Chapter 6
Effects of Moving and Looming Stimuli on Attention, Memory, and Fear Conditioning

Cognitive models of emotion assume that individuals continually scan their environments for stimuli that might influence their goals (Lazarus, 1991; Russell, 2003; Scherer, 2005). Similarly, Clark and Beck (2010) refer to an "Orienting Mode" of threat processing that precedes the activation of other cognitive processes. In short, an individual's appraisals of threat are connected to other cognitive processes. As we will see in this chapter, the LVM posits that people prioritize their attention and memory for stimuli that are dynamic and that may represent rapidly growing threats. In addition, perceptions of the dynamism and movement may be a key factor in the fear conditioning process that lead a person to perceive previously neutral stimuli as threatening.

The Prioritization of Looming Stimuli in Attentional Capture

Attentional Capture in the Visual Domain

Williams James (1950/1890) was one of the first modern theorists to cite the power of visual movement in attentional processes. More specifically, he suggested that "moving things" attract a person's attention (cited in Abrams & Christ, 2003). Since James, numerous studies of movement and attention have been carried out over the last 20 years. Research by Jonides and Yantis found evidence of attentional capture by new visual objects that abruptly appear during the time that a person is doing a different, irrelevant task (Jonides & Yantis, 1988; Yantis & Jonides, 1984, 1990). Subsequent studies carried out by Franconceri and Simons (2003) extended these findings by showing that other dynamic movement in addition to abruptly appearing objects captures attention. They concluded that attentional capture is elicited by moving objects and particularly by looming (*i.e., approaching) objects, but not by receding objects.

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According to Franconceri and Simons' (2003) "behavioral urgency" hypothesis, dynamic stimuli, and particularly looming stimuli, capture attention because they could signal the presence of a source of threat, such as a predator or a flying branch, that requires immediate action to prevent injury or harm. By contrast, receding objects would not have the same motivational significance because they don't tend to require immediate action.

Nonetheless, in a context of potential danger, even receding motion may create an increased sense of behavioral urgency. It can be recalled that a study by Lewis and McBeath (2004) indicates that people appear to have a perceptual bias to "ego-centrically" judge directionally ambiguous or even irrelevant motion as approaching (rather than receding). In accord with our present line of reasoning, Skarratt, Cole, and Gellatly (2009) used a visual search task to compare reaction time performance in response to looming and receding objects. Skarratt et al. found that detection times for looming objects were faster than those for both receding and static objects but the detection times for receding objects were still faster than for static objects. Skarratt and colleagues suggested that while both types of motion might have an alerting function, but looming motion appears to benefit from additional attentional prioritization and processing enhancement beyond the effects of motion alone.

Research consistent with a theoretical link between looming stimuli, behavioral urgency, and attention (or hypervigilance) has been reported by many other investigators. For example, in one study, Judd, Sim, Cho, von Muhlenen, and Lleras (2004) created an illusion for participants of looming or receding motion by manipulating how dots on a visual display started moving. Namely, they manipulated whether the dots moved as a coherent group with "looming motion" or "receding motion" coherent group in relation to a core reference location. Judd et al. proposed and found evidence for a "looming cueing effect" on detection times. Reaction times were faster when a target stimulus was to be detected that appeared at the center of dots that started moving as a group with looming motion (i.e., a "looming cueing effect"), as compared to dots that started moving with receding motion. Notably, the effects of looming stimuli on hypervigilance and attentional capture are typically assumed to function at an automatic level of processing. In support of this idea, Judd and colleagues found that the looming cuing effects appeared to influence reaction times of participants with automaticity, independently of conscious awareness.

Automatic processes are widely assumed to operate in a "capacity-free" manner so they are expected to place no demands on a person's limited cognitive resources. A study by Kahan, Colligan, and Wiedman (2011) was carried out to examine these assumptions. They asked participants to view looming or receding stimuli that would serve as orienting cues to signal which of two alternative experimental tasks they would perform. The cognitive load that was put on participants' attentional capacity was manipulated by varying whether the orienting cues were viewed *before* they performed the experimental task or *simultaneously* with the task so as to increase cognitive load by creating multiple attentional demands. The looming cues produced better performance on the experimental task irrespective of when they were presented and thus the results supported the automaticity of the attentional priority of looming stimuli. In other words, the looming stimuli had an automatic capacity-free advantage over the receding stimuli, regardless of other demands on attentional capacity.

Evidence of the automaticity of the attentional priority of looming stimuli over receding stimuli was also presented in a study by von Mühlenen and Llera (2007). They asked their participants to detect the presence of simple target probes that were placed in dynamic visual arrays of randomly moving dot patterns. At this point, the patterns gradually transformed into either a looming pattern, a receding pattern or stayed the same. The results of the study showed that detection of target probes was faster when they were placed in the middle of the looming arrays but not the receding arrays. Moreover, further results indicated that this attentional advantage was found even when the discrimination task became quite difficult and demanding.

In another study, Doi and Shinohara (2012) manipulated the movement of point light figures to examine attentional capture. Florescent dots were placed on the body of target persons or figures who are videotaped in the dark as they moved. The findings of these researchers aligned well with a behavioral urgency hypothesis for they showed that the human walking movement of an approaching figure was detected faster than receding walking movement. In a more sophisticated test of the importance of motivational significance to the perceiver, the researchers manipulated whether the figures were shown rightside up or upside down. When the figures were shown upside down, there was no detection advantage of the approaching figures over the receding figures.

Additional evidence that aligns well with the behavioral urgency of looming objects comes from another study by Lin, Murray, and Boynton (2009). Their study used a visual search paradigm to compare the effects of objects looming in the direction of the observer (which would signal an impending collision) with looming stimuli on a near-miss path. Results showed that looming stimuli on a near-miss trajectory had quite different effects. While the looming stimuli on a collision path with the observers captured their attention, the looming stimuli on a near-miss path did not. Moreover, just as in the Judd et al. (2004) and other studies, the effects seemed to occur without the participants' perceptual awareness. Lin and collaborators suggested that the visual system is innately set up to be hypervigilant for looming objects. In addition, it is set up to automatically categorize looming threats as threat stimuli and approaching stimuli on a near-miss course as safe.

Evidence consistent with such conclusions was also presented by Parker and Alais (2006) using a binocular rivalry paradigm. In particular, Parker and Alais compared looming and receding stimuli by simultaneously presenting them as separate images to each eye. As expected, the looming stimuli rather than receding stimuli were the dominant image when these were presented as separate images to each eye. Much like the other researchers we have mentioned (e.g., Franconceri, & Simons, 2003; Franconceri, Hollingsworth, & Simons, 2005), Parker and Alais (2006) suggested that stimuli that are expanding and apparently approaching the observer are often prioritized in attention because they are more likely to require immediate action.

As previously noted, an objects' dynamic motion can facilitate attentional capture even if it is not visibly looming (albeit it may do this less than a looming object). In addition, the effects of the object's dynamic kinetic motion on drawing attention may be enhanced when it also has other additional negative features. Bearing on this idea, Ceccarini and Caudek (2013) conducted a study showing that dynamic motion influences the processing advantage for detecting an angry as compared to a happy face in the crowd (the "anger superiority effect" or ASE). Other research using static images of faces had previously yielded equivocal results. Their study showed in five experiments that the ASE is obtained when using dynamic images of realistic human faces, but not when using static faces. Thus, they showed a processing advantage for detecting a dynamic threatening social stimulus but not one that is identical but static.

Also bearing on this idea, Carretié et al. (2009) showed participants negative (spiders and cockroaches) or neutral (butterflies or ladybugs) distractor stimuli while they performed on a digit categorization task (judging whether the second and fourth digits were the same or different in 4-digit displays). The distractors were either static or moved across a computer screen. As they predicted, Carretié et al. found that the moving negative distractors not only produced the longest reaction times in the digit categorization task, but also elicited the highest amplitudes in the P1 component of the ERPs which are closely associated with attentional capture. The results of this research suggested that motion supplies additional salience to threatening information that facilitates attentional capture.

In a study that in some ways parallels that of Carretié et al. (2009), Simons, Detenber, Roedema, and Reiss (1999) examined heart rate response to kinetic, moving as opposed to static images of emotion-arousing pictures. A pattern of decelerator heart rate response was found to the moving images, indicating that the moving images engaged sustained attention. In discussing their results, Simons et al. cited the results of a study by Reeves et al. (1985), who found that motion on a filmed screen is associated with higher levels of cortical arousal as assessed by alpha frequency on EEG recordings. In explaining their findings, Simons et al. (1999) emphasized an important idea that might account for the effects of motion on attention. Specifically, they stated that "motion continually presents new information to viewers, and thereby may hold their attention once it has been captured."

In another study, Basanovic, Dean, Riskind, and MacLeod (2017) attempted to specifically examine the effects of looming, approach movement on fear-linked attentional vigilance to spider stimuli. Attentional vigilance was assessed by showing the participants spiders and butterflies that displayed either approaching movement toward the viewer or receding movement from the viewer. The study found a fear-linked attentional vigilance to spider stimuli, but this only emerged only under receding stimulus movement conditions. When spider images displayed receding movement, the spider fearful participants displayed more heightened attentional vigilance than the lower spider fearful participants. However, no difference emerged in the approaching stimulus conditions.

We would expect that most individuals have a tendency to become more hypervigilant to spiders moving toward them. However, spider fearful individuals are more generally primed than less spider fearful individuals to expect spiders to approach. This can lead to a more general tendency toward hypervigilance for any spider movement than individuals with lower spider fears.

Taken together, there is considerable evidence that the visual system prioritizes moving and especially approaching stimuli for attention. Moreover, the visual system is obviously one of the most import sensory systems for detecting rapid dynamic gains in potential threats.

Auditory and Tactile Looming Perception

In addition to the visual system, individuals can also detect the dynamism and rapid dynamic gains by potential looming threats by using the auditory and tactile systems. Despite a dearth of relevant studies in these modalities, their results support the enhanced attentional capture and behavioral urgency associated with looming stimuli. In one study, McCarthy and Olsen (2017) used an auditory spatial localization task and found that looming sounds that rose continuously in intensity were localized faster and more accurately than receding sounds that decreased in intensity. Thus, looming sounds captured attention more quickly than the receding sounds. While not directly examining attentional capture, another study by Bach et al. (2008) also supports the behavioral urgency of rapid dynamic gains in the intensity of auditory stimuli. As we saw previously, Bach et al. found that rapid dynamic gains in sound intensity have warning properties at both the implicit psychophysiological level and the explicit level in terms of listener's reported arousal and emotions.

For another example, Meng, Gray, Ho, Ahtamad, and Spence (2015) examined the effects of looming stimuli in the tactile modality. In particular, they used a simulated "car-following task" in order to examine whether vibrotactile warning signals that move toward the body have promise for the design of future car-collision-warning systems. Reaction times for breaking on the simulated car on this task were found to be significantly faster for toward torso as compared to away from torso cues.

In another study in the tactile modality, Cabe (2011) blindfolded participants in an experimental task and then examined their responses to tactile sensations of looming. Sensations of looming stimuli were created by varying the forces on a weighted string held taut by the participant's finger or a handheld rod or ring. As expected, the participants used haptic information in inferences about relative spatial position and object movement.

The key point is that empirical evidence on multiple sensory modalities has convincingly corroborated that moving and looming stimuli are prioritized by the attentional system. Furthermore, this evidence strongly indicates that looming stimuli represent warning signals and are automatically prioritized because of their greater motivational significance and behavioral urgency.

Dynamic Movement and Memory

The LVM theoretically expects that dynamic, moving, and looming stimuli have priority in memory over static stimuli. One reason for their priority is that they may require behaviorally urgent action. Coupled with this, the dynamism of moving and looming stimuli makes them more vivid and apt to capture attention. A memory advantage should thus be expected for dynamic stimuli because information tends to be better remembered when it has been attended more intensely (Anderson et al., 2000).

Consistent with these theoretical expectations, ample evidence has been found that movement serves to enhance memory. In one early study, Lewis (1975) showed participants footage from video clips of motion pictures of real-world scenes or animated cartoons as compared to pictures from the same real-world scenes or animated cartoons that were unmoving and still, during 15-s exposure periods. Participants had greater recall for both types of moving stimuli, as well as for large stimuli, than for unmoving or small stimuli. In another study, Goldstein, Chance, Hoisington, and Buescher (1982) asked participants to study film clips or still-images taken from those clips and administered a recognition memory test a few minutes later. Recognition memory was significantly better if the pictures were presented in a dynamic mode and then seen later in a dynamic mode in a recognition task.

Two subsequent studies by Matthews, Benjamin, and Osbourne (2007) extended the foregoing findings by examining whether these effects are temporary or might be longer enduring. They presented participants with moving and static scenes of equal duration drawn from a wide variety of sources. After this, they tested recognition memory at intervals ranging from 3 days to 1 month. Rather strikingly, the advantages of moving scenes over static scenes were evident over the whole 1-month period of the study. Furthermore, this recognition memory advantage was independent of psychophysical characteristics such as the color of the stimuli (or their chromaticity).

It should be noted that Matthews et al. (2007) also compared recognition memory for moving scenes with memory in a "multistatic" condition which presented single static frames drawn from regular intervals in the moving clips in succession. This condition was included to rule out the possibility that the moving scenes were better recognized simply because they offered more static views and not because they were dynamic. Importantly, the results indicated that the advantage for the moving scenes was not wholly due to there being more static views in the dynamic scenes. Memory for the multistatic stimuli was the same as for single static images. Hence, as in other research (Pike, Kemp, Towell, & Phillips, 1997), their findings indicated that the dynamism and *fluid motion* in the images seems to be critical to the memory advantages of moving stimuli; it is not just that moving images simply contain more static information.

In another experiment, Buratto, Matthews, and Lamberts (2009) examined recognition memory by crossing the mode of presentation in the initial study phase (static, multistatic, moving) with the mode of presentation of the stimuli at a subsequent test phase (static, multistatic, moving). They found that the overall recognition rates were higher for scenes that had been presented as moving rather than static or multistatic in the study phase. However, movement at the time of recognition seemed to have less effect on the memory advantage for moving scenes.

Research on the effects of image movement on memory for human faces has presented similar evidence for the advantages of dynamic stimuli. In this regard, Lander, Christie, and Bruce (1999, p. 974) noted that prior research on facial recognition had primarily relied on static stimuli and had given little consideration to the role of movement. Nonetheless, as they stated: "Faces in the real world tend to be viewed in motion." Lander et al. (1999) designed their study to examine whether moving images of famous people were remembered better than static images of the sample people on a recognition memory task. To this end, Landers and colleagues presented images of moving and static faces to participants under several different conditions. In addition to moving images of faces, they presented some images as (1) photographic negatives (as in a film negative), (2) inverted (upside down), or (3) as out of their order in a sequence. Their findings supported that moving faces were better recognized than static ones under all conditions.

Like other investigators, Landers and colleagues suggested that the recognition memory advantages of moving faces could not be explained by the possibility that they contained more static information (more different views and face expressions than a single static view of the face). Their results indicated that the dynamic motion of the faces seemed to increase recognition of the faces, even when the amount of static information was equated in moving and static faces. The key point, they suggested, was that the "dynamics of the motion" provided unique additional information that facilitated face recognition. Of further note, these findings were obtained even when participants did not necessarily remember where the target persons were seen or what they were doing.

In another study, Weyers, Mühlberger, Hefele, and Pauli (2006) examined recognition memory for an avatar's static and dynamic morphs (e.g., a face developing from neutral to happy or angry) that were presented for 1 s each. Consistent with other studies we have described, Weyers et al. showed that dynamic expressions led to better recognition rates. Furthermore, the dynamic expression rates were rated by participants as more intense and realistic.

Other data demonstrating the importance of the dynamism of stimuli on recognition memory has found in studies using the "point light" technique (Johansson, 1973). As previously described, these studies use a procedure in which florescent dots are placed on the face or body of target persons who are videotaped in the dark as they move. These studies have provided evidence that people can discriminate the resulting points of light as faces, and distinguish between facial expressions and gender, as well as better identify the specific actor in different clips.

In one such study, Schiff, Banka, and de Bordes Galdi (1986) examined recognition memory for stimulus persons who had been seen in a dynamic video of a holdup at a liquor store, or static shots from the same video. Participants were better in recognizing individuals that had been seen in the dynamic videotape, rather than static shots from the videotape. Similarly, Roark, O'Toole, Abdi, and Barrett (2006) found that observers were better at recognizing individuals in whole body videos when they had been seen in videos showing dynamic facial speech rather than static shots from the scene videos.

Other research indicates that infants as well as adults prioritize dynamic information in memory. For example, a study by Otsuka et al. (2009) found evidence that 3–4-month-old infants exhibited better recognition memory of previously unfamiliar faces that they learned in a moving condition than in a static condition. Indeed, the infants in the moving condition could successfully recognize moving faces in one-third of the time (30 s vs. 90 s) that they required when viewing the same images of faces learned in a static condition. Moreover, just as in studies with adults, a multistatic condition did not provide the same benefit as moving images.

Of note, research has also begun to examine the specific effects of the looming or approaching movement of objects on memory processes. In a set of experiments, Pilz, Vuong, Bülthoff, and Thornton (2011) investigated whether approach movement leads to better recognition memory of faces than does receding movement. To examine whether this type of motion enhances face processing, Pilz et al. placed a number of different 3-dimensional models of heads on identical 3-dimensional body models. These models were animated to approach the perceiver, recede (walk away), or remain still. Consistent with theoretical expectations regarding greater motivational significance of approaching stimuli, the participants were faster in recognizing faces when they had been learned in the context of approaching motion than receding motion. In subsequent experiments, similar evidence was found when participants were shown moving or static avatars and then asked to search for target faces in the midst of static arrays. Echoing the explanations of researchers studying attentional processes, Pilz and collaborators (2011) suggested that the visual system may have special mechanisms that facilitate the encoding of dynamic, approaching objects that are highly behaviorally relevant.

Using a representational momentum paradigm, Greenstein, Franklin, Martins, Sewack, and Meier (2016) recently examined memory for dynamic scenes which were either threatening or nonthreatening. They presented participants with visually neutral dynamic stimuli (e.g., ambiguous scenes from video surveillance) and manipulated threat conceptually with verbal descriptions of the scenes. For example, in one scenario, a visually neutral scene of a person carrying a frying pan was described as a person bringing the frying pan to a friend, or as approaching another person to do harm. Participants in both the threatening and nonthreatening descriptions remembered the final scenes as displaced forward ahead of the final scenes they had actually seen. However, this representational momentum effect was stronger for the scenarios in the threat conditions. Greenstein et al. suggested that the increased representational momentum effects for threat could serve the function of increasing people's "ability to predict, and thereby evade, a moving threat" (p. 663).

In research on a closely related topic, Nairne, Vanarsdall, Pandeirada, Cogdill, and Lebreton (2013) examined the impact of animacy on memory. As was seen, dynamism and object movement appear to be critical cues for animacy (see Chap. 5). Nairne et al. tested the hypothesis that animacy is an important mneumonic dimension because of the fact that "distinguishing between living (animate) and nonliving things is essential for survival and successful reproduction." Results of Nairne et al.'s two studies showed that words that are high in animacy are better remembered. Moreover, the memory advantage of animate words remained even when they were equated with inanimate words along other mnemonically relevant dimensions (e.g., imageability).

In sum, a compelling body of evidence has accumulated that has indicated that dynamically moving and looming stimuli are advantaged in memory, just like they are in attentional capture. Moreover, these attentional and memory advantages appear to be innate because they are found in infants as well as adults.

Moving and Looming Stimuli and Fear Acquisition

In this final section, we present evidence that the advantages of dynamic stimuli on attention and memory also extend to the phenomenon of fear conditioning. The LVM theorizes that the dynamism and movement of stimuli should affect the readiness with which they can be conditioned to fear (Riskind, 1997). It can be noted that Carr (1969) suggested more than three decades ago that the animate nature of fear-relevant stimuli such as spiders or snakes distinguished them from other stimuli and is a "controlling variable" that mediates the importance of these stimuli in phobias. In a similar vein, Thorndike suggested even earlier than this that infants are more predisposed to manifest fear to objects that wiggle and contort themselves than to objects that are motionless stimuli (Thorndike, as cited in Seligman, 1971, p. 410). In a similar vein, McNally and Steketee (1985) reported evidence from retrospective interviews with animal phobics that fear-stimulus movement often played a role in fear acquisition. Such observations should hardly come as a surprise, given the presumed evolutionary function of fear conditioning is to increase the chances of survival against dynamic enemies and predators. The LVM posits that due to the association between movement and predation risk, the fear conditioning process is mediated, at least in part, by the perceived (or imagined) movement of the to-be-conditioned stimuli. To loosely paraphrase what James said, the LVM expects that "moving things" are more readily fear conditioned.

Somewhat surprisingly, there has been a dearth of attention to the effects of movement and the dynamic attributes of stimuli on conditioning. In our search of the literature, we found that the only study to even approach this question was done on aversive conditioning in minnows. Consistent with what we would expect, Wisenden and Harter (2001) hypothesized that object motion is a "particularly reliable indicator of predator identity that would be likely to affect aversive conditioning." They offered the explanation that object motion might be one of the few stimulus properties that a minnow might discern in the immediate environment that would be likely to indicate predation risk.

In Wisenden and Harter's (2001) study, a procedure was used in which chemical alarm signals were introduced into water tanks containing fathead minnows, who were exposed to one of two stimulus objects. One of the objects was a rod that resembled a natural predator of the minnows (a pike), and the other was a black disk. Critically, for some of the minnows, the rod or the disk was moving, while the remaining minnows the objects were static and stationary.

As Wisenden and Harter (2001) reported: "After a single conditioning trial, in which chemical alarm cues were paired with the stimulus objects, minnows associated risk (as indicated by defensive antipredator responses) significantly more with the previously moving object than the previously stationary object." In a dramatic contrast, the shape of the object (a disk as opposed to a natural predator), as opposed to the objects' movement, had no significant effect on aversive conditioning.

Wisenden and Harter's (2001) interpretations of their findings fit well with the LVM:

> "To eat, predators must approach, grasp, handle and swallow prey. Even predators that remain stationary while in ambush must engage in motion during a predation event. Motion, and not shape per se, is thus a predictable and reliable component of predation and may serve as an immediate releaser of learned risk association" (p. 363).

To our best knowledge, no other animal or human research seems to have examined the impact of object movement or the dynamism of objects in fear conditioning. However, a study by Arntz, Van Eck, and de Jong (1992) is germane to this topic. Arntz and colleagues examined the effects of unpredictable, sudden increases in painful stimulation on levels of acquired fear to a warning signal (or UCS). To this end, they test this, the administered 17 moderately painful shocks to participants, which alternated with three stronger unpredictable, sudden shocks to the warning signal. By contrast, the participants in a control condition received shocks of constant (or unchanging) and predictable intensity. The participants receiving trials with dynamic increases in intensity exhibited higher levels of conditioned subjective fear ratings, skin conductance responses, as well as heart rate acceleration and respiration to the warning signal, relative to participants who received shocks of constant (or unchanging) intensity.

The LVM would expect that sudden *increases* in shock intensity are easier to extrapolate to the expectation that severe harm will occur than static levels of shock. However, a limitation of the study for testing this is that the Arntz et al. study (1992) did not include a constant-high intensity shock condition.

Despite the paucity of evidence regarding the role of dynamic attributes such as object motion on fear conditioning, further research seems warranted. Dynamic stimuli are more lifelike and ecologically relevant. Thus, future research on conditioning with dynamic stimuli would likely benefit the advancement of understanding of fear conditioning processes.

The Impact of Approach Movement and Dynamic Change on Habituation

Riskind (1997) further postulated that static stimuli are easier to habituate, and that movement and other dynamic parameters should often impede habituation and the unlearning of fear. For example, it could be expected that a spider phobic would habituate more readily to a static slide of a spider than to a video clip of a moving spider—and particularly to a spider that is moving physically closer (or looming) to the viewer.

Research on psychological stress lends support to this idea because it has indicated that the anxiety responses that individuals have to threats that seem unvarying (static and constant) tend to habituate and diminish with time (Lazarus & Folkman, 1984; for a review, see Paterson & Neufeld, 1987). Moreover, the ease that a person might have in habituating to static threats would also be consistent with expectations derived from Helson's (1964) adaptation level model (see Chaps. 3 and 5), which assumes that individuals tend to quickly become accustomed to stimuli unless they change and intensify. From a different theoretical vantage point, individuals would be likely to find it easier to find ways to cope with threats that do not vary or are slow to change.

With just one notable exception, researchers studying desensitization and exposure have devoted surprisingly little attention to the role of stimulus movement. A study by Dorfan and Woody was designed to explicitly test these predictions of the LVM. In their study drops of sterilized urine were placed on the arms of college student participants who were assigned to one of three kinds of mental imagery conditions. Specifically, the participants were instructed to visualize germs as moving and spreading (moving around on their bodies), as static (i.e., they visualized urine drops as motionless on the original site of contamination), or as safe (i.e., it contains no harmful germs). Results indicated that the use of the moving imagery sensitized distress during a 30-min exposure, whereas the static and safety imagery reduced distress. In other words, exposure failed to reduce distress for the participants in the moving harm condition and they actually became more sensitized to the urine drops.

Several important implications are suggested by Dorfan and Woody's (2006) dramatic findings. In accord with Riskind's (1997) predictions, moving dynamic threats may often impede habituation. If so, using mental imagery instructions or other means (see "looming reduction strategies" in Chap. 15) to reduce the perceived or imagined dynamism of threats might potentially help to expedite habituation. A caveat, however, is that habituation to a static stimulus (such as a static spider image) may not protect a person from a return of fear when a dynamic stimulus (e.g., a moving spider) is encountered in real life. Thus, it may be necessary to augment initial habituation to a static threat stimulus with exposure to more dynamic versions of the threat stimulus to promote generalization and reduce a return of fear.

Overall Summary and Conclusions

The evidence presented in this chapter demonstrates that the dynamism of moving objects—and particularly looming objects—is prioritized in attentional capture and recognition memory. Moreover, this prioritization is apparently both automatic and innate and has been repeatedly demonstrated in infants as well as adults using a variety of methodologies. A great deal more research is needed to ascertain the role of dynamism and movement of objects in fear conditioning and desensitization.

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