When focusing on a goal interferes with action control: action versus state orientation and over-maintenance of intentions

Hester A. H. Ruigendijk · Sander L. Koole

Published online: 4 June 2014
© Springer Science+Business Media New York 2014

Abstract People vary in action versus state orientation, or the ease versus difficulty by which they can form and enact goals under demanding conditions (Kuhl and Beckmann in Volition and personality: action versus state orientation, Hogrefe, Göttingen, 1994). According to the over-maintenance hypothesis, state-oriented people are prone to think about their intentions in a narrow linguistic format that prevents flexible action control. Two studies tested this hypothesis by manipulating intention focus among action-versus state-oriented participants and examining how well they performed difficult actions. Focusing strongly (rather than weakly) on the task goal led state-oriented participants to make more errors during incongruent trials of a Stroop task (Study 1) and led to greater task-switch costs in response latencies (Study 2). Action-oriented participants showed the reverse pattern, and performed difficult actions more effectively when focusing on the task goal. These findings suggest that focusing on intentions may paradoxically impair action control among state-oriented people.

Keywords Action orientation · State orientation · Cognitive control · Intentions · Goals · Proactive control · Reactive control

Introduction Within modern Western society, goal-directedness is generally seen as vital to success. Techniques that encourage people to explicate their goals and action plans are widely propagated in management books and motivational training programs, often accompanied by such catchphrases as “people with goals succeed because they know where they’re going” and “people only hit what they aim at”. However, the effects of goals on achievement may be more complex than is often acknowledged. Merely focusing on one’s goals does not guarantee that these goals will be effectively implemented. Indeed, we suggest in this article that some people may paradoxically fail at enacting their goals because they are focusing on their goals.

Our conception of goals is derived from an action-theoretical perspective¹ (Koole et al. 2012; Kuhl 1984, 1994a, 2000). From this perspective, human behavior is governed by a balance between reactive versus proactive control

---

¹ Action control theory was originally proposed by Kuhl and associates in the 1980s (Kuhl 1984). Its presumed cognitive mechanisms of action control were elaborated during the 1990s (Kuhl 1984, 1994a). In the 2000s, the theory was extended into a personality systems interactions (PSI) theory, a comprehensive functional analysis of motivation and personality (Kuhl 2000). The interplay between intentions and action is a major aspect of PSI theory and is thus fully consistent with the present work. However, PSI theory also makes assumptions about the affective modulation of action control, which are beyond the present scope. In this article, we refer to this family of theories collectively as the ‘action-theoretical perspective’. 
processes. Reactive control relies on established routines or schemas that require little or no conscious supervision (e.g., Braver et al. 2007; Custers and Aarts 2010; Koole and Rothermund 2011; Lau and Passingham 2007). At times, however, people need to intervene more proactively in the stream of behavior. Pro-active control is especially needed when people cannot rely on pre-established behavioral routines (Meiran et al. 2012), when an action must be postponed until a specific opportunity (Braver et al. 2007), or when an action requires a sequence of multiple steps (Zanini et al. 2002). During proactive control, people often form an explicit linguistic representation that binds the different components of an intended action together. In this article, we refer to the latter type of mental representations as ‘goals’ or ‘intentions’.

After forming an intention, people need to maintain the intention in working memory (Braver et al. 2007; Goschke and Kuhl 1993). This maintenance process is a precarious affair, because the intention must be kept cognitively accessible while its behavioral enactment must be delayed to avoid premature action. Consequently, the cognitive maintenance of an intention is accompanied by inhibition of automatic behavioral routines, or ‘volitional inhibition’ (Kuhl and Kazén 1999). Releasing this inhibition is critical for flexible and efficient action. However, not everyone is equally capable of releasing volitional inhibition (Kuhl 1994b, 2000). So-called ‘action-oriented’ people are capable of releasing volitional inhibition rapidly and efficiently. Consequently, action-oriented people can execute difficult intended actions in a flexible and context-sensitive manner. By contrast, so-called ‘state-oriented’ people find it difficult to release volitional inhibition after forming an intention. As a result, state-oriented people are prone to maintain their intentions in a narrow linguistic format that is disconnected from implicit knowledge structures about the self and the world that are needed for context-sensitive action. If an intention is no more than a collection of words, then merely rehearsing these words will not promote action. In fact, rehearsing the linguistic representation of an intention may amplify behavioral passivity by strengthening volitional inhibition. This over-maintenance hypothesis can thus explain the seeming paradox that cognitively maintaining an intention may render state-oriented people less capable of enacting this intention (see also Kuhl 2000).

Consistent with the over-maintenance hypothesis, state-oriented people are more inclined than action-oriented people to mentally rehearse their intentions (Goschke and Kuhl 1993). At the same time, state-oriented people are less likely to enact difficult intentions than their action-oriented counterparts (e.g., Jostmann and Gieselmann 2014; Jostmann and Koole 2007; Kazén et al. 2008). For instance, state-oriented people display greater interference in a Stroop color-naming task than action-oriented people, particularly under demanding conditions that call on proactive control (Jostmann and Koole 2007). State-oriented people are also less likely to enact difficult intentions in everyday contexts, such as sticking with a diet (Palffai 2002), finding employment (Song et al. 2006), or breaking one’s personal athletic record (Heckhausen and Strang 1988). Taken together, converging lines of research indicate that state-oriented people display high cognitive activation of intentions accompanied by low behavioral enactment of these same intentions (for reviews, see Jostmann and Koole 2007; Koole et al. 2012; Kuhl and Beckmann 1994).

The heightened cognitive maintenance of intentions and their reduced enactment among state-oriented individuals have so far been observed in separate lines of research. It thus remains to be seen whether cognitively maintaining intentions indeed keeps state-oriented people from enacting these intentions, as the over-maintenance hypothesis suggests. Indeed, recent research has challenged the viability of the over-maintenance hypothesis. Specifically, Jostmann and Koole (2007, Study 3) found that state-oriented people displayed greater interference in a Stroop task when the intention was not pre-cued compared to when the intention was pre-cued. Performance decrements that occur only in the absence of pre-cues are often attributed to goal neglect (Kane and Engle 2003). A goal neglect account implies that state-oriented people think too little about their intentions, which contradicts the over-maintenance hypothesis. However, tasks without pre-cues also require more proactive control (Braver et al. 2007), which is impaired by over-maintenance processes (Baumann et al. 2005; Kazén et al. 2008). It thus remains ambiguous whether control deficits among state-oriented people are caused by over-maintenance processes.

In the present research, we sought to provide a direct test of the over-maintenance hypothesis. In two studies, we examined participants’ performance of difficult actions in a Stroop task (Study 1) or a task-switching paradigm (Study 2). We manipulated how strongly participants focused on their intentions using verbal instructions. Under strong intention focus, participants consciously focused their attention in determining their responses. Under weak intention focus, participants let the right answers come to them without applying extra effort. In line with the over-maintenance hypothesis, we predicted that state-oriented people would perform difficult actions less efficiently when focusing more

---

2 Within the action-theoretical tradition, the term ‘goals’ often denotes mental representations of desired outcomes, whereas the term ‘intentions’ often denotes mental representations of to-be-enacted behaviors. Although we agree that this differentiation is theoretically meaningful and useful, we note that, within contemporary psychology, researchers have often used the terms ‘goals’ and ‘intentions’ interchangeably (e.g., Austin and Vancouver 1996). Because the theoretical comparison between goals and intentions is not central to the present research, we followed the general convention in treating the two constructs as more or less interchangeable.
strongly on their intentions. We predicted no such pattern for action-oriented people. Indeed, if anything, we expected that focusing on intentions would lead action-oriented people to mobilize additional self-regulatory resources, and thus improve their execution of difficult actions (see Koole et al. 2012).

State-oriented people more readily display physiological arousal in response to increased task demands, arousal that may cause state-oriented people to underperform (Heckhausen and Strang 1988). Such over-arousal effects may be a byproduct of over-maintenance of intentions, especially when enacting the intention is both important and effortful (Brehm and Self 1989). However, over-maintenance of intentions is primarily a cognitive process, which may occur even when task-related increases in arousal are too small to push people beyond their optimal level. Because performance incentives were modest in the present studies, our participants would be expected to display little physiological arousal (Brehm and Self 1989). We therefore expected state-oriented participants to show over-maintenance without over-arousal. Empirically, we took several steps to establish the role of arousal in our results. First, we asked participants to report any changes in experienced arousal and examined whether these changes mediated our effects. Second, we measured two behavioral signatures of arousal: Facilitation of habitual responses in Study 1 (Hull 1943; Pelham and Neter 1995) and distractibility in Study 2 (Eysenck et al. 2007). We expected to find over-maintenance effects among our state-oriented participants, even in the absence of increased self-report or behavioral manifestations of arousal.

Study 1

Study 1 examined the joint influence of intention focus and action-state orientation in a Stroop (1935) task, one of the most widely used paradigms within psychology for studying how people can implement difficult actions (MacLeod 1991). Participants had to respond to the color of a word while ignoring the word meanings. The meaning of the words was either neutral (a string of X-es), congruent (e.g., the word blue written in a blue color), or incongruent (e.g., the word blue written in a red color). Experienced readers tend to make more mistakes and respond more slowly during incongruent trials, a phenomenon known as Stroop interference (MacLeod 1991). During the Stroop task, we used verbal instructions to manipulate how strongly participants were focused on their color-naming intentions.

Theoretically, the effects of intention focus and action-state orientation are most likely to emerge during incongruent Stroop trials. This is because incongruent Stroop trials are difficult to enact, due to the conflict between the task goal of color naming and the over-learned inclination to read the words. Resolving the Stroop conflict presumably requires proactive, volitional effort. In line with the over-maintenance hypothesis, we predicted that focusing more strongly (rather than weakly) on the color-naming intention would render state-oriented participants less capable of inhibiting their automatic inclination to read the word meanings, leading to greater Stroop interference. Conversely, we predicted that focusing more strongly (rather than weakly) on the color-naming intention would mobilize proactive control among action-oriented participants, leading to less Stroop interference.

We used a version of the Stroop task with a relatively high proportion (75 %) of congruent trials, because the effects of action-state orientation are usually most pronounced in high-congruency contexts (Jostmann and Koole 2007). High-congruency versions of the Stroop task typically find most variance on error rates rather than response latencies (Jostmann and Koole 2007, study 3; Kane and Engle 2003). Presumably, this is because participants only infrequently need to implement proactive control in the high-congruency context, which makes it tempting to become more passive and may hence foster lapses in proactive control (Kane and Engle 2003). Whenever such lapses occur, errors become more likely because incongruent stimuli are not noticed in time. When incongruent trials go unnoticed, they can no longer cause a slow-down in response times. In view of these considerations, we expected the effects of action-state orientation and intention focus to arise mainly for error rates.

Finally, we assessed in Study 1 in how far the effects of intention focus and action-state orientation might be due to arousal processes. To this end, we asked participants to report any changes in arousal and mood before and after the Stroop task. We further derived a behavioral measure of arousal from the Stroop task. A classic law in motivation research holds that increased arousal facilitates habitual behavior (Hull 1943; Pelham and Neter 1995). Consequently, if our manipulation of intention focus increased arousal among state-oriented people, we would expect intention focus to increase Stroop facilitation among this group. Given the low-arousing nature of our procedures, however, we expected to find no effects of intention focus and action-state orientation on either self-reported arousal, mood, or Stroop facilitation.

Method

Participants and design

Sixty-three volunteers (46 female and 17 male, average age 21) at the VU University Amsterdam participated for study credits or money. Participants varying in action versus state orientation were randomly assigned to strong or weak
intention focus conditions. The main dependent variable consisted of error rates during the Stroop task.

**Materials and procedure**

Participants were received by a female experimenter and escorted to individual cubicles. All instructions were computer-administered. Participants were first informed that they participated in several brief unrelated studies that were administered together for efficiency reasons. Participants then filled out some personality questionnaires, which included a measure of individual differences in action versus state orientation. Next, participants rated their mood and completed a Stroop task. The intention focus manipulation was introduced during the Stroop task. After this, participants rated their mood for a second time, completed a color blindness test, and answered some biographical questions. Finally, participants were debriefed, thanked, and rewarded for their contribution.

**Action versus state orientation** Individual differences in action versus state orientation were assessed with the decisiveness subscale of the Action Control Scale (ACS90; Kuhl 1994b). The ACS90 has been validated extensively in over 80 studies (see Koole et al. 2012, for a review). Throughout these studies, decisiveness has emerged as a robust predictor of how people deal with demanding conditions in controlled laboratory tasks (e.g., Jostmann and Kuhl 1994b). The ACS90 has been validated extensively in over 80 studies (see Koole et al. 2012, for a review).

Each of the 12 items of the decisiveness scale describe a demanding situation and two ways of dealing with the situation (Cronbach’s $\alpha = .73$). One alternative always corresponds with an action-oriented way of coping; the other with a state-oriented way of coping. An illustrative item is, ‘When I have to take care of something important which is also unpleasant: (a) I do it and get it over with, (b) It can take a while before I can bring myself to it’. In this case, answer a is scored as action-oriented and answer b is scored as state-oriented (in the actual scale, order of action- versus state-oriented answers is counterbalanced). Participants who gave 6 or more action-oriented responses were categorized as ‘action-oriented’. Participants who gave 5 or fewer action-oriented responses were categorized as ‘state-oriented’. The same substantive results emerged when we analyzed action control scores as a continuous variable.

**Mood assessment** Participants’ mood was assessed using a self-report inventory developed by Kuhl and associates translated into Dutch (e.g., Kazén et al. 2008). During each of the two mood assessments, participants rated how well 23 mood adjectives (e.g., tense, listless, joyful) applied to their current feelings, using 4-point Likert scales (from 1 = not at all, to 4 = completely). The adjectives were averaged into a single index of negative mood (Cronbach’s $\alpha = .88$).

**Stroop task** Participants completed 160 trials, out of which 60 were target trials that were used for analysis. The target trials consisted of 20 congruent, 20 incongruent and 20 neutral trials. During congruent trials, the words RED or BLUE were presented in matching colors. During incongruent trials, the words were presented in mismatching colors. During neutral trials, four crosses (XXXX) were presented in either blue or red font. The remaining 100 trials contained words that were congruent with the font colors. All color words and font colors were equally represented across filler and target trials, except for the neutral letter string XXXX, which was only presented during target trials. Presentation order of the trials was varied randomly for each participant.

Each trial started with a fixation cross that was presented for 1,000 ms in the center of the screen, which was immediately followed by the presentation of a letter-string. After participants responded, the screen went blank for 2,000 ms until the next fixation appeared. Before the actual task, participants practiced with six trials for which they received feedback. Participants answered by pressing the A on the computer keyboard to indicate that the color of the word was red or the 6 on the numeric pad of the keyboard to indicate that the color was blue.

**Intention focus manipulation** After participants received the instructions for the Stroop task, we introduced our experimental manipulation of intention focus. We modeled our intention focus manipulation after the procedures of Smilek et al. (2006). The latter researchers instructed participants to actively or passively guide their attention in visual search tasks. Their results showed that passive instructions reduced reliance on executive control processes, whereas active instructions increased reliance on executive control processes. These findings confirm that it is possible to manipulate how strongly people are focused on their intentions through simple task instructions.

In the weak intention focus condition, participants were instructed to approach the task in a way that would minimize their reliance on conscious intentions. Specifically, participants were presented with the following instructions:

The best strategy for performing this task is to relax. Open yourself to the colors that you will see and let the right answer emerge in you. Let what you see on the screen together with your feelings determine your response.
Some people find it hard to trust their feelings in this manner. Please still do your best to do it like this. Try to respond as quickly and as accurately as possible, while using this strategy. So just let the right answer pop into your mind.

In the strong intention focus condition, participants received a parallel set of instructions that were intended to maximize participants’ reliance on explicit intentions. Specifically, participants were presented with the following instructions:

The best strategy for performing this task is to be as active as possible. Focus on the color of the letters and not on the words that they form. Use your conscious attention to give the right response. Some people find it hard to consciously focus their attention in this manner. Please still do your best to do it like this. Try to respond as quickly and as accurately as possible, while using this strategy. So focus your attention on the color of the letters and not on the words.

It should be noted that in both intention focus conditions, the instructions clearly stated that participants were to focus on naming the ink colors. We thus tried to keep the task goal equally specific in both conditions. Moreover, in both conditions, we instructed participants to do their best. In this way, we tried to avoid differences in motivation between both conditions. Finally, in both conditions, we instructed participants to try and be as quickly and as accurately as possible. We gave the latter instruction to avoid that the manipulation would cause a shift in response criteria (e.g., emphasizing speed over accuracy or vice versa).

Results

Stroop task

Data of three colorblind participants (4.7 % of the entire sample) were discarded. Data of one participant (1.6 % of the entire sample) were discarded because he made errors on 50 % of all trials during the Stroop task. Our main interest was in error rates, which are usually a more sensitive measure of cognitive control than response times for Study 1’s high-congruency version of the Stroop task. Indeed, as in prior research (Jostmann and Koole 2007; Kane and Engle 2003), there were no effects of action orientation or intention focus on response times, $F$s < 1.51, $p$s > .23.

Table 1 Mean errors in color naming (standard deviations between brackets) as a function of intention focus, orientation, and trial type (Study 1)

| Intention focus | Trial Type | Incongruent $M$ (SD) | Neutral $M$ (SD) | Stroop interference $F$ $p$ |
|-----------------|-----------|----------------------|-----------------|-----------------------------|
| Strong          | Action-oriented$^a$ | .86 (1.25) | .53 (1.74) | .33 (1.49) |
|                 | State-oriented$^b$  | 2.43 (2.47) | .43 (.65) | 2.00 (2.18) |
| Weak            | Action-oriented$^c$ | 1.54 (1.39) | .23 (.44) | 1.31 (1.55) |
|                 | State-oriented$^d$  | 1.24 (1.25) | .65 (.79) | .59 (1.42) |

$^a$ $N = 15$, $^b$ $N = 14$, $^c$ $N = 13$, $^d$ $N = 17$.

Participants generally made more errors during incongruent trials ($M = 1.49, SD = 1.71$) than during neutral trials ($M = 1.48, SD = .68$), $t(58) = 4.45$, $p = .000$, Cohen’s $d = .78$. Participants did not differ in error rates during congruent trials ($M = .37, SD = .79$) and error rates during neutral trials, $t(58) = -81$, $p = .42$. Thus, participants’ error rates showed reliable Stroop interference effects, but no facilitation effects. Preliminary analyses revealed no effects of action versus state orientation and intention focus on Stroop facilitation, all $F$s < 2.3, $p$s > .13. We therefore discuss only the results for Stroop interference.

A 2 (orientation: action vs. state; between subjects) $\times$ 2 (intention focus: weak vs. strong; between subjects) $\times$ 2 (trial type: incongruent vs. neutral; within subjects) analysis of variance (ANOVA) revealed the predicted three-way interaction effect between orientation, intention focus, and trial type, $F(1, 55) = 7.42$, $p = .009$, $\eta^2_p = .12$. Relevant means are displayed in Table 1. For ease of interpretation, we computed an index of Stroop interference by subtracting the number of errors during neutral trials from the number of errors in response to incongruent trials. The effects of action control and intention focus on Stroop interference are visually displayed in Fig. 1.

Next, we conducted separate follow-up tests by intention focus condition. In the strong intention focus condition, state-oriented participants had more Stroop interference than action-oriented participants, $F(1, 55) = 7.17$, $p = .01$, $\eta^2_p = .12$. In the weak intention focus condition, the pattern was reversed, such that action-oriented participants showed more interference than state-oriented participants, although the latter effect was not significant, $F(1, 55) = 1.36$, $p = .25$, $\eta^2_p = .02$. Another way to interpret the interaction between intention focus and orientation is to note that action-oriented participants had less Stroop interference in the

---

3 In Study 1, a parallel analysis with action orientation as a continuous variable yielded a marginally significant interaction between intention focus and action orientation on Stroop interference, $F(1, 55) = 3.3, p = .07$, $\eta^2_p = .06$. 
strong intention focus condition than in the weak intention focus condition, although the effect was not significant, $F(1, 55) = 2.36, p = .13, \eta_p^2 = .04$. The opposite pattern was found among state-oriented participants, among whom Stroop interference was significantly greater in the strong intention focus condition, $F(1, 55) = 5.46, p = .02, \eta_p^2 = .09$.

### Mood

We conducted a $2$ (orientation) $\times$ $2$ (intention focus) $\times$ $2$ (time of measurement: before versus after Stroop task; within subjects) ANOVA on participants' global mood scores. There was a main effect of time of measurement: Participants experienced more negative moods after completing the Stroop task, $F(1, 58) = 17.66, p = .000, \eta_p^2 = .23$ ($M = 1.87, SD = .43$ versus $M = 2.06, SD = .42$). Notably, mood scores during the entire experiment remained close to the conceptual midpoint of the 4-point Likert scales that were used. Thus, the observed mood differences were of mild intensity. There were no effects involving an interaction between orientation and intention focus, $Fs < 1$. Furthermore, there were no main effects of orientation nor of intention focus on mood, all $Fs < 2.71, ps < .11$. Finally, statistically controlling for mood as a covariate did not change the effects of orientation and intention focus in the Stroop task. Thus, there was no indication that the observed pattern in the Stroop task was mediated by mood.

### Discussion

The effects of intention focus on Stroop interference were moderated by action versus state orientation. When intention focus was strong, state-oriented participants had significantly more Stroop interference than when intention focus was weak. The latter finding is consistent with the over-maintenance hypothesis, which holds that control deficits among state-oriented people arise when they become cognitively preoccupied by their intentions. Action-oriented participants displayed no evidence of an over-maintenance pattern. In fact, there was a non-significant trend such that strong (rather than weak) intention focus reduced Stroop interference among action-oriented participants. Focusing on intentions may thus facilitate the ability of action-oriented participants to enact difficult intentions. However, more research is needed to confirm this idea, because the latter finding fell short of statistical significance. Participants’ self-reported mood changes provided no indication that intention focus increased participants’ arousal or self-reported mood. Furthermore, there were no effects of intention focus or action-state orientation on Stroop facilitation. The latter may be regarded as a behavioral index of arousal, given that arousal is known to facilitate habitual action (Hull 1943; Pelham and Neter 1995) and hence can be expected to increase Stroop facilitation. Thus, it appears that Study 1’s over-maintenance pattern among state-oriented people cannot be explained in terms of over-arousal.

### Study 2

In Study 2, we used a task-switching paradigm that was developed by Dreisbach and Goschke (2004) to examine the over-maintenance hypothesis. In the first stage of this paradigm, participants categorize stimuli in a specific color while ignoring distracter stimuli in a different color. After a while, the task goal is changed such that participants have to categorize stimuli in a new target color, while distracters appear in the color of the former target. To perform well during the second stage, participants have to mentally disengage from their old task goal. We suspected that over-maintenance makes this mental disengagement more difficult, leading to more perseveration of the old task goal. If this is correct, then state-oriented people should display stronger perseveration in the Dreisbach and Goschke paradigm, especially when they are strongly focused on their intentions. Action-oriented people should be relatively immune to this effect, because of their ability to flexibly disengage from their intentions. We examined these predictions in Study 2.

We further conducted a more refined test of the over-maintenance hypothesis, by defining more specifically in what sense state-oriented people over-maintain their intentions. In particular, we suggest that over-maintenance processes lead state-oriented people to encode goal-related stimuli more strongly in linguistic terms. If this is correct, then state-oriented people can be expected to display lower
distractibility by goal-irrelevant information. Notably, this prediction is opposite to an over-arousal explanation, because arousal usually increases distractibility by goal-irrelevant information (Eysenck et al. 2007). In the Dreisbach and Goschke task, one can derive distractibility scores by comparing response latencies for different types of trials. In compatible trials, the target and distracter require the same response. In incompatible trials, target and distracter require different responses. Based on the over-maintenance hypothesis, we predicted that state-oriented people should show lower distractibility in the Dreisbach and Goschke task when they focused more (rather than less) on their intentions.

At first glance, the notion that intention focus should lower distractibility among state-oriented people might seem at odds with Study 1’s finding that intention focus increased Stroop interference among state-oriented people. However, Stroop interference stems from the over-learned activation of reading tendencies among skilled readers, so that overcoming Stroop interference requires effortful control (e.g., Kuhl and Kazén 1999; Morsella et al. 2009). By contrast, reduced distractibility among state-oriented people is presumably due to an automatic (but goal-dependent) linguistic encoding process. In the social-cognitive literature, this mechanism is also known as “goal shielding” (Achtziger et al. 2008; Mc Culloch et al. 2008; Shah et al. 2002; Veling and Van Knippenberg 2006, 2008). Because goal shielding is automatic, it applies only to relatively effortless tasks that can be delegated to automatic linguistic encoding processes. Consequently, the Stroop task of Study 1 was an unlikely context for goal shielding to emerge. In less effortful tasks, however, we would expect to find goal shielding (i.e., reduced distractibility) among state-oriented people who are focusing on their task goal.

In the Dreisbach and Goschke (2004) paradigm, the categorization task that participants perform is relatively easy prior to the switch in task goal, because (a) the distracters do not trigger over-learned responses, as in the Stroop task; and (b) there is not yet interference from an old task goal. Participants may thus perform this task fairly effortlessly, provided that they properly encoded the task instruction. Accordingly, we predicted that intention focus would lead to lower distractibility effects among state-oriented participants during the first stage of the Dreisbach and Goschke task. In the second stage of the Dreisbach and Goschke (2004) paradigm, however, the task becomes more effortful because there is interference from the old task goal. We therefore predicted that intention focus would no longer lower distractibility among state-oriented participants during the second stage of the task. Finally, we expected none of these distractibility effects to emerge among action-oriented people, because the latter rely less on automatic, relatively rigid forms of goal shielding (Goschke and Kuhl 1993).

Method

Participants and design

Sixty-nine volunteers (48 female and 21 male, average age 20) at the VU University Amsterdam participated for study credits or money. Participants with varying dispositional action versus state orientation were randomly assigned to the weak intention focus versus strong intention focus conditions. The main dependent variable consisted of response times during the symbol categorization task.

Materials and procedure

The equipment, assessment of action-state orientation (Cronbach’s α = .78), mood assessment (Cronbach’s α = .88), and intention focus manipulation were similar to Study 1. The main difference was that we used the paradigm developed by Dreisbach and Goschke (2004). Figure 2 provides a schematic representation of the task. Participants initially categorize target stimuli in a specific color while ignoring distracter stimuli in a different color. After this, participants have to categorize stimuli in a new target color, while distracters appear in the former target color. During this second stage, difficulties in disengaging from the old task goal presumably reflect perseveration tendencies.

Participants performed the task during three separate runs. Each run consisted of two stages of respectively 40 and 20 trials. During each run, we manipulated intention focus. The instructions were parallel to those we used in Study 1. Only this time, instead of focusing on the colors of the words, participants in the strong intention focus were told to, “Focus consciously on the color you were asked to respond to and on recognizing characteristics like vowel/
consonant”. Likewise, instead of opening themselves to the colors, participants in the weak intention focus were told to, “Open yourself to the colors that you will see and for characteristics like vowel/consonant and let the right answer emerge in you”. The manipulation was otherwise identical to Study 1.

When the sequence contained digits the word ‘letter’ was replaced by ‘digit’ and the words ‘vowel’ and ‘consonant’ by ‘odd’ and ‘even’. Participants were informed about the task switch after the first stage. Feedback was provided only during the first 22 training trials. After Dreisbach and Goschke (2004), whether the stages contained trials consisting of digits or numbers was randomly varied between participants; half of the participants completing only the digit task, the other half completing only the letter task.

During each trial, two digits (2, 3, 4, 5, 6, 7, 8, or 9; in olive, purple or grey colors) or two letters (A, E, O, U, K, M, R, or S; in red, yellow or blue) were presented simultaneously above each other in two different colors. This led to twelve possible sequences of target and distracter colors (six for letters and six for digits). These twelve sequences were equally counterbalanced between participants. Participants had to respond only to the digit or letter in the target color and to categorize it as even or odd, or as a vowel or a consonant by pressing the “A” or the “6” on the keyboard. Participants had to ignore the simultaneously presented letter or digit in the distracter color.

During compatible trials, the two digits or letters required the same response (e.g., both letters were vowels). During incompatible trials, the two digits or letters required different responses (e.g. the distracter was a vowel and the target was a consonant). Each trial started with a fixation cross that remained on screen for 250 ms, followed by the digits or letters that remained on the screen until a response was given. After participants gave a response, a blank screen was displayed for 500 ms before a new trial started.

Results

**Categorization task**

Data of six colorblind participants (9.8 % of the entire sample) were discarded, and data of three participants (4.9 % of the entire sample) were not analyzed because of a programming error. Similar to Dreisbach and Goschke (2004), the analysis yielded no effects of our design factors on error rates. We therefore report only the effects for participants’ response times. Response times below 150 ms and above 2,000 ms were excluded from analysis, as were errors (6 % of all trials). The most theoretically meaningful comparison was between mean response times during the remaining five trials immediately before the task goal switch (the last five compatible as well as the last five incompatible trials of the first stage) and mean response times during the remaining five trials immediately after the task goal switch (the first five compatible as well as the first five incompatible trials of the second stage). We made this comparison separately for compatible and incompatible trials.

Unexpectedly, we only found effects of action versus state orientation for the first two tasks, and the effect diminished during the third task. Although we did not a priori predict this pattern, prior research has found that the importance of action orientation decreases as cognitive tasks become more well-rehearsed, and presumably less in need of proactive control (see Jostmann and Koole 2007, Study 2, on practice effects). The absence of a main effect of perseveration in the third block supports the notion that practice effects became more potent at this stage, $F(1, 55) = 2.11, p = .15, \eta_p^2 = .037$. Moreover, the relevant three-way interaction between orientation (action- vs. state; between subjects), intention focus (weak vs. strong; between subjects) and stage (before vs. after task switch; within participants) was not significant for incompatible trials $F(1, 55) = 1.72, p = .20, \eta_p^2 = .03$. We therefore concentrate on the results for the first two tasks.

We subjected response times to a 2 (orientation: action- vs. state; between subjects) × 2 (intention focus: weak vs. strong; between subjects) × 2 (stage: before vs. after task switch; within participants) × 2 (trial type: compatible vs. incompatible; within participants) ANOVA. This analysis yielded a three-way interaction between orientation, intention focus, and task interval, $F(1, 55) = 4.46, p = .04, \eta_p^2 = .08$, qualified by the predicted four-way interaction between orientation, intention focus, task interval and trial type, although marginally significant, $F(1, 55) = 3.42, p = .07, \eta_p^2 = .06^2$. Relevant means are displayed in Table 2.

**Distractibility**

We first turned to distractibility effects, which we computed by subtracting average response times in compatible trials from average response times in incompatible trials. Higher numbers indicate a greater slow-down during incompatible (versus compatible) trials, and thus distractibility by information that is incompatible with the task goal. Recall that, according to the over-maintenance hypothesis, a strong (rather than weak) intention focus should lower distractibility among state-oriented participants. Moreover, this

---

2 In Study 2, a parallel analysis with action orientation as a continuous variable yielded a significant interaction between intention focus and action orientation on perseveration, $F(1, 55) = 5.78, p = .02, \eta_p^2 = .10$. 

---
effect should mainly occur during the first stage of the Dreisbach and Goschke (2004) task, which was relatively easy and hence more sensitive to automatic goal shielding (Shah et al. 2002).

In the first stage of the task (i.e., before the change in task goal), we found the predicted orientation by intention focus interaction, $F(1, 55) = 4.01$, $p = .05$, $\eta^2_p = .07$. This interaction is graphically displayed in Fig. 3. State-oriented participants displayed less distractibility under strong (rather than weak) intention focus, $F(1, 55) = 4.49$, $p = .04$, $\eta^2_p = .08$. Conversely, action-oriented participants displayed somewhat more distractibility with strong (rather than weak) intention focus, although the latter effect was not significant, $F(1, 55) = .61$, $p = .44$, $\eta^2_p = .01$. Another way to interpret these data is to note that, in the strong intention focus condition, state-oriented participants displayed significantly less distractibility than action-oriented participants, $F(1, 55) = 4.59$, $p = .04$, $\eta^2_p = .08$. In the weak intention focus condition, the difference in distractibility between action- and state-oriented participants was not significant, $F(1, 55) = .58$, $p = .45$, $\eta^2_p = .01$. During the second stage of the task (i.e., after the task goal had changed), there were no significant effects of intention focus or orientation, $p s > .38$.

**Perseveration**

We next turned to perseveration effects. In Dreisbach and Goschke’s (2004) experiments, perseveration effects were observed for incompatible trials, but not for compatible trials. Thus, we ran separate analyses for each trial type. For compatible trials, there was a significant two-way interaction between orientation and task interval, $F(1, 55) = 4.96$, $p = .03$, $\eta^2_p = .08$. Action-oriented participants were faster to respond before the switch ($M = 582$, $SD = 80$) than after the switch ($M = 611$, $SD = 114$). State-oriented participants, on the other hand, were slower to respond before the switch ($M = 615$, $SD = 115$) than after the switch ($M = 599$, $SD = 103$). The latter effect was unexpected, so we are cautious to interpret it here. There were no other significant main or interaction effects $p > .54$ for compatible trials.

For incompatible trials, there was a significant three-way interaction between orientation, intention focus, and task interval, $F(1, 55) = 7.13$, $p = .01$, $\eta^2_p = .12$ (see footnote 4). To facilitate interpretation, we subtracted response times to incompatible trials before the change in task goals from response times to incompatible trials after the change in task goals. The resulting values represent perseveration effects for incompatible trials. For convenience, we refer to these values as simply ‘perseveration’. The interaction between orientation and intention focus is graphically displayed in Fig. 4. Follow-up tests revealed that strong (rather than weak) intention focus led state-oriented participants to display more perseveration, $F(1, 55) = 10.27$, $p = .002$, $\eta^2_p = .16$. Conversely, strong (rather than weak) intention focus led action-oriented

### Table 2

| Intention focus | Compatible First block $M$ (SD) | Second block $M$ (SD) | Incompatible First block $M$ (SD) | Second block $M$ (SD) | Perseveration Effect Compatible $M$ (SD) | Incompatible $M$ (SD) |
|-----------------|---------------------------------|-----------------------|----------------------------------|-----------------------|------------------------------------------|-----------------------|
| **Strong**      |                                 |                       |                                  |                       |                                          |                       |
| Action-oriented | 597.64 (84.74)                  | 629.45 (111.59)       | 630.97 (90.99)                   | 647.47 (112.59)       | 31.81 (65.02)                            | 16.50 (74.68)         |
| State-oriented  | 639.72 (133.99)                 | 624.94 (117.29)       | 611.09 (108.85)                  | 679.29 (128.46)       | -14.78 (86.84)                           | 68.21 (81.21)         |

**Weak**

| Action-oriented | 559.25 (70.57)                  | 583.49 (117.18)       | 567.46 (87.29)                   | 606.06 (113.45)       | 24.25 (82.14)                            | 38.60 (97.71)         |
| State-oriented  | 590.06 (90.34)                  | 573.04 (82.34)        | 622.74 (114.69)                  | 600.10 (78.39)        | -17.02 (65.05)                           | -22.64 (83.92)        |

---

$^a$ N = 16, $^b$ N = 16, $^c$ N = 11, $^d$ N = 16

---

![Graph](image)
participants to display somewhat less perseveration, although the latter effect was not significant, $F(1, 55) = .50, p = .49, \eta^2_p = .01$. Another way to interpret this pattern is to note that, when intention focus was strong, state-oriented participants displayed marginally more perseveration than action-oriented participants, $F(1, 55) = 3.33, p = .07, \eta^2_p = .06$. By contrast, when intention focus was weak, state-oriented participants displayed marginally less perseveration than action-oriented participants, $F(1, 55) = 3.80, p = .056, \eta^2_p = .07$.

**Mood**

We conducted a $2 \times 2 \times 2$ (orientation) ANOVA on participants’ global mood scores. This analysis yielded only a main effect of time of measurement, $F(1, 55) = 3.97, p = .05, \eta^2_p = .07$. Participants had a slightly more negative mood after the task ($M = 1.91, SD = .43$) compared to before the task ($M = 1.80, SD = .43$). As in Study 1, mood scores in Study 2 remained close to the conceptual midpoint of the 4-point Likert scales that were used. Thus, participants’ average moods remained neutral throughout Study 2. Importantly, when we included negative mood changes as a covariate in our statistical analyses of the perseveration task, the effects of intention focus and orientation remained unchanged. In short, there was no indication that the findings in Study 2 were mediated by mood.

**Discussion**

In Study 2, we examined the effects of action-state orientation and intention focus on a task-switching paradigm (Dreisbach and Goschke 2004). The results show that a change in task goals strongly influenced the effects of intention focus on action- versus state-oriented participants. Before the switch in task goals, participants had to simply categorize letters or numbers that were accompanied by distracting information. In this relatively simple task context, focusing strongly (rather than weakly) on the task goal led state-oriented participants to become less distracted by information that was incompatible with the task goal. This goal shielding effect (Shah et al. 2002) indicates that our intention focus manipulation indeed led state-oriented to focus more strongly on the task goal. When the task goal changed, state-oriented people no longer displayed goal shielding. Presumably, the change in task goals led state-oriented participants to switch towards more effortful processing, which inhibited automatic goal shielding. The restriction of goal shielding to low-effort tasks also explains why state-oriented participants did not display goal shielding in the incongruent Stroop trials of Study 1.

After a new task goal was introduced, however, strong intention focus led state-oriented people to display more perseverance of the old task goal. This pattern of low distractibility before the goal change and high perseveration after the goal change is consistent with the over-maintenance hypothesis. Presumably, focusing on intentions leads state-oriented people to strongly activate linguistic representations of the task goal, which led to low distractibility in the initial task, when just a single goal was relevant. However, after the task goal had changed, state-oriented people found it difficult to release their old task goal. Another way of interpreting this pattern is to state that increased intention focus led state-oriented participants to display reduced distractibility, as indicated by reduced interference from incompatible information. However, this reduction in distractibility came at the cost of increased rigidity, in the form of increased perseveration of old task sets.

There was a trend for action-oriented participants to display less goal shielding (i.e., more distractibility) when they focused more strongly on their intentions. The latter trend may seem counterintuitive. However, it should be noted that goal shielding is theoretically a relatively automatic mechanism, which is presumably not driven by higher volitional processes. For instance, Stroebe et al. (2013) showed that goal shielding can lead people to become sidetracked from their long-term goals (i.e., maintaining a healthy diet, is presumably volitional for most people) by short-term hedonic goals (i.e., indulging in junk food). To prevent such goal conflicts, action-oriented people may rely more on higher-level volitional processes when they are actively focusing on their intentions. This approach invoked the cost of increased distractibility among action-oriented people when only a single goal was...
relevant (i.e., before the change in task goals). After the change in task goals, however, the approach of action-oriented people paid off in terms of reduced perseveration of old task goals.

**Meta-analysis of studies 1–2**

Although the patterns in Studies 1–2 were consistent with expectations and the predicted interaction effects were significant, the observed contrasts were not always statistically reliable. Moreover, both studies had relatively low numbers of participants per cell, and hence low statistical power to detect moderately strong effects. To address this problem, we conducted a meta-analysis of the central findings of both studies. Although the tasks we used in the two studies differed in many particulars, they both included trials in which participants had to use proactive control to execute difficult actions. In Study 1, the theoretically relevant trials were those involving Stroop interference; in Study 2, the theoretically relevant trials were those involving perseveration effects.

We obtained average Stroop interference effects from Study 1, and average perseveration effects of incompatible trials from Study 2. To ensure comparability across tasks, we standardized these outcome variables. Preliminary analyses showed no effects of type of task, $p > .89$, so we combined scores on the two tasks into a single measure of volitional action control. On the resulting values, we performed a 2 (orientation: action vs. state; between subjects) × 2 (intention focus: weak versus strong; between subjects) ANOVA. This analysis yielded the predicted interaction between orientation and focus, $F(1, 113) = 11.36$, $p = .001$, $\eta^2_p = .09$.

We proceeded by examining the effects separately for action- and state-oriented people. State-oriented participants showed poorer action control in the strong intention focus condition than in the weak intention focus condition, $F(1, 113) = 5.82$, $p = .02$, $\eta^2_p = .05$. By contrast, action-oriented participants showed better action control in the strong intention focus condition than in the weak intention focus condition, $F(1, 113) = 5.57$, $p = .02$, $\eta^2_p = .05$. Another way to interpret the intention focus by action control interaction is to note that performance of action- and state-oriented people differed by intention focus. In the strong intention focus condition, state-oriented participants displayed less effective action control than action-oriented participants, $F(1, 113) = 9.61$, $p = .002$, $\eta^2_p = .08$. By contrast in the weak intention focus condition, state-oriented participants displayed marginally more effective action control than action-oriented participants, $F(1, 113) = 2.87$, $p = .09$, $\eta^2_p = .03$.

**General discussion**

In the present research, we took a closer look at the role of intentions in action control. To this end, we experimentally manipulated how strongly people focused on their intentions and examined how this influenced their capacity to execute actions of varying levels of difficulty in a Stroop task (Study 1) and a task-switching paradigm (Study 2). The results showed that the effects of intention focus were strongly moderated by action versus state orientation. Among action-oriented people, stronger intention focus led to less efficient execution of difficult actions. Among state-oriented people, however, stronger intention focus led to less efficient execution of difficult actions. Focusing on intentions may thus facilitate or impair action control, depending on whether people are action- versus state-oriented.

One explanation for the present findings might be that leading people to focus on their intentions heightens arousal. Conceivably, an increase in arousal might push state-oriented people to “choke under pressure” (Heckhausen and Strang 1988; see also Baumeister and Shibley 1986; Beilock and Carr 2005), whereas action-oriented individuals might need this kind of stimulation as a motivational incentive. However, participants’ self-reports indicated generally modest levels of arousal throughout the present studies, and no hint of any changes in arousal or mood among our participants that could explain their performance differences. Furthermore, there were no effects of intention focus or action versus state orientation on a behavioral marker of arousal, namely, facilitation of routine actions in Study 1 (i.e., Stroop facilitation, see Eysenck et al. 2007; Hull 1943; Pelham and Neter 1995). Consequently, each of the tests that we conducted of the arousal hypothesis came up with negative results.

In our view, the present findings are best explained by differences in the cognitive maintenance of intentions between action- versus state-oriented people. According to the over-maintenance hypothesis, state-oriented people are less able than action-oriented people to connect their intentions to implicit (procedural) knowledge structures that enable the flexible execution of difficult actions. As a consequence, state-oriented people maintain their intentions in a narrow, purely linguistic format that inhibits the behavioral enactment of intentions. The over-maintenance hypothesis predicts that, among state-oriented people, focusing more on intentions paradoxically makes it harder to flexibly enact the intention. Among action-oriented people, intentions are presumably supported by implicit (procedural) knowledge structures, so that focusing on intentions does facilitate action control.

The general pattern of findings in the present two studies is consistent with the over-maintenance hypothesis.
Moreover, Study 2 provided more detailed insight into the nature of over-maintenance processes among state-oriented individuals. In the latter study, intention focus led state-oriented people to display less distractibility, at least, as long as the task goal remained unchanged. With a change in task goal, however, state-oriented people lost this advantage and instead displayed greater interference by their old task goal in their new task. It thus appears that state-oriented people form more rigid links between a goal and stimuli that are relevant to the enactment of the goal. This narrow format of state-oriented people’s intentions presumably allows them more effectively encode goal-relevant information in linguistic terms. However, this linguistic encoding process is relatively inflexible, and cannot be easily deactivated. Furthermore, this linguistic encoding process is incapable of overcoming strong over-learned behavior tendencies, as evidenced by our findings in Study 1’s Stroop task.

The present research is not without limitations. First, the present studies were conducted in a laboratory setting. Prior research suggests that action orientation moderates enactment of intentions in real life settings, such as work (Diefendorff et al. 2000), sports (Heckhausen and Strang 1988), and health behavior (Palfai 2002). In such settings, it would be useful to know if intention focus moderates the effects of action versus state orientation. Second, the present studies were mostly oriented towards understanding action-control deficits among state-oriented people. As a result, we devoted less attention to the question how action-oriented people maintain high levels of flexibility in intentional action control. Kuhl (2000) has suggested that action-oriented people may release volitional inhibition through up-regulation of positive affect. These affect regulation processes presumably operate largely intuitively, on implicit levels (Jostmann et al. 2005; Koole and Fockenberg 2011; Koole and Jostmann 2004). The relatively coarse self-report mood measures that we used in the present research were probably not sensitive enough to detect such intuitive affect regulation processes. Future research should therefore examine the interplay between over-maintenance and intuitive affect regulation.

Although many questions remain, the present research provides some of the most direct evidence to date that merely focusing on an intention does not automatically warrant that this intention will be translated into action. This point is of great theoretical significance, because traditional expectancy-value models of human motivation have neglected the processes that allow for the implementation of motivational tendencies (Greve 2001; Heckhausen and Kuhl 1985; Kuhl 1987). Likewise, models of goal setting (Locke and Latham 1990) and goal priming (Custers and Aarts 2010; Shah et al. 2002) have assumed that the linguistic representation of a goal is directly linked to behavioral processes of goal implementation. If the latter theoretical models were correct, then focusing on an intention should facilitate action control for everyone. However, the present findings showed that focusing on an intention had the opposite effect among state-oriented people. The implication is that people may fail to act upon their goals even when their goals are the first and foremost thing on their mind. Indeed, people may sometimes fail to act upon their goals because their goals are the first thing on their mind. Ironically, thinking about a goal may sometimes (for some people) interfere with people’s capacity to act upon this very goal.

References

Achtziger, A., Gollwitzer, P. M., & Sheeran, P. (2008). Implementation intentions and shielding goal striving from unwanted thoughts and feelings. Personality and Social Psychology Bulletin, 34(3), 381–393. doi:10.1177/1098016107309328.

Austin, J. T., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process, and content. Psychological Bulletin, 120(3), 338. doi:10.1037/0033-2909.120.3.338.

Baumann, N., Kaschel, R., & Kuhl, J. (2005). Striving for unwanted goals: stress-dependent discrepancies between explicit and implicit achievement motives reduce subjective well-being and increase psychosomatic symptoms. Journal of Personality and Social Psychology, 89(5), 781. doi:10.1037/0022-3514.89.5.781.

Baumeister, R. F., & Showers, C. J. (1986). A review of paradoxical performance effects: Choking under pressure in sports and mental tests. European Journal of Social Psychology, 16(4), 361–383. doi:10.1002/ejsp.2420160405.

Beilock, S. L., & Carr, T. H. (2005). When high-powered people fail working memory and “choking under pressure” in math. Psychological Science, 16(2), 101–105. doi:10.1111/j.0956-7976.2005.00789.x.

Beokaerts, M., & Otten, R. (1993). Handlungskontrolle und Lernanstrangung im Schulunterricht. Zeitschrift für Pädagogische Psychologie, 7(2/3), 109–116.

Braver, T. S., Gray, J. R., & Burgess, G. C. (2007). Explaining the many varieties of working memory variation: Dual mechanisms of cognitive control. In A. R. A. Conway, C. Jarrod, M. J. Kane, A. Miyake, & J. N. Towse (Eds.), Variation in working memory (pp. 76–106). Oxford: Oxford University Press.

Brehm, J. W., & Self, E. A. (1989). The intensity of motivation. Annual Review of Psychology, 40(1), 109–131. doi:10.1146/annurev.ps.40.020189.000545.

Custers, R., & Aarts, H. (2010). The unconscious will: How the pursuit of goals operates outside of conscious awareness. Science, 329, 47–50. doi:10.1126/science.1185895.

Diefendorff, J. M. (2004). Examination of the roles of action-state orientation and goal orientation in the goal-setting and performance process. Human Performance, 17, 375–395. doi:10.1207/s15327043hup1704_2.

Diefendorff, J. M., Hall, R. J., Lord, R. G., & Strean, M. L. (2000). Action-state orientation: Construct validity of a revised measure and its relationship to work-related variables. Journal of Applied Psychology, 85, 250–263. doi:10.1037/0021-9010.85.2.250.

Diefendorff, J. M., Richard, E. M., & Gosserand, R. (2006). Examination of situational and attitudinal moderators of the hesitation and performance relation. Personnel Psychology, 59, 365–393. doi:10.1111/j.1744-6570.2006.00641.x.
Shah, J. Y., Friedman, R., & Kruglanski, A. W. (2002). Forgetting all else: On the antecedents and consequences of goal shielding. *Journal of Personality and Social Psychology, 83*, 1261–1280. doi:10.1037/0022-3514.83.6.1261.

Smilek, D., Enns, J. T., Eastwood, J. D., & Merikle, P. M. (2006). Relax! Cognitive style influences visual search. *Visual Cognition, 14*, 543–564. doi:10.1080/13506280500193487.

Song, Z., Wanberg, C. R., Niu, X., & Xie, Y. (2006). Action-state orientation and the theory of planned behavior: A study of job search in China. *Journal of Vocational Behavior, 68*, 490–503. doi:10.1016/j.jvb.2005.11.001.

Stroebe, W., Van Koningsbruggen, G. M., Paping, E. K., & Aarts, H. (2013). Why most dieters fail but some succeed: A goal conflict model of eating behavior. *Psychological Review, 120*(1), 110–138.

Stroop, J. R. (1935). Studies of interference in serial verbal reaction. *Journal of Experimental Psychology, 18*, 643–662. doi:10.1037//0096-3445.121.1.1.

Veling, H., & Van Knippenberg, A. (2006). Shielding intentions from distraction: Forming an intention induces inhibition of distracting stimuli. *Social Cognition, 24*(4), 409–425. doi:10.1521/soco.2006.24.4.409.

Veling, H., & Van Knippenberg, A. (2008). Intention formation induces episodic inhibition of distracting stimuli. *Acta Psychologica, 128*(1), 45–55. doi:10.1016/j.actpsy.2007.09.010.

Zanini, S., Rumiati, R. I., & Shallice, T. (2002). Action sequencing deficit following frontal lobe lesion. *Neurocase, 8*, 88–99. doi:10.1076/neur.8.1.8.