Political Ideology and Executive Functioning: The Effect of Conservatism and Liberalism on Cognitive Flexibility and Working Memory Performance

Bryan M. Buechner[1] ⊙, Joshua J. Clarkson[1], Ashley S. Otto[2],
Edward R. Hirt[3], and M. Cony Ho[4]

Abstract

Although models of political ideology traditionally focus on the motivations that separate conservatives and liberals, a growing body of research is directly exploring the cognitive factors that vary due to political ideology. Consistent with this emerging literature, the present research proposes that conservatives and liberals excel at tasks of distinct working memory processes (i.e., inhibition and updating, respectively). Consistent with this hypothesis, three studies demonstrate that conservatives are more likely to succeed at response inhibition and liberals are more likely to succeed at response updating. Moreover, this effect is rooted in different levels of cognitive flexibility and independent of respondents' demographics, intelligence, religiosity, and motivation. Collectively, these findings offer an important perspective on the cognitive factors that delineate conservatism and liberalism, the role of cognitive flexibility in specific working memory processes, and the impact of political ideology on a multitude of behaviors linked to inhibition and updating (e.g., creativity, problem-solving, self-control).

Political ideology reflects a specific set of ethical ideals, principles, and doctrines that explain the basis by which society should function (Jost et al., 2009). Traditionally, models of political ideology focus on the motivational differences that drive the ideologies of conservatives and liberals (Altemeyer, 1998; Jost et al., 2003; Stenner, 2005). Yet political ideology is not defined solely by motivation (Jost, 2006), as political ideology is impacted by cognitive factors such as categorization (Zmigrod et al., 2018), metacognitive sensitivity (Rollwage et al., 2018), and intellectual humility (Zmigrod, Zmigrod, et al., 2019). Building on this latter work, the present research proposes an underlying cognitive difference in the mental flexibility of conservatives and liberals that directly impacts their executive functioning in the form of working memory.

Working Memory Processes

Working memory is a multifunction system comprised of complementary processes that facilitate the temporary storage and updating of information and regulate attentional control during various mental processes (Baddeley, 1986). Although the specific number of processes is debated, research clearly distinguishes between two key processes: inhibition and updating (Engle et al., 1999; Miyake et al., 2000).[1]

Inhibition is the ability to override thoughts and behaviors that interfere with existing information, whereas updating is the ability to revise working memory representations based on relevant information (Baddeley, 1986; Diamond, 2013; Miyake et al., 2000). Importantly, these processes—though complementary—are independent; they load on separate factors (Miyake et al., 2000) and activate different brain regions (Garavan et al., 1999).

This independence is important, as individuals can excel at one process but not necessarily the other. Consistent with this intuition, we hypothesize that political ideology is linked not

[1] University of Cincinnati, OH, USA
[2] Baylor University, Waco, TX, USA
[3] Department of Psychological and Brain Sciences, Indiana University, Bloomington, IN, USA
[4] Clemson University, SC, USA

Corresponding Author:
Bryan M. Buechner, University of Cincinnati, 2906 Woodside Drive, Cincinnati, OH 45221, USA.
Email: buechnbm@mail.uc.edu

to better working memory in general but rather to these specific functions of working memory. That is, we predict conservatives and liberals are more likely to perform well at tasks of inhibition and updating, respectively. The basis for this hypothesis is rooted in the cognitive flexibility of conservatives and liberals.

Cognitive Flexibility

Cognitive flexibility is critical in restructuring, adapting, and updating mental processes in response to external stimuli (Ionescu, 2012; Martin & Rubin, 1995; Van Heil et al., 2016). Cognitively rigid individuals rely on perseverance and conditioning for learning, maintain fixed mental representations of objects, and exploit active strategies at the expense of alternatives when problem-solving, whereas cognitively flexible individuals test new rules when learning, maintain fluid mental representations of objects, and explore multiple strategies when problem-solving (see Maddox & Markman, 2010).

Interestingly, findings across a variety of domains suggest that conservatives and liberals vary in their cognitive flexibility. Specifically, liberals appear to be cognitively flexible; they are open to new experiences (Carney et al., 2008), socially adaptable (Hirsh et al., 2010), egalitarian (Jost et al., 2009), novelty seekers (Carney et al., 2008), and unpredictable in their actions (Tomkins, 1963). Conversely, conservatives appear to be cognitively rigid; they are persistent at impulse regulation (Clarkson et al., 2015), norm-adherent (Gosling et al., 2003), resistant to change (Jost et al., 2009), rule-adherent (Altemeyer, 1998), and perceive greater control over their actions (Rigoni et al., 2012). Indeed, work links cognitive rigidity to traits associated with political conservatism (authoritarianism, nationalism, and system justification; Zmigrod et al., 2018).

Critical to the present research, this difference in cognitive flexibility is proposed to impact performance on tasks that require inhibition and updating. Although research has linked cognitive flexibility to executive functioning more broadly (Diamond, 2013; Ionescu, 2012; Rougier et al., 2005), we propose that the cognitive flexibility of conservatives and liberals directly impacts their ability to engage in these select working memory processes. Specifically, the traits that reinforce cognitive rigidity in conservatives (e.g., rule adherence, resistance to change) should promote response inhibition by facilitating persistence through suppression of conflicting stimuli. Conversely, the traits that reinforce cognitive flexibility in liberals (e.g., openness, adaptability) should promote response updating by facilitating adaptation through suppression of outdated information. Collectively, then, conservatives and liberals are hypothesized to perform well at tasks of inhibition and updating, respectively, due to their respective difference in cognitive flexibility.

Overview

Using direct (Study 1) and indirect (Studies 2 and 3) measures of working memory, we assessed the extent to which

performance on tasks that require inhibition and updating varied as a function of political ideology. Moreover, we examined the extent to which the findings stem from differences in cognitive flexibility (Study 3). Importantly, given documented associations between political ideology and individual demographics (e.g., Brandt et al., 2014; Chambers et al., 2013; Naumann et al., 2016; Rindermann et al., 2012), we controlled for respondent demographics (see Table 1) to isolate the unique influence of political ideology across studies.

All studies received approval from an institutional review board. Target samples were based on a priori power analyses (power of .8, small–medium effect sizes, an α level of .05; Faul et al., 2007). Exclusion criteria were as follows: any participants who failed attention checks (Oppenheimer et al., 2009) or failed to adhere to procedures (Curran, 2016). Additionally, a captcha security measure was used to minimize undue influences (e.g., bots) when using online samples (Studies 2 and 3), and participants were paid a fair wage for their time (Goodman & Paolacci, 2017).[2] Full details of our manipulations, measures, and covariates are specified in the supplement.

Study 1

Study 1 consisted of two studies conducted at separate time points that tested whether conservatives and liberals perform differentially on tasks of inhibition (Study 1a) and updating (Study 1b). Specifically, participants completed a task of either inhibition (inhibition of return [IOR] task; Posner & Cohen, 1984) or updating (keeping-track task; Yntema & Mueser, 1962), as these well-documented tasks have been directly linked to each process (Engle et al., 1999; Klein, 2000).

Study 1a

Method

One hundred fifteen undergraduates at a Midwestern University in the United States were recruited for a study on attention regulation. Eight participants were removed for having response times 1.5 standard deviations (*SD*s) above the mean on the target trials, following the recommendations of Peck and Devore (2012), and two participants were removed for failing to follow instructions (Curran, 2016), which resulted in a final sample of 105 undergraduates (51% female; $M_{age} = 20.55$).

After being welcomed to the study, participants were presented with the IOR task (Posner & Cohen, 1984) as our assessment of inhibition, as it requires respondents to fixate on a target cue while ignoring distracting stimuli. Specifically, the IOR instructs participants to respond to a target cue (a "GO" sign) as quickly as possible while ignoring an uninformative cue presented randomly (an "X"). Two boxes are shown on participants' computer screens. On each trial, the initial cue appears inside one box followed by the target cue in the same or opposite box. When the target cue appears, participants are instructed to respond by pressing the corresponding letter on their keyboard as quickly and accurately as possible (i.e., A for

Table 1. Sample Demographics Across Studies.

Demographic Variable	Study 1a	Study 1b	Study 2	Study 3	Supplemental
Age	20.55	20.20	35.70	33.71	38.40
Gender					
Male (%)	47.6	63.6	54.9	34.8	51.5
Female (%)	50.5	36.5	44.1	64.7	48.5
Race					
African American (%)	10.5	4.2	10.8	8.7	8.9
Caucasian (%)	77.1	85.4	71.8	74.4	82.2
Asian (%)	3.8	7.3	11.8	8.2	4.7
Hispanic (%)	3.8	1.0	4.6	7.2	3.6
Other (%)	4.8	2.1	1.0	1.4	0.6
Education level					
Some high school (%)	—	—	0.5	1.9	1.2
Completed high school (%)	—	—	11.3	7.7	6.5
Some college (%)	—	—	22.1	30.4	20.7
Completed college (%)	—	—	40.5	42.5	52.1
Some graduate school (%)	—	—	7.2	5.3	7.1
Completed graduate school (%)	—	—	18.5	12.1	12.4
Annual personal income					
Under $25,000 (%)	—	—	15.9	19.8	10.1
$25,000–$49,999 (%)	—	—	27.2	23.2	30.8
$50,000–$74,999 (%)	—	—	18.5	22.7	27.8
$75,000–$99,999 (%)	—	—	21.0	12.6	11.2
$100,000–$124,999 (%)	—	—	7.2	8.2	8.3
$125,000–$149,999 (%)	—	—	5.6	3.9	5.9
$150,000 or greater (%)	—	—	2.1	5.8	3.6
Prefer not to answer (%)	—	—	2.6	3.9	2.4

Note. Studies 1a and 1b used undergraduates, whereas Studies 2 and 3 and the Supplemental Study used U.S. and Canadian online participants.

when the cue appears in the box on the left or L for when the cue appears in the box on the right). Participants completed 100 trials, with the average response latency serving as our index of performance (Posner & Cohen, 1984; for a review, see Kardes et al., 2019).

Upon completing the task, participants indicated demographics (gender, age, and race) and our measure of political ideology on a 7-point scale anchored from *very liberal* to *very conservative* (Knight, 1999; see Jost, 2006), before being debriefed and thanked.

Results

We performed an inverse transformation on the response latency data (Fazio, 1990), such that higher values indicate faster responses. The transformed data were submitted to a linear regression, with political ideology (continuous, mean-centered) as the predictor.

The analysis revealed a significant relationship between political ideology and response latency, $b = 0.084$, $SE = .042$, $t(96) = 1.987$, $p = .050$, 95% confidence interval (CI) $= [0.000, 0.168]$; conservatives displayed better performance (i.e., faster response times) than their liberal counterparts.[3] Moreover, analysis of accurately identifying the target cue failed to reveal a significant relationship, $b = -0.001$, $SE = .003$, $t(95) = 0.370$, $p = .712$, 95% CI $[-0.004, 0.006]$.

Conservatives' faster response latencies, then, were not due to inaccurate responding.

Study 1b

Method

One hundred one undergraduates at a Midwestern University in the United States were recruited for a study on attention regulation. Five participants were removed for having accuracy scores 1.5 *SD*s below the mean (Peck & Devore, 2012), which resulted in a final sample of 96 participants (64% male; $M_{age} = 20.20$).

After being welcomed to the study, participants were presented with the keeping-track task (Yntema & Mueser, 1962) as our assessment of updating, as it requires respondents to constantly update their mental representations of a target cue. Specifically, participants are asked to focus on multiple categories (animals, colors, countries, distances, metals, and relatives). They are then shown a list of words one at a time from the categories, asked to retain only the last exemplar from each category, and recall the most recent exemplar (i.e., the target cue) when asked. For instance, participants could be sequentially presented with the words "yellow," "Canada," "brother," "England," and "cow" and then asked to indicate the last country presented (here, the correct answer is England). Each trial exposed participants to a set of words within each of the six

possible categories in a serial and random order. Participants completed 45 trials in total, with the average accuracy of their responses across trials serving as our index of performance (Miyake et al., 2000).

Upon completing the task, participants indicated demographics (gender, age, and race) and their ideology before being debriefed and thanked.

Results

We performed a z-score transformation on the total number of correct responses before submitting the response accuracy data to a linear regression, with political ideology (continuous, mean-centered) as the predictor. The analysis revealed a significant relationship between political ideology and response accuracy, $b = -0.175$, $SE = .076$, $t(88) = -2.294$, $p = .024$, 95% CI $[-0.326, -0.023]$; liberals displayed better performance (i.e., more correct responses) than their conservative counterparts. Moreover, analysis of the average amount of time participants took to respond across trials failed to reveal a significant relationship, $b = -0.075$, $SE = .093$, $t(88) = -0.805$, $p = .423$, 95% CI $[-0.259, 0.110]$. Consequently, the accuracy by liberals was not due to slower response latencies.

Discussion

The findings of Study 1 offer initial evidence in support of our hypotheses: Conservatives perform better on a task of response inhibition (Study 1a), whereas liberals perform better on a task of response updating (Study 1b). Consequently, performance on tasks that require these different working memory processes systematically varies as a function of political ideology.

Study 2

Study 2 assessed the extent to which these performance differences are unique to political ideology. For instance, the complexity of updating might result from heightened intelligence, whereas the persistence of inhibition might result from heightened impulse regulation. This possibility is important as liberals are more open to experience (Carney et al., 2008) and openness is linked to elevated intelligence (Ackerman & Heggestad, 1997). Relatedly, conservatives tend to be more religious (Feldman & Johnston, 2014), and religiosity is positively correlated with impulse regulation (McCullough & Willoughby, 2009). Consequently, Study 2 assessed intelligence and religiosity to rule out any potential impact on political ideology. Furthermore, Study 2 manipulated inhibition and updating within the same task to minimize any confounds between tasks and to isolate these separate working memory processes through either the absence (inhibition) or presence (updating) of a rule change.

Method

Two hundred twenty American and Canadian Amazon Mechanical Turk respondents were recruited for a study on

perception. Nine participants were excluded for failing the bot check, 5 participants for failing to follow instructions, and 12 participants for failing the attention check, resulting in a final sample of 194 participants (55% male; $M_{age} = 35.70$).

Upon being welcomed to the study, participants were informed that they would be playing a version of Scrabble. Specifically, participants were instructed that they would be provided with a string of random letters and would have 30 s to list as many solutions as possible using the provided letters. Importantly, participants were further instructed that their responses had to be English words and could not include proper nouns (Clarkson et al., 2015). Participants then completed a practice puzzle with no restriction on the word length.

Following this practice puzzle, participants were randomly assigned to either the inhibition or updating condition. In both conditions, participants were instructed to use the provided letters to generate as many solutions as possible within a 30-s time frame. Importantly, however, the word length restriction for solutions was either kept the same across puzzles (inhibition condition) or varied across puzzles (updating condition). Specifically, those in the inhibition condition were instructed to list the same number of solutions for each puzzle, such that participants instructed to list only three-letter (four-letter) solutions for the first puzzle were then instructed to list only three-letter (four-letter) solutions for the second puzzle. Conversely, those in the updating condition were instructed to list a different number of solutions for each puzzle, such that participants instructed to list only three-letter (four-letter) solutions for the first puzzle were then instructed to list only four-letter (three-letter) solutions for the second puzzle. Consequently, the inhibition task required respondents to focus on a specific word length while avoiding solutions of alternative length across puzzles, whereas the updating task required respondents to modify the word length for correct solutions across puzzles.[4]

Upon receiving these instructions, participants completed two sequential puzzles. For each puzzle, participants were shown a series of letters along with boxes in which to type as many solutions as they could generate. After 30 s, the screen automatically advanced to an instruction slide that either kept the rule the same (inhibition condition) or changed the rule (updating condition). The average number of solutions generated across puzzles ($r = .61$, $p < .001$) served as our index of performance, with higher values indicative of greater performance.

After completing the puzzles, participants completed a brief filler task before indicating their intelligence and religiosity, with the order of scales randomized. To assess intelligence, participants completed an adapted version of the Wechsler Adult Intelligence Scale (Wechsler, 1997). This scale assesses global intelligence using multiple-choice questions that assess mathematical, verbal, and analytic aptitude. The total number of correct responses served as our index of intelligence ($\alpha = .74$; see Friedman et al., 2006).

To assess religiosity, participants completed a modified version of the Duke University Religion Index (Koenig & Büssing, 2010). The original index incorporates items related to
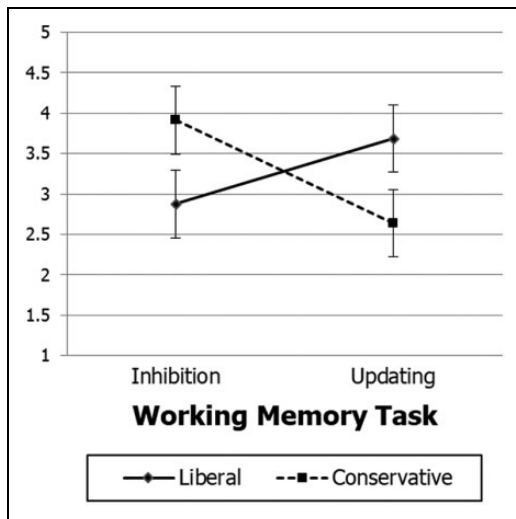
Figure 1. Number of correct solutions as a function of political ideology and working memory task. *Note.* Political ideology is plotted at ± 1 *SD* with 95% confidence intervals. Participants had 30 s to complete each puzzle, with the average number of solutions across puzzles shown here.

organized religious activities and intrinsic religiosity. For our purposes, we focused on the three original intrinsic religiosity items and included a fourth (i.e., "Overall, I would classify myself as a religious person."). Responses were provided on a 7-point scale anchored from *strongly disagree* to *strongly agree* and averaged ($\alpha = .95$), such that higher values indicated greater religiosity.

Finally, participants completed a series of demographics (age, gender, race, income, and education), their political ideology,[5] and an attention check before being debriefed, thanked, and compensated.

Results

The number of correct solutions was submitted to a hierarchical regression, with task ($0 = inhibition$, $1 = updating$) and ideology (continuous, mean-centered) as predictors in the first step (along with demographic variables, intelligence, and religiosity as covariates) and their interaction in the second step (Cohen et al., 2003).[6]

Analysis of the number of correct solutions across puzzles revealed a significant Task $\times$ Ideology interaction, $b = -0.570$, $SE = .159$, $t(180) = -3.588$, $p < .001$, 95% CI $[-0.884, -0.257]$ (see Figure 1). Conservatives generated more solutions than liberals in the inhibition task, $b = 0.306$, $SE = .127$, $t(85) = 2.40$, $p = .019$, 95% CI $[0.052, 0.559]$, whereas liberals generated more solutions than conservatives in the updating task, $b = -0.335$, $SE = .127$, $t(85) = -2.64$, $p = .010$, 95% CI $[-0.587, -0.083]$.[7,8]

Additionally, religiosity had no association with performance, $b = -0.027$, $SE = .089$, $t(181) = -0.307$, $p = .759$, 95% CI $[-0.202, 0.148]$, whereas intelligence had a positive association, $b = 1.789$, $SE = .649$, $t(181) = 2.758$, $p = .006$,

95% CI $[0.509, 3.069]$. Yet neither variable influenced the relationship between ideology and task performance.[9]

Discussion

As in Study 1, conservatives outperformed liberals on a task of response inhibition, whereas liberals outperformed conservatives on a task of response updating. Here, however, the findings were independent of intelligence and religiosity. Moreover, the working memory manipulation provided a direct comparison of performance by isolating inhibition and updating within the same task (rather than different tasks: see Study 1).

Study 3

Study 3 examined the extent to which the performance difference exhibited in the previous studies stems from different levels of cognitive flexibility in conservatives and liberals. Specifically, we propose that (i) liberals are more cognitively flexible than conservatives (Zmigrod et al., 2018; see Jost et al., 2003) and (ii) cognitive flexibility should enhance updating but undermine inhibition. We tested the entirety of this conceptual model in Study 3.

Method

Two hundred twenty American and Canadian Amazon Mechanical Turk participants were recruited for a study on perception. Seven participants were excluded for failing to follow instructions and six participants were excluded for failing our attention check, which resulted in a final sample of 207 participants (65% female; $M_{age} = 33.71$).

Upon being welcomed to the study, participants were informed that they would be provided with a grid of numbers and asked to identify patterns. This task set the foundation for our manipulation of response inhibition and updating. Specifically, participants were instructed to count the number of times an even number directly followed an odd number in a row. For instance, the number string 8 7 3 2 contains one instance where an even number follows an odd number (i.e., 2 follows 3). Moreover, participants were informed that each row in the grid was labeled with an example from various categories (e.g., fruits, animals, countries) and that they were instructed to only use rows labeled from a particular category. For instance, being provided the category animal, participants would identify rows with labels named after animals (e.g., horse, monkey). Participants were then presented a 10×20 number grid, provided the instructions again, and informed to complete the task as quickly and accurately as possible. Once they completed the task, they were instructed to enter their count on the subsequent screen.

Following this task, participants were randomly assigned to either the inhibition or updating condition. In both conditions, participants were instructed to count the number of times an even number follows an odd number in a row. However, participants were instructed to either again only use rows labeled

from the same category of animals (inhibition condition) or only use rows labeled from the different category of countries (updating condition). Consequently, participants had to attend to specific stimuli in each condition; however, the inhibition task required respondents to focus on the specific rule and avoid the different category labels, whereas the updating task required respondents to modify their existing rule by assimilating different category labels. Upon receiving these instructions, participants were again presented a 10×20 letter grid and informed to respond as quickly and accurately as possible. We assessed their count and the amount of time required to complete the task.

Participants then indicated their level of cognitive flexibility (Martin & Rubin, 1995). This 12-item scale assesses general cognitive flexibility (e.g., "I can communicate an idea in many different ways.") and cognitive rigidity (e.g., "I avoid new and unusual situations."). Responses were provided on a 6-point scale anchored from *strongly disagree* to *strongly agree* and averaged ($\alpha = .75$), such that higher values indicated greater flexibility.

Finally, participants indicated demographics (age, gender, race, income, and education), their political ideology, and an attention check before being debriefed, thanked, and compensated.

Results

Dependent measures were submitted to a hierarchical regression, with task (0 = *inhibition*, 1 = *updating*) and ideology (continuous, mean-centered) as predictors in the first step and their interaction in the second step (Cohen et al., 2003).

Accuracy

We created an accuracy index by calculating the absolute difference between the correct solution and participants' reported solution. This index allowed us to assess relative accuracy by considering the degree of inaccuracy. Correct solutions yielded a value of 0, and values decreased linearly with the relative degree of inaccuracy. Accuracy, then, was indexed by scores closer to 0.

Analysis of this index revealed a significant Task × Ideology interaction, $b = -0.439$, $SE = .161$ $t(194) = -2.730$, $p = .007$, 95% CI $[-0.756, -0.122]$ (see Figure 2). Consistent with the previous two studies, conservatives were more accurate than liberals in the *inhibition* task, $b = 0.260$, $SE = .118$, $t(97) = 2.194$, $p = .031$, 95% CI $[0.025, 0.494]$, whereas liberals were more accurate than conservatives in the *updating* task, $b = -0.247$, $SE = .111$, $t(90) = -2.216$, $p = .029$, 95% CI $[-0.468, -0.026]$.

Time

The amount of time participants spent on the number grid was transformed as in Study 1b (Fazio, 1990). Analysis revealed a main effect of task, $b = -0.007$, $SE = .003$, $t(204) = -2.140$,
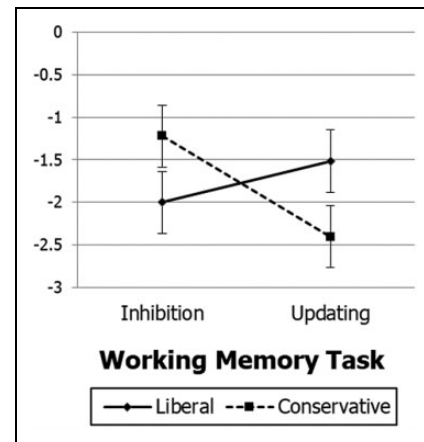

Figure 2. Accuracy as a function of political ideology and working memory task. *Note.* Political ideology is plotted at ±1 SD with 95% confidence intervals. Values closer to zero indicate greater accuracy.

$p = .034$, 95% CI $[-0.013, -0.001]$; participants took significantly longer in the updating ($M = 52.33$ s, $SD = 27.66$ s) relative to the inhibition ($M = 38.08$ s, $SD = 13.29$ s) task. The interaction, however, was not significant ($b = -0.001$, $p = .758$, 95% CI $[-0.004, 0.003]$), and thus, the accuracy interaction is not attributable to differences in time spent on the task.

Cognitive Flexibility

The cognitive flexibility index revealed the predicted main effect of political ideology, $b = -0.068$, $SE = .023$, $t(204) = -2.890$, $p = .004$, 95% CI $[-0.114, -0.022]$, such that liberals reported being more flexible than conservatives. The interaction was not significant ($b = 0.007$, $p = .884$, 95% CI $[-0.088, 0.102]$).

Mediation Analysis

As a direct test of our conceptual model, we constructed a 95% CI around the effect of ideology on accuracy as a function of cognitive flexibility at each level of task (Model 15; Hayes, 2018). This analysis of moderated mediation revealed a significant mediating pathway for both the inhibition (indirect effect = .069, 95% CI [0.011, 0.149]) and updating (indirect effect = -.067, 95% CI [-0.142, -0.015]) tasks (see Figure 3).

Discussion

Study 3 demonstrated that conservatives and liberals not only vary in their level of cognitive flexibility but that cognitive flexibility differentially predicted performance on tasks of inhibition and updating, which, in turn, mediated the effect of ideology on task performance.[10]

General Discussion

Although models of political ideology traditionally focus on key motivational differences that separate conservatives and
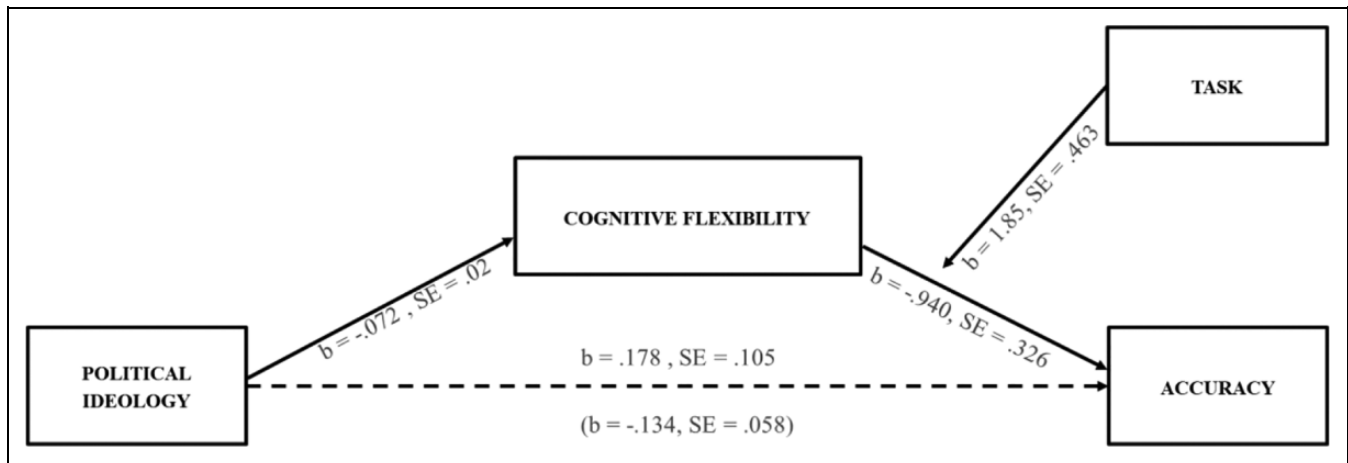
Figure 3. Moderated mediation model in Study 3.

Table 2. Overview of Procedures and Results Across Studies.

Study	N	Ideology Mean (of 7)	Regression Analysis	Task Coding	Standardized β	Covariates
1a	105	3.86	Linear: ideology (mean-centered, continuous) and covariates	Inhibition only	.213*	Age, gender, and race
1b	96	4.09	Linear: ideology (mean-centered, continuous) and covariates	Updating only	−.254*	Age, gender, and race
2	194	3.89	Hierarchical: task and ideology (continuous, mean-centered) as predictors in the first step (with covariates) and the interaction term in the second step	0 = *Inhibition*, 1 = *updating*	−.240**	Age, gender, race, income, education, intelligence, and religiosity
3	207	3.54	Hierarchical: task and ideology (continuous, mean-centered) as predictors in the first step (with covariates) and the interaction term in the second step	0 = *Inhibition*, 1 = *updating*	−.190**	Age, gender, race, income, and education
Supplemental	196	3.66	Hierarchical: task and ideology (continuous, mean-centered) as predictors in the first step (with covariates) and the interaction term in the second step	0 = *Inhibition*, 1 = *updating*	−.155*	Age, gender, race, income, and education

Note. Data from the article are available via the Figshare repository platform. Access to these files is available using the link included alongside this article. Data for the Supplemental Study are available on the Open Sciences Framework and accessible via the link (https://osf.io/pvk29/).
*$p < .05$. **$p < .01$.

liberals (Jost et al., 2009), recent work has elucidated key cognitive differences as well (Jost, 2017; Van Hiel et al., 2016; Zmigrod et al., 2018). The present work builds on this developing literature by documenting executive function differences in the form of response inhibition and updating. Of note, these effects replicated across different samples and different manipulations of inhibition and updating, and the findings were independent of factors critical to task performance (i.e., intelligence, motivation, and religiosity; see Table 2). Collectively, these findings offer a unique perspective to consider the cognitive differences that delineate conservatism and liberalism and the impact of cognitive flexibility on executive functioning while highlighting the importance of a nonpartisan perspective to ideology (Duarte et al., 2015) and an upside to cognitive rigidity (Ionescu, 2012).

Importantly, these results both inform the role of cognitive flexibility in working memory and converge with previous literature in demonstrating that inhibition and updating can have unique antecedents despite being complementary processes (Barrett et al., 2004; Engle et al., 1999; Friedman et al., 2006). Specifically, flexibility was positively associated with updating but negatively associated with inhibition. That said, this research raises questions related to the role of cognitive flexibility (through political ideology) on mental set-shifting. For instance, conservatives may be able more likely to mentally shift due to their ability to engage in the focal task, while liberals may be more likely to mentally shift due to their ability to adapt to new information. Indeed, this work speaks to the importance of identifying the effects of cognitive flexibility on various executive functioning processes.

Of course, this research is not without limitations. The studies focused largely on American and Canadian participants to control for cultural definitions of conservatives and liberals, but it is important to consider the role of cognitive flexibility and working memory processes within other cultures. Additionally, the research relied on two novel tasks of inhibition and updating to control for potential confounds associated with the established paradigms used in Study 1, yet these paradigms need further validated and other paradigms that isolate these specific working memory processes need identified. finally, although emerging work is exploring the differences between extremes and moderates across ideologies (Lammers et al., 2017; Rollwage et al., 2019; Zmigrod, Rentfrow, & Robbins, 2019), we did not identify differences as a function of extremity, a finding that illustrates the need for theoretical perspectives into when political ideology effects are driven by ideological content versus ideological extremity.

Finally, the differences in cognitive flexibility and subsequent working memory tasks documented here present a unique lens to consider the behavior of conservatives and liberals. For instance, the effects of political ideology on self-control might be more nuanced than originally theorized; conservatives may better regulate behaviors that require inhibition (i.e., delayed gratification; Simpson et al., 2012), whereas liberals may better regulate behaviors that require updating (i.e., habit modification; Hofmann et al., 2011). Relatedly, creativity may vary as a function of ideology, as liberals' flexibility should facilitate divergent thinking, whereas conservatives' rigidity should facilitate convergent thinking (Guilford, 1956). Indeed, rather than attributing a single behavior to one ideology, this research speaks to identifying specific dimensions of behavior that differentially map onto the separable cognitive abilities of conservatives and liberals.

ORCID iD

Bryan M. Buechner https://orcid.org/0000-0002-3043-0429

Supplemental Material

The supplemental material is available in the online version of the article.

Notes

1. Mental set-shifting, defined as switching back and forth between mental sets, is commonly postulated as a third function (Miyake et al., 2000). The potential effects of ideology on this alternative process are detailed in the General Discussion section.
2. Sensitivity power analyses demonstrated that the final samples used across experiments provided a power of .8 to detect small to medium effect sizes (Study 1a: $f^2 = .076$, Study 1b: $f^2 = .084$, Study 2: $f^2 = .041$, and Study 3: $f^2 = .038$).
3. The effect of ideology on performance becomes nonsignificant, $b = 0.049$, $SE = .039$, $t(103) = 1.27$, $p = .207$, 95% CI $[-0.027, 0.125]$, when demographics are removed from the model. However, the exclusion of demographics does not alter the significance of the performance measure in Studies 1b, 2, or 3.
4. We conducted pretests to ensure the manipulations of inhibition and updating in Studies 2 and 3 were not differentially difficult.
5. Given political engagement, under certain conditions, can strengthen the tendency for individuals to sort into conservative identifications (Federico & Malka, 2018), we assessed engagement on a single-item scale (1 = *not engaged at all*, 7 = *extremely engaged*). However, engagement was not correlated with ideology ($r = .022$, $p < .759$) and, though likely underpowered, did not moderate the interaction ($b = -0.077$, $p = .477$).
6. Following the recommendations of Yzerbyt et al. (2004), we conducted separate analyses using the interaction of each covariate with the experimental condition to avoid bias in the estimation of interaction effects. The findings across studies, however, were largely unchanged (see Supplemental Material).
7. For convergence, we included two additional measures of ideology: political affiliation (1 = *strongly democrat*, 5 = *strongly republican*; Lammers et al., 2017) and the Social and Economic Conservatism Scale (SECS; α = .78; Everett, 2013). Both the affiliation ($b = -0.548$, $p = .024$) and SECS ($b = -0.052$, $p = .008$) revealed significant Task × Ideology interactions.
8. To test whether the findings hold across multiple dimensions of political ideology (Feldman & Johnson, 2014), we assessed social ($b = -0.408$, $p = .011$) and economic ($b = -0.315$, $p = .064$) ideology, which mirrored the general Ideology × Task interaction in Study 2.
9. Studies 2 and 3 assessed possible ideological differences in motivation toward the focal task. Although motivation was positively association with performance in Studies 2 ($b = 0.227$, $p = .018$) and 3 ($b = 0.302$, $p = .009$), motivation had no effect as a covariate in either study.
10. Consistent with work on the multifaceted nature of cognitive flexibility (Van Hiel et al., 2016), we conducted a replicate of Study 3 using a behavioral measure of cognitive flexibility (see Supplemental Material). Although the performance findings did not fully replicate (the simple effect was significant only for updating), political ideology significantly predicted cognitive flexibility ($b = -0.102$, $p = .002$), and flexibility was a significant mediator.

References

Ackerman, P. L., & Heggestad, E. D. (1997). Intelligence, personality, and interests: Evidence for overlapping traits. *Psychological Bulletin*, *121*(2), 219–245. https://doi.org/10.1037/0033-2909.121.2.219

Altemeyer, B. (1998). The other "authoritarian personality." In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 30, pp. 47–92). Academic Press.

Baddeley, A. (1986). *Working memory* (Oxford Psychology Series). Clarendon Press/Oxford University Press.

Barrett, L. F., Tugade, M. M., & Engle, R. W. (2004). Individual differences in working memory capacity and dual-process theories of the mind. *Psychological Bulletin*, *130*(4), 553–573. https://doi.org/10.1037/0033-2909.130.4.553

Brandt, M. J., Reyna, C., Chambers, J. R., Crawford, J. T., & Wetherell, G. (2014). The ideological-conflict hypothesis: Intolerance among both liberals and conservatives. *Current Directions in Psychological Science*, *23*(1), 27–34. https://doi.org/10.1177/0963721413510932

Carney, D. R., Jost, J. T., Gosling, S. D., & Potter, J. (2008). The secret lives of liberals and conservatives: Personality profiles, interaction styles, and the things they leave behind. *Political Psychology*, *29*(6), 807–840. https://doi.org/10.1111/j.1467-9221.2008.00668.x

Chambers, J. R., Schlenker, B. R., & Collisson, B. (2013). Ideology and prejudice: The role of value conflicts. *Psychological Science*, *24*(2), 140–149. https://doi.org/10.1177/0956797612447820

Clarkson, J. J., Chambers, J. R., Hirt, E. R., Otto, A. S., Kardes, F. R., & Leone, C. (2015). The self-control consequences of political ideology. *Proceedings of the National Academy of Sciences*, *112*(27), 8250–8253. https://doi.org/10.1073/pnas.1503530112

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Lawrence Erlbaum Associates.

Curran, P. G. (2016). Methods for the detection of carelessly invalid responses in survey data. *Journal of Experimental Social Psychology*, *66*, 4–19. https://doi.org/10.1016/j.jesp.2015.07.006

Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, *64*, 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Duarte, J. L., Crawford, J. T., Stern, C., Haidt, J., Jussim, L., & Tetlock, P. E. (2015). Political diversity will improve social psychological science. *Behavioral and Brain Sciences*, *38*, 1–13. https://doi.org/10.1017/S0140525X14000430

Engle, R. W., Tuholski, S. W., Laughlin, J. E., & Conway, A. R. A. (1999). Working memory, short-term memory, and general fluid intelligence: A latent variable approach. *Journal of Experimental Psychology: General*, *128*(3), 309–331. https://doi.org/10.1037/0096-3445.128.3.309

Everett, J. A. (2013). The 12 item Social and Economic Conservatism Scale (SECS). *PLoS One*, *8*(12), e82131. https://doi.org/10.1371/journal.pone.0082131

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/10.3758/BF03193146

Fazio, R. H. (1990). A practical guide to the use of response latency in social psychological research. In C. Hendrick & M. S. Clark (Eds.), *Research methods in personality and social psychology* (pp. 74–97). Sage.

Federico, C. M., & Malka, A. (2018). The contingent, contextual nature of the relationship between needs for security and certainty and political preferences: Evidence and implications. *Political Psychology*, *39*(S1), 3–48. https://doi.org/10.1111/pops.12477

Feldman, S., & Johnston, C. (2014). Understanding the determinants of political ideology: Implications of structural complexity. *Political Psychology*, *35*(3), 337–358. https://doi.org/10.1111/pops.12055

Friedman, N. P., Miyake, A., Corley, R. P., Young, S. E., DeFries, J. C., & Hewitt, J. K. (2006). Not all executive functions are related to intelligence. *Psychological Science*, *17*(2), 172–179. https://doi.org/10.1111/j.1467-9280.2006.01681.x

Garavan, H., Ross, T. J., & Stein, E. A. (1999). Right hemispheric dominance of inhibitory control: An event-related functional MRI study. *Proceedings of the National Academy of Sciences*, *96*(14), 8301–8306. https://doi.org/10.1073/pnas.96.14.8301

Goodman, J. K., & Paolacci, G. (2017). Crowdsourcing consumer research. *Journal of Consumer Research*, *44*(1), 196–210. https://doi.org/10.1093/jcr/ucx047

Gosling, S. D., Rentfrow, P. J., & Swann, W. B Jr. (2003). A very brief measure of the big-five personality domains. *Journal of Research in Personality*, *37*(6), 504–528. https://doi.org/10.1016/S0092-6566(03)00046-1

Guilford, J. P. (1956). The structure of intellect. *Psychological Bulletin*, *53*(4), 267–293. https://doi.org/10.1037/h0040755

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford.

Hirsh, J. B., DeYoung, C. G., Xu, X., & Peterson, J. B. (2010). Compassionate liberals and polite conservatives: Associations of agreeableness with political ideology and moral values. *Personality and Social Psychology Bulletin*, *36*(5), 655–664. https://doi.org/10.1177/0146167210366854

Hofmann, W., Friese, M., Schmeichel, B. J., & Baddeley, A. D. (2011). Working memory and self-regulation. *Handbook of Self-Regulation: Research, Theory, and Applications*, *2*, 204–225.

Ionescu, T. (2012). Exploring the nature of cognitive flexibility. *New Ideas in Psychology*, *30*(2), 190–200. https://doi.org/10.1016/j.newideapsych.2011.11.001

Jost, J. T. (2006). The end of the end of ideology. *American Psychologist*, *61*(7), 651–670. https://doi.org/10.1037/0003-066X.61.7.651

Jost, J. T. (2017). Ideological asymmetries and the essence of political psychology. *Political Psychology*, *38*(2), 167–208. https://doi.org/10.1111/pops.12407

Jost, J. T., Federico, C. M., & Napier, J. L. (2009). Political ideology: Its structure, functions, and elective affinities. *Annual Review of Psychology*, *60*, 307–337. https://doi.org/10.1146/annurev.psych.60.110707.163600

Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003). Political conservatism as motivated social cognition. *Psychological Bulletin*, *129*(3), 339–375. https://doi.org/10.1037/0033-2909.129.3.339

Kardes, F. R., Escoe, B., & Wu, R. (2019). Response latency methodology in consumer psychology. In F. R. Kardes, P. M. Herr, & N. Schwarz (Eds.), *Handbook of research methods in consumer psychology*. Routledge.

Klein, R. M. (2000). Inhibition of return. *Trends in Cognitive Sciences*, *4*(4), 138–147. https://doi.org/10.1016/S1364-6613 (00)01452-2

Knight, K. (1999). Liberalism and conservatism. In J. P. Robinson, P. R. Shaver, & L. S. Wrightsman (Eds.), *Measures of social psychological attitudes, Vol. 2. Measures of political attitudes* (pp. 59–158). Academic Press.

Koenig, H. G., & Büssing, A. (2010). The Duke University Religion Index (DUREL): A five-item measure for use in epidemiological studies. *Religions*, *1*(1), 78–85. https://doi.org/10.3390/rel1010078

Lammers, J., Koch, A., Conway, P., & Brandt, M. J. (2017). The political domain appears simpler to the politically extreme than to political moderates. *Social Psychological and Personality Science*, *8*(6), 612–622. https://doi.org/10.1177/1948550616678456

Maddox, W. T., & Markman, A. B. (2010). The motivation–cognition interface in learning and decision making. *Current Directions in Psychological Science*, *19*(2), 106–110. https://doi.org/10.1177/0963721410364008

Martin, M. M., & Rubin, R. B. (1995). A new measure of cognitive flexibility. *Psychological Reports*, *76*(2), 623–626. https://doi.org/10.2466/pr0.1995.76.2.623

McCullough, M. E., & Willoughby, B. L. (2009). Religion, self-regulation, and self-control: Associations, explanations, and implications. *Psychological Bulletin*, *135*(1), 69–93. https://doi.org/10.1037/a0014213

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology*, *41*(1), 49–100. https://doi.org/10.1006/cogp.1999.0734

Naumann, L. P., Benet-Martínez, V., & Espinoza, P. (2016). Correlates of political ideology among U.S.-born Mexican Americans: Cultural identification, acculturation attitudes, and socioeconomic status. *Social Psychological and Personality Science*, *8*(1), 20–28. https://doi.org/10.1177/1948550616662124

Oppenheimer, D. M., Meyvis, T., & Davidenko, N. (2009). Instructional manipulation checks: Detecting satisficing to increase statistical power. *Journal of Experimental Social Psychology*, *45*(4), 867–872. https://doi.org/10.1016/j.jesp.2009.03.009

Peck, R., & Devore, J. L. (2012). *Statistics: The exploration & analysis of data*. Brooks/Cole.

Posner, M. I., & Cohen, Y. (1984). Components of visual orienting. In H. Bouma & D. G. Bouwhuis (Eds.), *Attention and performance X: Control of language processes* (pp. 513–556). Lawrence Erlbaum Associates.

Rigoni, D., Kühn, S., Gaudino, G., Sartori, G., & Brass, M. (2012). Reducing self-control by weakening belief in free will. *Consciousness and Cognition*, *21*(3), 1482–1490. https://doi.org/10.1016/j.concog.2012.04.004

Rindermann, H., Flores-Mendoza, C., & Woodley, M. A. (2012). Political orientations, intelligence and education. *Intelligence*, *40*(2), 217–225. https://doi.org/10.1016/j.intell.2011.11.005

Rollwage, M., Dolan, R. J., & Fleming, S. M. (2018). Metacognitive failure as a feature of those holding radical beliefs. *Current Biology*, *28*(24), 4014–4021. https://doi.org/10.1016/j.cub.2018.10.053

Rollwage, M., Zmigrod, L., de-Wit, L., Dolan, R. J., & Fleming, S. M. (2019). What underlies political polarization? A manifesto for computational political psychology. *Trends in Cognitive Sciences*, *23*(10), 820–822. https://doi.org/10.1016/j.tics.2019.07.006

Rougier, N. P., Noelle, D. C., Braver, T. S., Cohen, J. D., & O'Reilly, R. C. (2005). Prefrontal cortex and flexible cognitive control: Rules without symbols. *Proceedings of the National Academy of Sciences*, *102*(20), 7338–7343. https://doi.org/10.1073/pnas.0502455102

Simpson, J. A., Griskevicius, V., Kuo, S. I., Sung, S., & Collins, W. A. (2012). Evolution, stress, and sensitive periods: The influence of unpredictability in early versus late childhood on sex and risky behavior. *Developmental Psychology*, *48*(3), 674. https://doi.org/10.1037/a0027293

Stenner, K. (2005). *The authoritarian dynamic*. Cambridge University Press. https://doi.org/10.1017/CBO9780511614712

Tomkins, S. S. (1963). Left and right: A basic dimension of ideology and personality. In R. W. White (Ed.), *The study of lives* (pp. 388–411). Atherton. https://doi.org/10.1037/12238-017

Van Hiel, A., Onraet, E., Crowson, H. M., & Roets, A. (2016). The relationship between right-wing attitudes and cognitive style: A comparison of self-report and behavioural measures of rigidity and intolerance of ambiguity. *European Journal of Personality*, *30*(6), 523–531. https://doi.org/10.1002/per.2082

Wechsler, D. (1997). *Wechsler Adult Intelligence Scale* (3rd ed.). Psychological Corp.

Yntema, D. B., & Mueser, G. E. (1962). Keeping track of variables that have few or many states. *Journal of Experimental Psychology*, *63*(4), 391. https://doi.org/10.1037/h0045706

Yzerbyt, V. Y., Muller, D., & Judd, C. M. (2004). Adjusting researchers' approach to adjustment: On the use of covariates when testing interactions. *Journal of Experimental Social Psychology*, *40*(3), 424–431. https://doi.org/10.1016/j.jesp.2003.10.001

Zmigrod, L., Rentfrow, P. J., & Robbins, T. W. (2018). Cognitive underpinnings of nationalistic ideology in the context of Brexit. *Proceedings of the National Academy of Sciences*, *115*(19), E4532–E4540. https://doi.org/10.1073/pnas.1708960115

Zmigrod, L., Rentfrow, P. J., & Robbins, T. W. (2019). The partisan mind: Is extreme political partisanship related to cognitive inflexibility? *Journal of Experimental Psychology: General*, *149*(3), 407–418. https://doi.org/10.1037/xge0000661

Zmigrod, L., Zmigrod, S., Rentfrow, P. J., & Robbins, T. W. (2019). The psychological roots of intellectual humility: The role of intelligence and cognitive flexibility. *Personality and Individual Differences*, *141*, 200–208. https://doi.org/10.1016/j.paid.2019.01.016

Author Biographies

Bryan M. Buechner is a doctoral candidate of marketing in the Lindner College of Business. His interests focus on the cognitive processes that drive behavior, and his research specializes in political psychology, working memory, and self-control.

Joshua J. Clarkson (PhD in social psychology and PhD in marketing) is an associate professor of marketing in the Lindner College of Business who specializes in the areas of persuasion, social influence, and self-control. His research has been published in top journals within psychology and marketing, and his findings have been featured in media outlets from business magazines and news articles to pop-psychology books and edited academic volumes.

Ashley S. Otto is an assistant professor of marketing in the Hankamer School of Business. Her research primarily focuses on consumer judgment and decision making.

Edward R. Hirt is a full professor in the Department of Psychological and Brain Sciences at Indiana University and serves as the director of the HirtLab, which concentrates on researching issues related to motivation and performance. He has authored over 75 publications in peer-reviewed journals and has recently written a book titled *Self-Regulation and Ego Control*, coauthored by Joshua J. Clarkson and Lile Jia.

M. Cony Ho is a clinical assistant professor of marketing at Clemson University. His research focuses primarily on self-control, goals, and the role of luck in goal pursuit.