or control or for other reasons not associated with health and safety, they may not trust the source and reject the effort. For example, explicitly talking about the value of safety and why safety is important at the beginning can connect with shared values and bolster a sense of trust.
- Sometimes, using local people or people in certain roles can increase perceived credibility. For example, many people trust their local healthcare provider for health-related information more than they would trust an advertisement or something they hear in the news.

TO WHAT DEGREE MIGHT THE STRATEGY EVOKE PSYCHOLOGICAL REACTANCE?

BACKGROUND

When people perceive that being persuaded to do something (e.g., through a message) threatens their freedom, they may experience psychological reactance. Psychological reactance is “an unpleasant motivational arousal that emerges when people experience a threat to or loss of their free behaviors” (Steindl et al., 2015, p. 205). Psychological reactance often shows up as anger or counterarguing (Rains, 2013).

The use of strong, directive, or controlling language like “you must” or “you should” can increase psychological reactance (Miller et al., 2007; Shen, 2015).

WHY THIS MATTERS

When strategies elicit psychological reactance, they may motivate the person to do the opposite of what the strategy intended (Brehm & Brehm, 1981). For example, a strong statement like “You must always use a seat belt” may cause some people to refuse to use one.

Further, language framed as a loss can elicit stronger psychological reactance than messages using a gain frame (Shen, 2015). For example, “You must always use a seat belt, or you will lose the right to drive” may elicit even more reactance.

SUGGESTIONS / EXAMPLES

- Some people are more prone to psychological reactance than others. Language that you feel is not threatening may be received very differently by others. Therefore, it is important to ask people about their reactions to a strategy.
- Using questions rather than statements can quiet psychological reactance. For example, instead of saying, "You must always use a seat belt," one could ask "Who in your life would want you to use a seat belt?"
- Certain sources may evoke more psychological reactance than others. For example, using law enforcement officers to promote traffic safety may evoke more psychological reactance than using healthcare providers.
- Learn more about navigating psychological reactance by taking training on Motivational Interviewing. Motivational Interviewing is a technique whereby you seek to identify what motivates someone else to change (instead of assuming what motivates them). It is specifically designed to reduce psychological reactance.
- See "Guidance on Messaging to Avoid Reactance and Address Moral Disengagement" for more about messaging to minimize psychological reactance in relation to seat belt use and aggressive driving at: <https://www.mdt.mt.gov/research/projects/trafficsafety-reactance.shtml>

TO WHAT DEGREE DOES THE STRATEGY GROW MISPERCEPTIONS OF NORMATIVE BELIEFS OR BEHAVIORS?

BACKGROUND

Extensive studies have explored the relationship between normative beliefs and behavior. Normative beliefs include perceptions about what behaviors are most common in a group (e.g., “All my friends speed”) and what important people in that group expect (e.g., “My family expects me to wear a seat belt”).

People typically want to behave in ways that are considered normal and acceptable (Rhodes et al., 2020). However, people often misperceive the norms of their peers, and these misperceptions can lead people to align their behaviors with the misperceived norms (Amialchuk et al., 2019). For example, if a person thinks most people speed, they may be more likely to speed themselves. Or, if a person believes their supervisor thinks it is okay to use a cell phone while driving, they may be more likely to use a cell phone while driving.

WHY THIS MATTERS

Strategies to prevent risky behaviors (like speeding or using a cell phone while driving) can inadvertently increase the perception that such behaviors are common. Increasing the perception that risky behaviors are common (or acceptable) can increase their prevalence.

SUGGESTIONS / EXAMPLES

- Check strategies to see if they may inadvertently create the perception that a risky behavior is more common than it is.
- Add language to strategies that clarifies existing positive, healthy norms while still raising concern. For example, instead of saying, “We have a culture in our community that people do not care about traffic safety and don’t use seat belts,” say, “While the majority of people in our community use seat belts, we still have too many people who are not.”
- Stating existing positive, healthy norms can bolster the sense of perceived self-efficacy and give people hope that the issue can be addressed. For example, “Many workplaces in our community are establishing policies that do not allow use of cell phones while driving for work. If you would like information about how your workplace can join the effort, please contact...”
- During a heightened enforcement effort, law enforcement leaders can say, “While most drivers in our community never drive after drinking, we still experience too many alcohol-related crashes. We are taking extra steps this weekend to stop drinking and driving.”

TO WHAT DEGREE DOES THE STRATEGY STIGMATIZE CERTAIN PEOPLE?

BACKGROUND

Stigma is defined as “a strong feeling of disapproval that most people in a society have about something” (Cambridge University Press, 2021). Stigma includes a collection of attitudes, beliefs, behaviors, and structures that interact at different levels of society, at the individual level, in groups, in organizations, and various public systems (National Academies of Sciences, Engineering, and Medicine, 2016). Stigma is associated with a variety of negative social and health outcomes (National Academies of Sciences, Engineering, and Medicine, 2016; Livingston & Body, 2010; Pattyn et al., 2014).

For example, it is widely known that alcohol-impaired driving is unacceptable. There is strong societal disapproval (stigma) associated with engaging in this risky driving behavior and as a result, a person who is arrested for alcohol-impaired driving may feel stigmatized.

Research suggests that there is a connection between impaired driving and having a substance use disorder (Roberts et al., 2019). Getting adequate treatment for a substance use disorder can lead to reductions in impaired driving behavior (Cheng et al., 2021). However, because of stigma, people may be reluctant to ask for help or get the help they need (Pattyn et al., 2014).

WHY THIS MATTERS

Understanding what stigma is and how it shows up is important in efforts to change beliefs. Stigma can ultimately make behavior change less likely to occur. Some strategies may highlight the strong disapproval of risky driving behaviors by portraying a person who has engaged in such behaviors as bad, immoral, or unworthy.

However, the unintended consequences of such strategies may elicit shame and guilt, reduce self-efficacy, and reduce hope that behavior change can occur. Stigma can inhibit the change that is needed to improve traffic safety.

SUGGESTIONS / EXAMPLES

- The language we use to describe people and their behaviors is important and can reduce stigma or inadvertently increase stigma (SAMHSA, 2017). Consider focusing on behaviors instead of people.
- The national advocacy group MADD changed their name several years ago from “Mothers Against Drunk Drivers” to “Mothers Against Drunk Driving.” Their intention was to focus on the behavior.
- Consider questions such as
 - o “How might stigma inadvertently be promoted in this strategy?”
 - o “How could the language be more inclusive and less stigmatizing?” (Finley et al., 2019, p. 324).



REFERENCES

- Amialchuk, A., Ajilore, O., & Egan, K. (2019). The influence of misperceptions about social norms on substance use school-aged adolescents. *Health Economics*, 28(6), 736–747. <https://doi.org/10.1002/hec.3878>
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, 37(2), 122–147. <http://dx.doi.org.proxybz.lib.montana.edu/10.1037/0003-066X.37.2.122>
- Bandura, A. (1993). Perceived Self-Efficacy in Cognitive Development and Functioning. *Educational Psychologist*, 28(2), 117–148. https://doi.org/10.1207/s15326985ep2802_3
- Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J. F., & Martin, B. W. (2012). Physical Activity 2: Correlates of physical activity: why are some people physically active and others not? *The Lancet*, 380(9838), 258–271.
- Blondé, J., & Girandola, F. (2016). Revealing the elusive effects of vividness: A meta-analysis of empirical evidences assessing the effect of vividness on persuasion. *Social Influence*, 11(2), 111–129. <https://doi.org/10.1080/15534510.2016.1157096>
- Boden, M. T., Berenbaum, H., & Gross, J. J. (2016). Why Do People Believe What They Do? A Functionalist Perspective. *Review of General Psychology*, 20(4), 399–411. <https://doi.org/10.1037/gpr0000085>
- Brehm, S. S., & Brehm, J. W. (1981). *Psychological Reactance: A Theory of Freedom and Control*. Academic Press. <https://www.elsevier.com/books/psychological-reactance/brehm/978-0-12-129840-1>
- Cambridge University Press. (2021). Stigma. Retrieved from <https://dictionary.cambridge.org/dictionary/english/stigma>
- Cheng, W.-J., Chen, L.-Y., Fang, S.-C., Chang, H.-M., Yang, T.-W., Chang, R.-C., Hsing, T.-C., & Huang, M.-C. (2021). Examining factors associated with postintervention recidivism in DUI repeat offenders after alcohol treatment: One-year follow-up study. *Journal of Substance Abuse Treatment*, 130, 108426. <https://doi.org/10.1016/j.jsat.2021.108426>
- Cooper, J. (2019). Cognitive Dissonance: Where We've Been and Where We're Going. *International Review of Social Psychology*, 32(1), 7. <https://doi.org/10.5334/irsp.277>
- Erceg-Hurn, D. M. (2008). Drugs, money, and graphic ads: A critical review of the Montana Meth Project. *Prevention Science: The Official Journal of the Society for Prevention Research*, 9(4), 256–263. <https://doi.org/10.1007/s11121-008-0098-5>
- Finley, K., Otto, J., & Ward, N. (2019). Epilogue. In N. Ward, B. Watson, & K. Fleming-Vogl (Eds.). (2019). *Traffic Safety Culture: Definition, Foundation and Application*. (pp. 321-328). UK: Emerald Publishing
- Fishbein, M., & Ajzen, I. (2010). *Predicting and Changing Behavior: The Reasoned Action Approach* (1st edition). Psychology Press.
- Galvin, B. M., Randel, A. E., Collins, B. J., & Johnson, R. E. (2018). Changing the focus of locus (of control): A targeted review of the locus of control literature and agenda for future research. *Journal of Organizational Behavior*, 39(7), 820–833. <https://doi.org/10.1002/job.2275>
- Gerrard, M., Gibbons, F. X., Houlihan, A. E., Stock, M. L., & Pomeroy, E. A. (2008). A dual-process approach to health risk decision making: The prototype willingness model. *Developmental Review*, 28(1), 29–61. <https://doi.org/10.1016/j.dr.2007.10.001>
- Grayot, J. D. (2020). Dual Process Theories in Behavioral Economics and Neuroeconomics: A Critical Review. *Review of Philosophy and Psychology*, 11(1), 105–136. <https://doi.org/10.1007/s13164-019-00446-9>
- Gwaltney, C. J., Metrik, J., Kahler, C. W., & Shiffman, S. (2009). Self-efficacy and smoking cessation: A meta-analysis. *Psychology of Addictive Behaviors*, 23(1), 56–66. <http://dx.doi.org.proxybz.lib.montana.edu/10.1037/a0013529>

- Harmon-Jones, E., Harmon-Jones, C., & Levy, N. (2015). An Action-Based Model of Cognitive-Dissonance Processes. *Current Directions in Psychological Science*, 24(3), 184–189. <https://doi.org/10.1177/0963721414566449>
- Hornik, R., Jacobsohn, L., Orwin, R., Piesse, A., & Kalton, G. (2008). Effects of the National Youth Anti-Drug Media Campaign on Youths. *American Journal of Public Health*, 98(12), 2229–2236. <https://doi.org/10.2105/AJPH.2007.125849>
- Ismagilova, E., Slade, E., Rana, N. P., & Dwivedi, Y. K. (2020). The effect of characteristics of source credibility on consumer behaviour: A meta-analysis. *Journal of Retailing and Consumer Services*, 53, 101736. <https://doi.org/10.1016/j.jretconser.2019.01.005>
- Jang, K., & Baek, Y. M. (2018). How to effectively design public health interventions: Implications from the interaction effects between socioeconomic status and health locus of control beliefs on healthy dietary behaviours among US adults. *Health & Social Care in the Community*, 26(5), 664–674. <https://doi.org/10.1111/hsc.12577>
- Juntunen, M., & Lehenkari, M. (2021). A narrative literature review process for an academic business research thesis. *Studies in Higher Education*, 46(2), 330–342. <https://doi.org/10.1080/03075079.2019.1630813>
- Kahneman, D. (2011). *Thinking, Fast and Slow* (1st edition). Farrar, Straus and Giroux.
- Kong, Y., & Shen, F. (2011). Impact of Locus of Control on Health Message Effectiveness. *Health Marketing Quarterly*, 28(4), 354–371. <https://doi.org/10.1080/07359683.2011.623114>
- Lewis, I., Watson, B., Tay, R., & White, K. M. (2007a). The Role of Fear Appeals in Improving Driver Safety: A Review of the Effectiveness of Fear-Arousing (Threat) Appeals in Road Safety Advertising. *International Journal of Behavioral Consultation and Therapy*, 3(2), 203–222.
- Lewis, I. M., Watson, B., White, K. M., & Tay, R. (2007b). Promoting public health messages: Should we move beyond fear-evoking appeals in road safety? *Qualitative Health Research*, 17(1), 61–74. <https://doi.org/10.1177/1049732306296395>
- Livingston, J. D., & Boyd, J. E. (2010). Correlates and consequences of internalized stigma for people living with mental illness: a systematic review and meta-analysis. *Social Science & Medicine* (1982), 71(12), 2150–2161. <https://doi.org/10.1016/j.socscimed.2010.09.030>
- Metzger, M. J., Flanagin, A. J., Eyal, K., Lemus, D. R., & Mccann, R. M. (2003). Credibility for the 21st Century: Integrating Perspectives on Source, Message, and Media Credibility in the Contemporary Media Environment. *Annals of the International Communication Association*, 27(1), 293–335. <https://doi.org/10.1080/23808985.2003.11679029>
- Miao, C., Qian, S., & Ma, D. (2017). The Relationship between Entrepreneurial Self-Efficacy and Firm Performance: A Meta-Analysis of Main and Moderator Effects*. *Journal of Small Business Management*, 55(1), 87–107. <https://doi.org/10.1111/jsbm.12240>
- Miller, C. H., Lane, L. T., Deatrick, L. M., Young, A. M., & Potts, K. A. (2007). Psychological Reactance and Promotional Health Messages: The Effects of Controlling Language, Lexical Concreteness, and the Restoration of Freedom. *Human Communication Research*, 33(2), 219–240. <https://doi.org/10.1111/j.1468-2958.2007.00297.x>
- National Academies of Sciences, Engineering, and Medicine. (2016). *Ending Discrimination Against People with Mental and Substance Use Disorders: The Evidence for Stigma Change*. Washington, D.C.: National Academies Press.
- Oreg, S., & Katz-Gerro, T. (2006). Predicting Proenvironmental Behavior Cross-Nationally Values, the Theory of Planned Behavior, and Value-Belief-Norm Theory. *Environment and Behavior*, 38(4), 462–483. <https://doi.org/10.1177/0013916505286012>
- Pattyn, E., Verhaeghe, M., Sercu, C., & Bracke, P. (2014). Public stigma and self-stigma: differential association with attitudes toward formal and informal help seeking. *Psychiatric Services (Washington, D.C.)*, 65(2), 232–238. <https://doi.org/10.1176/appi.ps.201200561>

- Petty, R. E., & Briñol, P. (2015). Emotion and persuasion: Cognitive and meta-cognitive processes impact attitudes. *Cognition and Emotion, 29*(1), 1–26. <https://doi.org/10.1080/02699931.2014.967183>
- Petty, R. E., & Cacioppo, J. T. (1986). The Elaboration Likelihood Model of Persuasion. In *Advances in Experimental Social Psychology* (Vol. 19, pp. 123–205). Elsevier. [https://doi.org/10.1016/S0065-2601\(08\)60214-2](https://doi.org/10.1016/S0065-2601(08)60214-2)
- Pornpitakpan, C. (2004). The Persuasiveness of Source Credibility: A Critical Review of Five Decades' Evidence. *Journal of Applied Social Psychology, 34*(2), 243–281. <https://doi.org/10.1111/j.1559-1816.2004.tb02547.x>
- Rains, S. A. (2013). The Nature of Psychological Reactance Revisited: A Meta-Analytic Review. *Human Communication Research, 39*(1), 47–73. <https://doi.org/10.1111/j.1468-2958.2012.01443.x>
- Rhodes, N., Shulman, H. C., & McClaran, N. (2020). Changing Norms: A Meta-Analytic Integration of Research on Social Norms Appeals. *Human Communication Research, 46*(2–3), 161–191. <https://doi.org/10.1093/hcr/hqz023>
- Roberts, W., Moore, K. E., Pittman, B. P., Fillmore, M. T., & McKee, S. A. (2019). High Risk of Alcohol-Impaired Driving in Adults With Comorbid Alcohol and Substance Use Disorders in the U.S. Population. *Journal of Studies on Alcohol and Drugs, 80*(1), 114–119.
- Shen, L. (2015). Antecedents to Psychological Reactance: The Impact of Threat, Message Frame, and Choice. *Health Communication, 30*(10), 975–985. <https://doi.org/10.1080/10410236.2014.910882>
- Shen, F., Sheer, V. C., & Li, R. (2015). Impact of Narratives on Persuasion in Health Communication: A Meta-Analysis. *Journal of Advertising, 44*(2), 105–113. <https://doi.org/10.1080/00913367.2015.1018467>
- Simpson, J. K. (2017). Appeal to fear in health care: Appropriate or inappropriate? *Chiropractic & Manual Therapies, 25*(1), 27. <https://doi.org/10.1186/s12998-017-0157-8>
- Steindl, C., Jonas, E., Sittenthaler, S., Traut-Mattausch, E., & Greenberg, J. (2015). Understanding Psychological Reactance: New Developments and Findings. *Zeitschrift Für Psychologie, 223*(4), 205–214. <https://doi.org/10.1027/2151-2604/a000222>
- Substance Abuse and Mental Health Services Administration (SAMHSA). (2017). *Words matter: How language choice can reduce stigma*. Retrieved from <https://facesandvoicesofrecovery.org/wp-content/uploads/2019/06/Words-Matter-How-Language-Choice-Can-Reduce-Stigma.pdf>
- Taubman – Ben-Ari, O. (2016). Parents' perceptions of the Family Climate for Road Safety: Associations with parents' self-efficacy and attitudes toward accompanied driving, and teens' driving styles. *Transportation Research Part F: Traffic Psychology and Behaviour, 40*, 14–22. <https://doi.org/10.1016/j.trf.2016.04.006>
- Ward, N., Otto, J., & Finley, K. (2019). *Traffic Safety Culture Primer*. Center for Health and Safety Culture (Montana State University). https://www.mdt.mt.gov/other/webdata/external/research/docs/research_proj/tsc/TSC_PRIMER/PRIMER.pdf
- Williams-Piehot, P., Schneider, T. R., Pizarro, J., Mowad, L., & Salovey, P. (2007). Matching health messages to health locus of control beliefs for promoting mammography utilization. *Psychology & Health, 16*(12), 1652–1678. <https://doi.org/10.1080/08870440310001652678>

This public document was published in electronic format at no cost for printing and distribution.