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Voting Advice Application Use Increases Party Position Knowledge: An Experimental Study Among Belgian Youngsters

Joke Matthieu [1,2], Laura Jacobs [2], Matthias Van Campenhout [2], and Stefaan Walgrave [2]

[1] Department of Political Science, Vrije Universiteit Brussel, Belgium
[2] Department of Political Science, University of Antwerp, Belgium

Correspondence: Joke Matthieu (joke.matthieu@vub.be / joke.matthieu@uantwerpen.be)

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Abstract

Political knowledge is vital for democratic citizenship, yet many voters struggle to correctly identify party positions. This article investigates whether voting advice applications (VAAs) can increase party position knowledge (PPK) among young voters. We present results from a large-scale experiment in Flanders (Belgium) using two real-world VAAs: De Stemtest, a generic VAA targeting the general electorate, and De Jongerenstemtest, a youth-oriented version specifically designed to appeal to younger citizens. Respondents aged 16–30 (N = 2,291) were randomly assigned to a control group or one of the treatment conditions. Multilevel logistic regression models demonstrate that VAA exposure does not uniformly enhance PPK: the generic VAA produced no significant learning effect, whereas the youth-oriented VAA significantly improved respondents' ability to identify party positions correctly. Contrary to expectations, the learning effects did not vary systematically across parties or between mainstream and niche parties. Our findings provide rare causal evidence of PPK effects from real-world VAA exposure, highlighting the importance of tailoring such tools to specific audiences.

Keywords

experimental design; party position knowledge; political knowledge; survey experiment; voting advice applications; young voters

1. Introduction

Political knowledge is a cornerstone of democratic citizenship. It enables voters to navigate the political landscape, hold political elites accountable, and make informed electoral choices (Barabas et al., 2014; Delli Carpini & Keeter, 1996). Party position knowledge (PPK) refers to citizens' awareness of where political parties stand on specific policy issues. This type of knowledge is particularly important in multiparty systems, where programmatic competition often spans multiple ideological dimensions and voters cannot rely solely on simple heuristics. Voters with knowledge of party positions can engage meaningfully in representative democracies and make electoral choices that align with their substantive policy preferences.

While static political knowledge typically focuses on enduring facts about institutions, leaders, or procedural rules, PPK is policy-specific and dynamic, requiring individuals to track parties' evolving stances across a range of issue domains. As Barabas et al. (2014) argue, policy-specific knowledge imposes high cognitive demands and is often unevenly distributed in the electorate, being concentrated among politically engaged publics. Many voters hold only partial or inaccurate perceptions of party positions, especially in multiparty systems where the number of parties and overlapping issues make it hard to create a clear mental map of the political landscape (Schultze, 2014). Individual-level demand factors such as political interest, cognitive ability, and media use are consistently associated with higher levels of PPK. However, PPK also depends on the availability of information and campaign dynamics (Barabas & Jerit, 2009). In this study, we deal with the latter. We do not deal with individual predictors of PPK but instead focus on a specific type of information that voters may encounter during an electoral campaign: voting advice applications (VAAs).

VAAs are online tools that enable users to compare their own stances on various policy issues with those of the parties on offer and inform them about which parties align more closely with their own policy views. In many countries, VAAs have boomed, and using a VAA has become one of the most employed ways in which voters inform themselves about the party's offer. For instance, in the country we are studying here, Belgium, the most popular VAA during the last election in June 2024 was used more than seven million times, on a voting population of just over eight million. In countries such as the Netherlands, Germany, and Switzerland, similar participation rates are observed.

What VAAs essentially do is inform voters about parties' policy stances, both directly and indirectly. Virtually all VAAs end with an output screen that displays a list of parties along with each party's degree of overlap with, or distance from, the user's own preferences. This way, indirectly, through this comparison with their own preferences, users may learn about what stances parties hold. For instance, a user who gets a high aggregate overlap with a particular party may derive this party's policy positions from that generally high congruence (being the same position as that this voter personally holds). However, some VAAs also allow for the direct learning of parties' policy positions, as they, at the end of the session, provide users the opportunity to dig deeper into the results and compare, policy by policy, their own views with those of each party. If users grab that opportunity, they may directly observe and learn, for each issue, what each party stands for. The VAA, whose effect we study here, did offer such a deepening and direct learning option; however, we have no information on whether our subjects actually utilized this option.

Previous work has already examined the PPK effects of VAA use, but experimental work that can tease out a truly causal effect of VAA exposure remains very limited. Our study offers rare experimental evidence leveraging a real-world VAA while entirely controlling exposure. Moreover, previous work looked at the

effect of VAA use on general users. Here, we examine whether learning effects are different when a VAA is designed for and targeted at a specific population group, namely the young. Indeed, young people may be more sensitive to new information, and a VAA that engages them more, both in terms of substance and format, may promote greater learning effects. Finally, previous work on VAA use and PPK did not investigate whether learning varies across parties; our study looks at party differences and tests whether users learn more about mainstream parties than about niche parties.

Concretely, this article experimentally examines the possible increase in PPK among a sample of more than 2,000 young Belgian voters and compares the PPK effect of participating in a generic "normal" VAA (De Stemtest) with that of the use of a special VAA targeted towards the youth (De Jongerenstemtest). We find that VAA use indeed significantly increases PPK among our young subjects, but that only the specific youth VAA was able to generate a PPK effect; among the young voters in our sample, we do not witness an increase in PPK after completing the generic VAA. Learning of party positions seems to be indistinguishable across all parties, and we do not find that young subjects learn more about some parties' positions compared to others.

2. Party Characteristics, VAA Use, and PPK

Voters rely on ideological heuristics and party cues to make sense of party positions (Conover & Feldman, 1989; Dahlberg & Harteveld, 2016; Zaller, 1992). These cues are more effective when they are clear and unambiguous (Bischof & Senninger, 2018; Lefevere, 2024). Mainstream, centrist parties frequently adopt more unclear positions, either to appeal broadly, as a result of coalition dynamics and the need for compromise or to avoid electoral backlash (Dalton & McAllister, 2015; Lefevere & Verwee, 2025). Ambiguity—especially in the form of vagueness (the extent to which a policy statement of a party allows for varied interpretations) or inconsistency (referring to a party expressing conflicting positions on an issue)—undermines voters' ability to identify party positions (Lefevere & Verwee, 2025). For example, some parties adopt clear-cut positions on both the traditional socioeconomic left–right dimension and the newer sociocultural GAL–TAN axis. These parties typically maintain a more consistent ideological profile compared to mainstream parties, aligning as either left-wing or right-wing across a wide range of policy issues. Often, these are radical or niche parties with more ideologically extreme positions and clear ownership over a number of issues (Conover & Feldman, 1989; Jennart, 2025; Lefevere, 2024). This clarity also reinforces the potency of ideological heuristics, particularly on the margins of the ideological spectrum (Dahlberg & Harteveld, 2016; Rovny, 2013). Still, the relationship between party type and PPK might vary across issue domains. Niche parties—such as radical right parties—tend to be most explicit on the issues they "own," but remain more ambiguous on long-standing economic dimensions (Rovny & Polk, 2020). Conversely, mainstream parties may be easier to locate on these traditional issues, but less so on newer or cross-cutting ones. Nevertheless, we expect that on average, niche parties' positions are easier to identify because their messages are more homogeneous and less strategically blurred. In the context under scrutiny, niche parties display a high degree of ideological congruence across both economic and cultural dimensions, whereas mainstream parties must manage more internally diverse electorates, resulting in more shifts on these issues. Thus, relying on heuristics should be easier for niche parties than for mainstream parties. Consequently, individuals' knowledge of party positions before exposure to any treatment—i.e., their baseline or pre-treatment PPK—is expected to be lower for centrist mainstream parties than for more ideologically extreme niche parties (Jennart, 2025).

Hypothesis 1: The baseline level of PPK is higher for niche parties compared to mainstream parties.

VAAs became an integral part of electoral campaigns in many European democracies. These online tools enable users to compare their own policy preferences with those of the parties. Hence, VAAs hold the potential to serve as a learning tool, helping users build more accurate and comprehensive knowledge of party positions. They expose users to party positions on policy issues (Garzia & Marschall, 2016). VAAs not just confront users with the views of parties, they also present the information in a highly structured and accessible format, providing side-by-side comparisons of party stances. This should reduce the cognitive effort required to gather party position information from fragmented bits in the news media (Kamoen et al., 2015). Moreover, VAAs confront users with policy areas they might not otherwise engage with, broadening their exposure beyond their usual public. This feature is particularly valuable in multiparty systems, where voters often lack clear heuristics for mapping party positions across multiple ideological dimensions.

Empirical research, employing a variety of methodological approaches, did find a generally positive relationship between VAA exposure and PPK, although the magnitude and consistency of these effects vary. Early work relied primarily on observational designs, either inviting individuals who had just completed a VAA to participate in a follow-up survey (Kamoen et al., 2015) or asking respondents about their past VAA use alongside measures of political knowledge (Schultze, 2014). While these studies often report substantial gains in voters' ability to identify what parties stand for (e.g., Schultze, 2014), this is not always the case (e.g., Heinsohn et al., 2019). Moreover, these designs have been criticized for lacking a proper control group of non-users and for their susceptibility to self-selection biases (Pianzola, 2014), as participants in these studies are often skewed in terms of age, education, and political interest (Heinsohn et al., 2019).

In response to these limitations, scholars have increasingly adopted experimental designs, in which respondents are randomly assigned to either complete a VAA or not, mitigating both problems with self-selection and a lack of a control group. Experimental studies, however, tend to find much smaller effects on PPK, highlighting the challenges of isolating causal impacts (Munzert & Ramirez-Ruiz, 2021). The difference between observational and experimental work thus suggests that part of the observed knowledge gains may be attributed to self-selection.

Hypothesis 2: Exposure to a VAA increases PPK among young voters.

While VAAs may enhance PPK in general, most existing tools are designed for a broad electorate and rarely account for the specific needs of younger users. Studies of VAA effects typically evaluate a single generic application aimed at informing the general voting public, which means their findings reflect the average impact across diverse age groups (Munzert & Ramirez-Ruiz, 2021; Schultze, 2014). However, there are reasons to believe that these generic tools may not reach their full potential among younger citizens, who differ from older groups in their political knowledge and media consumption habits.

Younger voters are still shaping their political views and knowledge, often having had less prior exposure to party positions (Neundorf & Smets, 2017). This may make them particularly sensitive to interventions that reduce informational barriers and present content in an accessible way. Moreover, younger audiences typically prefer visually engaging, interactive, and contextually relevant formats that align with their digital media habits (Kivunja, 2014). Generic VAAs may therefore be less effective in capturing youngsters' attention or sustaining their interest throughout the tool.

A VAA specifically designed for young voters may address these limitations by incorporating simplified language, age-relevant issue framing, and dynamic design features. These adaptations could increase users' attention and motivation—two critical components of learning (Bandura, 1986; Kivunja, 2014). Higher motivation is expected to encourage younger users to more actively engage with party stances, which is key to transforming exposure into knowledge. Furthermore, such a tool could present information in smaller, more digestible units and provide immediate, tailored feedback on how users' responses align with party positions. Research on gamification, for instance, shows that such design choices—including interactive feedback and visually engaging elements—are particularly effective in helping younger audiences comprehend and retain new information (Hamari et al., 2014). Hence, a youth-oriented VAA may have the potential to foster more active learning among the young.

> *Hypothesis 3*: Exposure to a youth VAA increases PPK among young voters more than exposure to a generic VAA.

In addition to general expectations of VAA effects on PPK, we argue that the magnitude of the knowledge gain may vary systematically depending on party characteristics. We expect the effect of VAA use on PPK to be greater for mainstream parties than for niche parties. This expectation stems from the differential baseline visibility and clarity of cues for party positions. Since mainstream parties' positions are less clear to begin with (see Hypothesis 1), there is more to gain in terms of PPK for their positions compared to those of niche parties. This increases the likelihood that voters already know the latter's positions before using a VAA (Conover & Feldman, 1989; Jennart, 2025; Rovny, 2013). VAAs expose users in a structured and accessible way to a wide range of issue positions and expose "issue publics" (Henderson, 2014; Krosnick, 1990) to issues they may care less about. Such a presentation is especially useful when party positions are unclear or inconsistently communicated elsewhere, making VAAs particularly informative regarding mainstream parties whose stances are less distinctive and more susceptible to misperception or lack of awareness. For niche parties, the potential for knowledge gain through VAA exposure may be lower due to a ceiling effect, where users encounter relatively little new information, and thus, their PPK may not increase significantly post-treatment (Schultze, 2014; Van De Pol et al., 2014).

> *Hypothesis 4*: Exposure to a VAA increases PPK among young voters more with respect to mainstream parties' positions than to those of niche parties.

3. Data and Method

3.1. Case Description

Participants in our study are from Flanders, the Northern part of Belgium—a parliamentary democracy with a multiparty system, high electoral volatility, and party fragmentation featuring both mainstream and niche parties (Deschouwer, 2012). The three Flemish mainstream parties—Christian-democrats (CD&V), liberals (Open Vld), and socialists (Vooruit)—were founded in the 19th century. These parties have declined electorally in favor of newer parties founded in response to newly emerging cleavages (Delwit & Van Haute, 2021; Dennison & Kriesi, 2023; Luypaert, 2025). In this article, we consider the Green Party (Groen), the radical right (Vlaams Belang, VB), and the radical left (PvdA) to be niche parties. Since the beginning of the 2000s, a renewed Flemish nationalist party (N-VA) has also been very successful.

On June 9, 2024, regional, federal, and European elections were held. Belgium has a system of compulsory turnout. For the first time, the voting age was lowered for the European elections: young citizens who had reached the age of 16 were required to vote for the European Parliament, while the minimum age for voting in other elections remained 18 years. This means that around 600,000 voters had to vote for the first time. We focus here on this crucial group of 16–30-year-olds (Generation Z)—both new voters and young citizens with limited electoral experience. Research indicates that civic habits develop later for younger generations (Jennings & Stoker, 2004) and that this age range is crucial for the formation of political behavior (Boonen, 2015). Generation Z often settles down later, delaying milestones such as marriage and parenthood, which in turn further postpones civic engagement. Studying the full 16–30 age span helps capture these shifting patterns. The upper limit of 30 also reflects common age caps for youth party wings and organizations in Belgium.

During the 2024 campaign, the Flemish public broadcaster *VRT* and the newspaper *De Standaard*, in collaboration with the University of Antwerp and Tree Company (Walgrave et al., 2025), launched De Stemtest, a generic VAA, and De Jongerenstemtest, a VAA aimed at youngsters. While De Stemtest has been well-established since its foundation in 2004, De Jongerenstemtest marked the first large-scale initiative tailored specifically to young voters in Flanders. Both VAAs were extensively consulted during the campaign: De Stemtest was completed 3,931,582 times and De Jongerenstemtest was completed 601,977 times, reaching a large segment of the electorate. In fact, De Stemtest set a global record for individual-level usage.

3.2. Experimental Design

We leverage a between-subjects experiment. Data was collected from April 4 until April 14, 2024, during the electoral campaign in the run-up to the June 9 elections. Both VAAs used in this study were only made publicly accessible on April 15. We examine the effect of treatment by real-world VAAs that were not yet publicly available. This means we had complete control over exposure and are sure that subjects were not pre-treated. Other experimental studies on VAAs often rely on "real-life" VAAs that have already been launched (e.g., Enyedi, 2016; Garry et al., 2019; Munzert et al., 2021), but we test the possible implications of a real-life VAA without the possibility that respondents had already participated in it, optimizing the chances of fully isolating the causal effect. The fact that respondents in our study were exposed to the actual VAA, which was later launched in the lead-up to the June 9, 2024 elections in Belgium, adds substantial ecological validity to our study.

Participants were drawn from a five-wave youth panel, which was approved by the ethics board of the University of Antwerp. Our study was part of Wave 2. The panel was recruited using convenience sampling, with researchers and student assistants engaging youth organizations and recruiting participants from schools and other youth locations, relying on a stratified sample of large, mid-size, and small towns across Belgium (Jacobs et al., 2024). A total of 3,051 participants were included in the present study. A total of 1,566 respondents were randomly assigned to the control group, who completed a survey that included both control and dependent variables; 1,485 respondents were randomly assigned to either De Stemtest or De Jongerenstemtest. These treatment group respondents were first invited to complete a short survey that included only control variables. Then they were invited to participate in a second survey in which one of the VAAs was embedded, and where, right after completing the VAA, they were asked to answer questions

about the main dependent variable, PPK. Respondents received monetary compensation for participating in the experiment and the panel in general. Youth panel members earned €5 for each wave they completed, totaling €50 if they participated in all five waves. Additionally, respondents assigned to an experimental condition were offered an extra €5 on top of their initially earned compensation for participating in the panel. While acknowledging potential negative effects, compensating respondents for their participation has proven effective in reaching typically underrepresented populations (Singer & Kulka, 2002) and increasing the overall representativeness of studies (DeCamp & Manierre, 2016). This strategy proved fruitful, given that the panel attrition between Wave 1 and Wave 2 was only 14.6%. Figure 1 offers an overview of the experimental design.

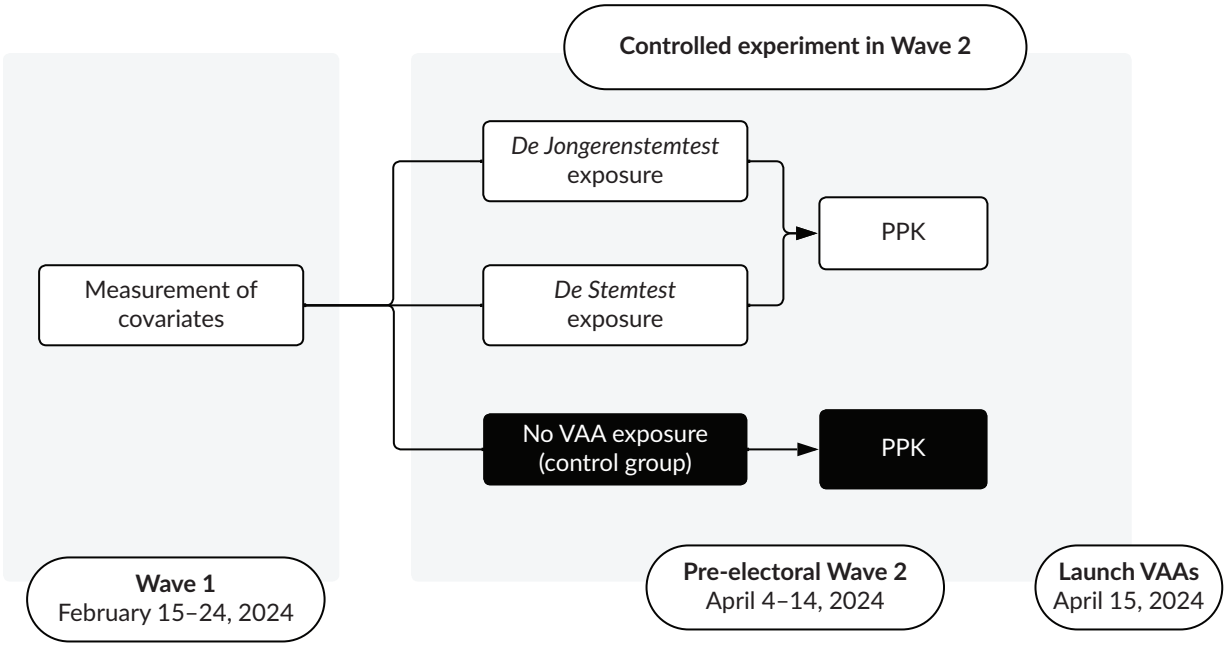

Figure 1. Overview of the experimental study design.

Those in the De Stemtest condition were exposed to a VAA targeting a general audience. Respondents assigned to the De Jongerenstemtest condition participated in a VAA designed specifically for younger citizens, incorporating features that should appeal to youth. The two VAAs differed in terms of statements, the inclusion of status quo information, and overall layout. Each VAA included 35 statements, of which 15 overlapped, and 20 were unique to each version (Walgrave et al., 2025). De Jongerenstemtest featured items more attuned to young citizens' daily life (e.g., student work, free menstrual products, or voting age), based on focus group input (see Table A1 in Supplementary File 1 for an overview). De Jongerenstemtest also provided extra context and clarification for each policy statement, including explanations of the current situation for each policy, definitions of complex terms, and balanced pro/con arguments. This information was presented appealingly, with interactive swiping options and mimicking the aesthetic of *VRT*'s Instagram-based news page NWS NWS NWS (381,000+ followers), featuring dynamic visuals, vibrant colors, and additional elements of interactivity. This approach aligns with the news consumption habits of young people, 87.1% of whom report daily Instagram use, with NWS NWS NWS being the most cited source (Jacobs et al., 2024).

In contrast, De Stemtest also provided information about the statements, which were presented in plain text in a toggle below each statement and employed a more restrained, less interactive, and less colorful design. Furthermore, De Stemtest allowed users to give more weight to issues, but the more complex feature was omitted from De Jongerenstemtest. Figure A1 in the Supplementary File 1 provides a visual comparison between the two VAAs.

3.3. Dependent Variable: PPK

While some studies measure PPK through participants' subjective feelings about how up to date they believe they are with parties' positions (Kamoen et al., 2015), we use a validated approach to measure PPK (Heinsohn et al., 2019; Munzert et al., 2021; Schultze, 2014). We asked respondents to indicate whether they believe the seven largest parties in Flanders support or oppose six specific policy proposals. These parties include the radical left PvdA, the green party Groen, the socialist party Vooruit, the Christian-Democratic party CD&V, the liberal party Open Vld, the nationalist and conservative party N-VA, and the radical right party Vlaams Belang.

One example of such a policy proposal is: "People with large assets should pay more taxes." An overview of the six statements is provided in Table A2 of Supplementary File 1, which includes additional features of the statements. Respondents had to indicate for each party whether it agreed or disagreed with the statement; a "don't know" option was available. Every respondent provided 42 answers, as participants had to estimate the party position for six statements related to seven parties. Statements were selected to strike a balance across policy issues (Van Camp et al., 2014); half of the statements focused on socio-economic issues (such as taxation, labor policies, and workers' rights) and the other half on socio-cultural matters (including climate policies, migration, and the legalization of soft drugs). Half of the statements were phrased so that agreeing would indicate a right-wing stance, while the other half were framed such that agreeing would imply a left-wing position. Important for our experimental set-up, three of the six statements featured in De Jongerenstemtest, and the other three were included in De Stemtest.

Participants' answers were then compared to the party positions. The party leaders provided these party positions, and hence, these are their official stances (there was cross-validation with the party manifesto). See Table A3 in Supplementary File 1 for an overview of these answers by party. The comparison between answers and the correct answer resulted in a binary variable, where 0 indicated incorrect answers ("wrong" or "don't know") and 1 indicated correct answers. The dataset was hierarchically structured by stacking it, resulting in a long format where each respondent received a score for every party on each policy statement.

3.4. Independent Variables

For *party type*, we created a dummy variable that classifies the three traditional parties—CD&V, Vooruit, and Open Vld—as mainstream, and PvdA, Groen, N-VA, and Vlaams Belang as niche. This classification follows prior work (Delwit & Van Haute, 2021; Luypaert, 2025) and reflects the distinction between parties embedded in traditional societal cleavages (Lipset & Rokkan, 1967) and those emphasizing narrower, issue-centered agendas. Mainstream parties have historically dominated government coalitions and pursued broad office- and policy-seeking strategies, whereas niche parties mobilize around unambiguous, often non-economic issues that are less prioritized by mainstream actors (Guth & Nelsen, 2021; Stiers, 2025). We acknowledge that this boundary is not always clear-cut and that parties such as Groen and N-VA occupy

more hybrid positions. Still, consistent with dynamic and saliency-based understandings of nicheness (Bischof, 2017; Meyer & Miller, 2015; Wagner, 2012), both can be considered niche. Ecological and regional segments constitute classic arenas of niche competition (Bischof, 2017): Groen focuses on environmental and post-materialist issues along the sociocultural GAL–TAN axis, whereas N-VA retains an ethno-regional and identity-based profile emphasizing Flemish autonomy, typically framing other issues—including socioeconomic ones—from a communitarian perspective (Abts et al., 2019). However, both have held government office, niche concerns, and programmatic focus rather than office exclusion (Meyer & Miller, 2015).

Party extremity is operationalized as the ideological distance between a party's mean position and the center of the left–right spectrum. Party positions were derived from De Stemming 2025, based on the average score of each party across 30 policy statements—15 related to socioeconomic issues and 15 to sociocultural topics—measured on a scale from −5 (left/libertarian) to +5 (right/authoritarian; Lefevere et al., 2025). Again, official party stances provided by the party leaders were used. Extremity was calculated as the absolute distance to the ideological center (0), resulting in two continuous variables: socioeconomic extremity and sociocultural extremity. See Table A4 and Figure A2 in Supplementary File 1.

A third independent variable indicates whether a *PPK knowledge item was derived from De Stemtest or De Jongerenstemtest*.

A final independent variable indicates whether a *policy statement referred to the socioeconomic or sociocultural issue dimension, corresponding to the classical economic left–right divide and the GAL–TAN dimension* (Kurella & Rapp, 2025). The socioeconomic dimension encompassed policies related to taxation, as well as labor regulations and workers' rights. The sociocultural dimension included policy statements on climate change and pollution, migration, and the legalization of soft drug use (see Table A2 in Supplementary File 1).

3.5. Randomization and Manipulation Check

Since we drew our respondents from a youth panel recruited through a convenience sample, our data are not representative of the broader youth population; highly educated and politically interested youngsters are overrepresented. Although this selective composition limits external validity, it also represents a least-likely case for detecting VAA-induced learning effects, as a high baseline of political interest reduces the room for improvement, making this a conservative test for finding VAA effects. Furthermore, non-parametric Kruskal–Wallis tests and chi-square tests indicate no significant differences between our experimental and control groups on key sociodemographic and attitudinal characteristics (see Table B1 in Supplementary File 2). Respondents in the three groups do not differ significantly in terms of age, gender, migration background (having at least one parent or grandparent born outside Belgium), mother's education level (highest diploma attained), financial stress (measured on an 11-point scale from *very difficult* to *very easy*), political interest (measured on an 11-point scale from *not at all interested* to *very interested*), or left–right self-placement on both the socioeconomic and sociocultural axis (ranging from 0 to 10). This indicates that our randomization was successful, mitigating concerns about the limitations of using a convenience sample; differences in PPK are likely to be attributed only to the treatment. Moreover, a recent study (Krupnikov et al., 2021) has verified that in political science research, convenience samples act similarly to representative samples. Given the absence of significant abnormalities in the randomization process, we report results without covariates.

We also conducted a manipulation check to determine whether respondents recognized that the VAA they participated in was aimed at the general or youth population. To this end, we employed two different manipulation checks. First, we asked respondents three questions, which they answered after participating in the VAA. The answers were given on an eleven-point scale ranging from 0 (*fully disagree*) to 10 (*fully agree*). The statements were the following: (a) "The VAA statements dealt with issues that youngsters consider important"; (b) "The VAA statements are comprehensible for youngsters"; and (c) "The VAA is visually attractive to youngsters." Regarding these three items, respondents in the De Jongerenstemtest condition reported higher mean scores than those in the De Stemtest condition. ANOVAs revealed that these differences between the experimental groups were statistically significant ($F(1, 949) = 81.94$, $p < .001$; $F(1, 949) = 93.55$, $p < .001$; $F(1, 949) = 133.66$, $p < .001$, respectively). The data are visually reported in Figure 2.

Second, we also asked a more straightforward question to assess whether the manipulation worked: "Please indicate on the scale below to what extent the VAA was aimed at young people or adults," with a score of 0 indicating that the VAA was aimed at youngsters and a score of 10 indicating it was aimed at adults. Here too, as can be seen in Figure 2, respondents in the De Jongerenstemtest condition perceived the VAA as more youth-oriented. In contrast, those in the De Stemtest condition viewed it as more adult-oriented (significant difference: $F(1, 949) = 218.03$, $p < .001$). Taken together, these results confirm that participants

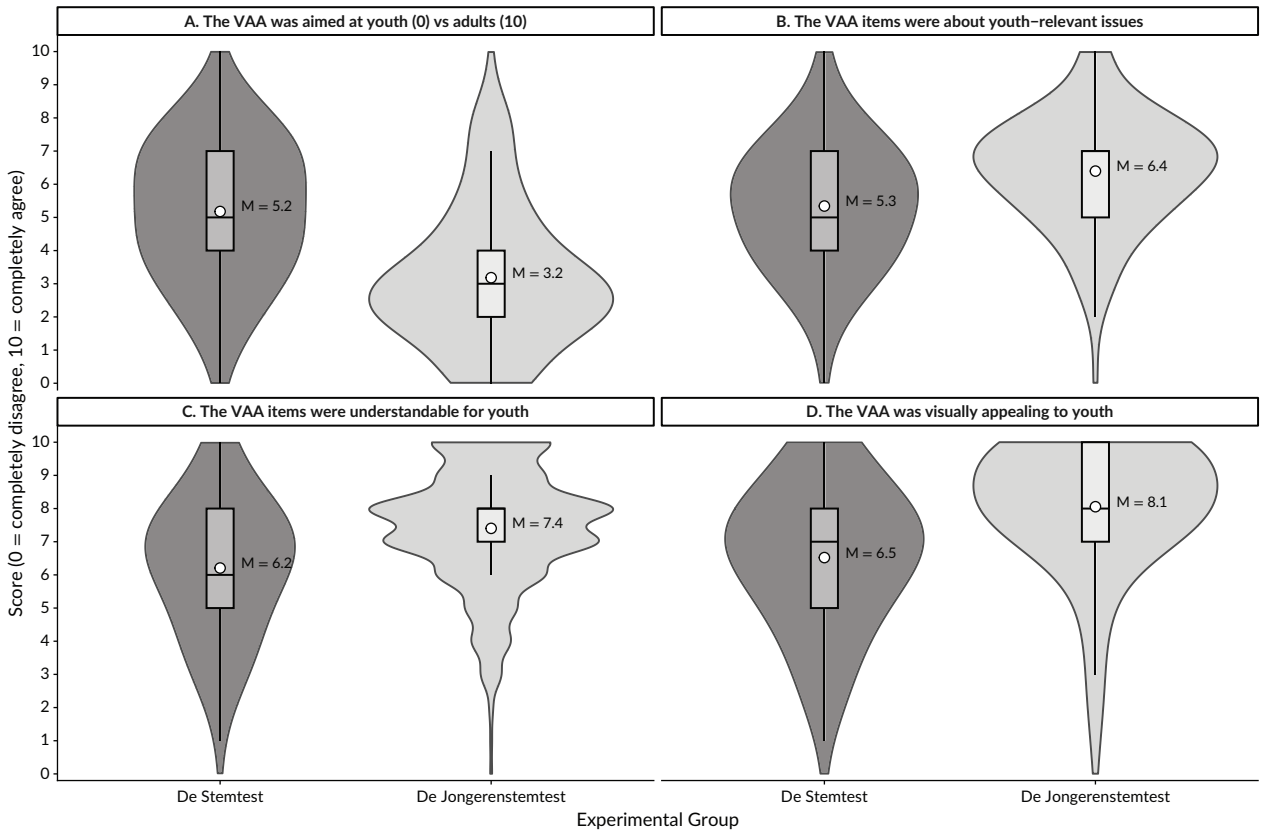

Figure 2. Manipulation check results for the experimental groups ($N = 951$): Panel A: general item (VAA aimed at youth vs adults); Panel B: youth-relevant issues; Panel C: understandable for youth; Panel D: visually appealing to youth. Note: Violin plots display the distribution of responses (boxplots = median/IQR; white circles = means).

accurately identified the target audience of the VAA they engaged with, demonstrating that our manipulation was successful.

3.6. Analyses

In Section 4, we analyze item–party responses using multilevel logistic regression with a random intercept for respondents (q_p_id) to account for repeated measures within individuals. We report odds ratios with 95% confidence intervals. The dependent variable is a binary indicator of PPK (1 = correct attribution; 0 = incorrect or "don't know"); for interpretation, we present model-based predicted probabilities with 95% CIs. First, we describe baseline PPK patterns in the control group and estimate baseline models on the control sample only to assess variation by issue type, party, ideological extremity (economic and sociocultural), and party type (niche vs. mainstream). We then estimate experimental models comparing De Stemtest and De Jongerenstemtest to the control group, including interactions with whether the knowledge item was included in the assigned VAA, as well as probe moderation by party characteristics. Model fit and variance inflation factors are evaluated and reported in Supplementary File 2 (see tables B2, B3, B4, B5, B6, and B7); the null models of the included tables are reported in Table B8 in Supplementary File 2 and show substantial between-respondent variance (ICC ≈ .21–.22), justifying the use of multilevel logistic regression models with random intercepts; statistical significance is evaluated at $\alpha = .05$ (two-tailed). Finally, analyses use listwise deletion.

4. Results

4.1. Non-Experimental Party and Issue Differences in PPK

To establish a baseline for evaluating the influence of VAA exposure, we first look at PPK among respondents in the control group. This subgroup's PPK reflects participants' unaided ability to identify party positions. The descriptive analysis reveals very large differences across political parties and issues (see Figure 3).

Regarding some socioeconomic issues, such as wealth taxation, correct attribution rates were high for PVDA (75%), N-VA (69%), and Vlaams Belang (62%), but low for mainstream parties, including CD&V (28%) and Open VLD (18%). Conversely, for student work flexibility, correct identification was poor across all parties, with correct responses ranging from 19% (PVDA) to 41% (Open VLD), and "don't know" responses exceeding 50% for most parties. Similarly, performance on sociocultural issues was mixed. On the EU migration item, Vlaams Belang's position was correctly identified by 85% of respondents, while Vooruit's position was only correctly identified by 8%, with 64% giving incorrect responses. For items related to nitrogen emissions and cannabis legalization, correct attribution rates were generally much lower. For instance, correct identification of cannabis legalization ranged from 17% (Open VLD) to 43% (N-VA, Vlaams Belang), with "don't know" responses exceeding 50% for many parties. Across various issues, parties at the ideological extremes (PVDA, Vlaams Belang, Groen) tended to be more easily recognized, particularly on topics such as wealth taxation and EU migration. In contrast, mainstream parties (CD&V, Open VLD, Vooruit) were more often met with uncertainty, as evidenced by higher "don't know" rates. Although we cannot conduct a stringent test due to the limited number of issues, evidence suggests that respondents are more knowledgeable about a party's position when that party "owns" the specific issue. These descriptive results highlight considerable variation in PPK depending on the issue and party.

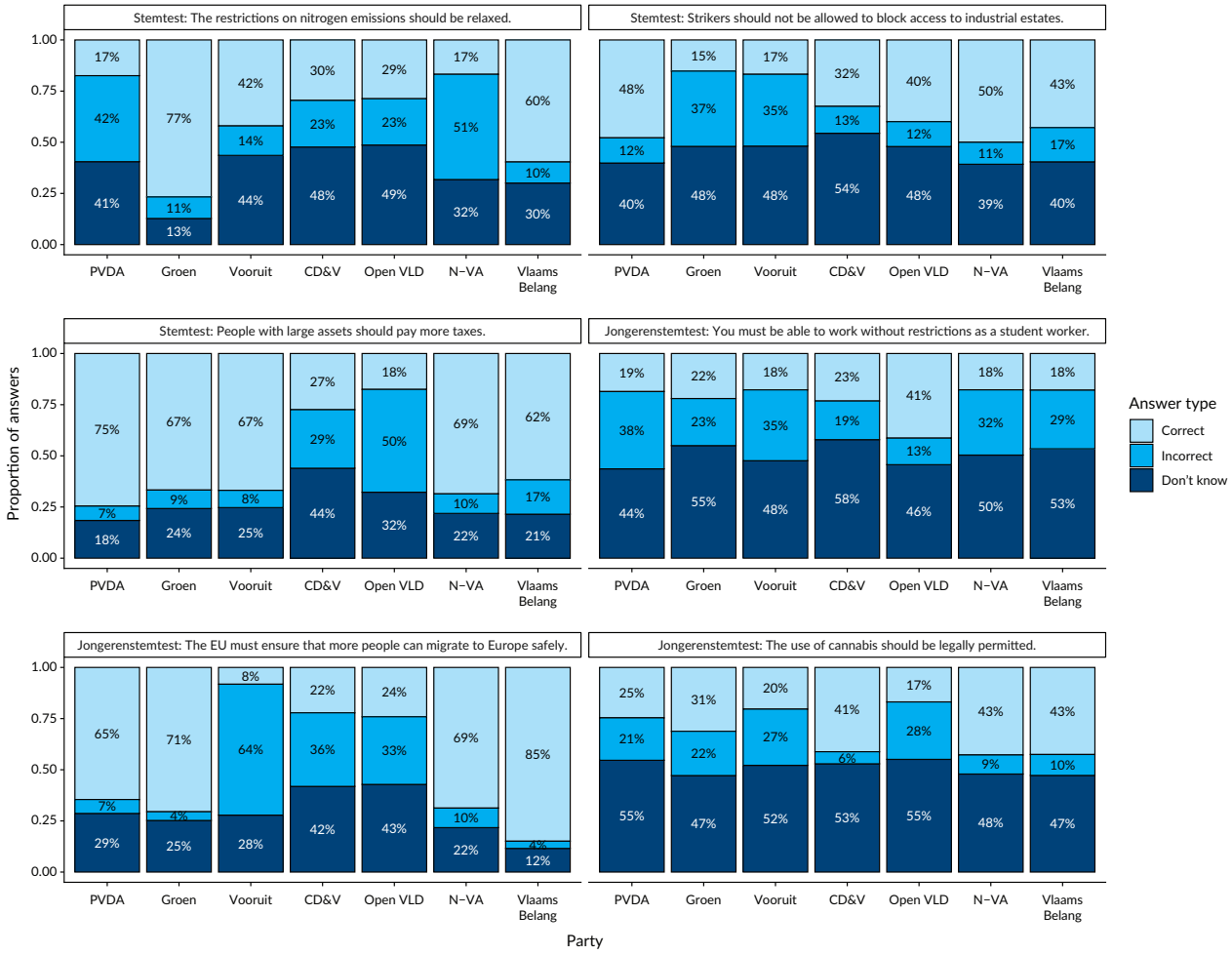

Figure 3. Proportion of correct, incorrect, and don't know answers by statement and party in the control group ($N = 1340$). Notes: Bars show the distribution of responses to each party's position, "correct" matches the party's official position, "incorrect" reflects a wrong attribution, "don't know" indicates the explicit don't know option.

Building on these descriptive patterns, we estimated multilevel logistic regression models to explain variation in PPK across issue and party characteristics. The main results are presented in Table B9 in Supplementary File 2. Respondents were less likely to correctly identify party positions on items from De Jongerenstemtest than on items from De Stemtest, showing 42% lower odds of correct attribution (OR = 0.58, $p < .001$; Model 1, Table B9 in Supplementary File 2). Knowledge was also somewhat higher for sociocultural items compared to socioeconomic ones (OR = 1.34, $p < .001$), suggesting that culturally oriented statements were more easily recognized. Positions of Groen (OR = 1.33, $p < .001$), N-VA (OR = 1.15, $p < .001$), and Vlaams Belang (OR = 1.66, $p < .001$) were more often correctly identified than those of PVDA. In contrast, mainstream parties such as Vooruit (OR = 0.52, $p < .001$), CD&V (OR = 0.54, $p < .001$), and Open VLD (OR = 0.50, $p < .001$) were less easily recognized. These party results are also shown in Figure 4, Panel A.

Party extremity was positively associated with knowledge. Model 2 shows that respondents were more likely to correctly attribute positions of parties with extreme stances on both economic (OR = 1.14, $p < .001$) and cultural dimensions (OR = 1.36, $p < .001$). These relationships were further refined in Model 3 and are shown in Figure 4, panels C and D, which indicates issue-specific effects: economic extremity was most predictive for

socioeconomic items (OR = 0.78, $p < .001$), whereas cultural extremity was most predictive for sociocultural items (OR = 1.45, $p < .001$). Model 4 depicted in Figure 4, panel B, demonstrates that niche parties were more easily recognized than mainstream ones, with more than twice the odds of correct attribution (OR = 2.43, $p < .001$).

These findings provide strong evidence for systematic variation in PPK depending on party and issue characteristics. Across all four models, the positions of parties that can be classified as niche, ideologically coherent, and positioned at the extremes of the political spectrum were more easily identified than those of

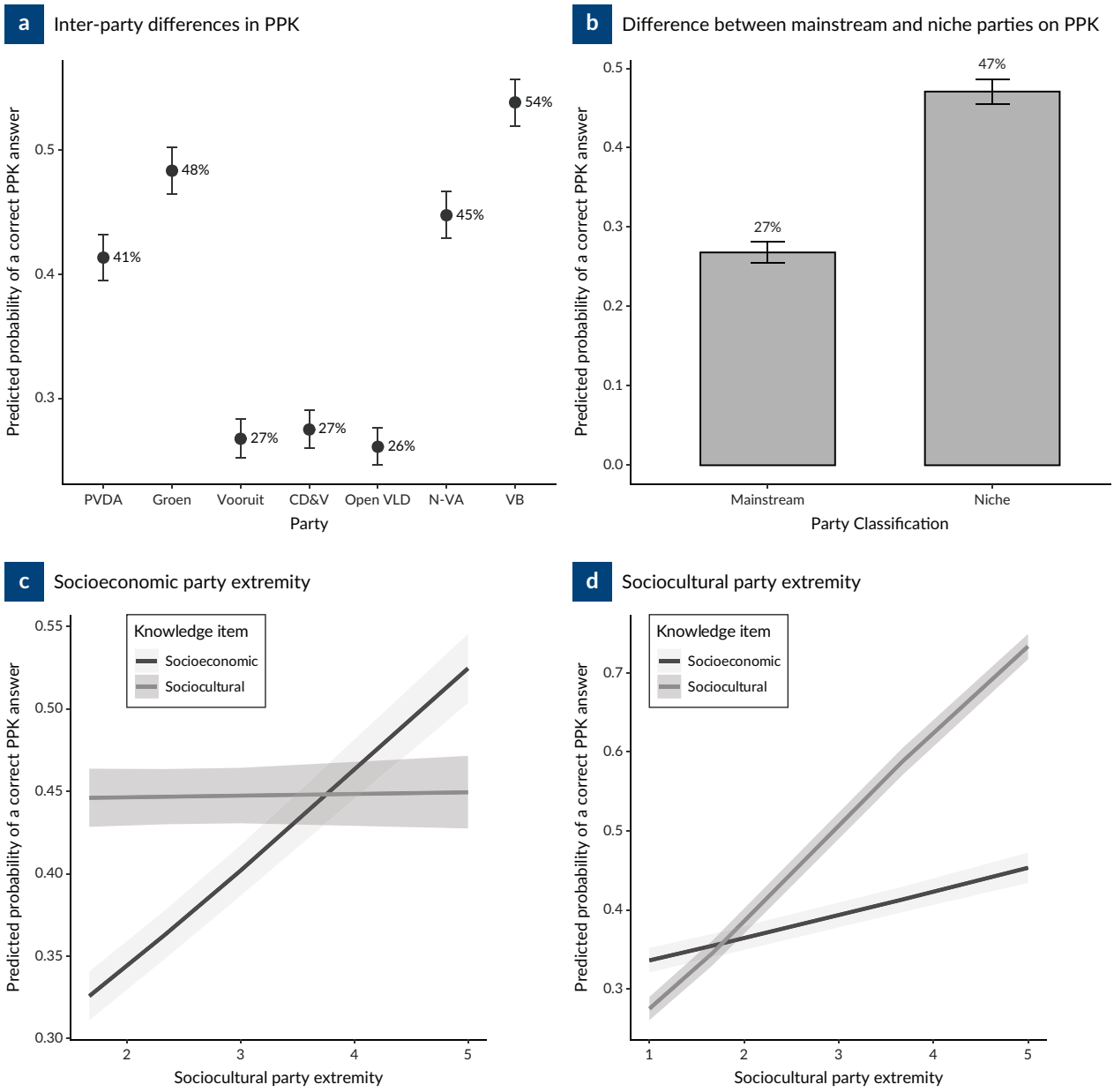

Figure 4. Predicted probabilities of PPK in control group participants (N = 1340): Panel A: inter-party differences; Panel B: mainstream versus niche parties; Panel C: socioeconomic party extremity by knowledge item; Panel D: sociocultural party extremity by knowledge item. Note: Estimates are based on mixed-effects logistic regression models (see Table B9 in Supplementary File 2).

mainstream and centrist parties. To assess whether our results depend on classifying Groen and N-VA as niche parties, we re-estimated all models treating both parties as mainstream. The substantive patterns remain virtually identical—effects shift slightly in magnitude but not in direction or significance (see Table B10 in Supplementary File 2). This confirms that the findings are robust to alternative operationalizations of "nicheness." Similarly, party extremity on both economic and cultural dimensions was positively associated with knowledge, particularly when matched with corresponding issue types. Because the nitrogen emissions statement could also be considered socioeconomic rather than sociocultural, we re-estimated all models with this item reclassified accordingly (see Table B11 in Supplementary File 2). Across all model specifications, the odds ratios for the sociocultural–socioeconomic contrast increase (e.g., from OR = 1.34 to OR = 2.70 in Model 1). Importantly, all substantive conclusions remain unchanged: knowledge of party positions is consistently higher for niche and ideologically extreme parties than for mainstream parties, regardless of how the nitrogen item is coded. Taken together, these results support Hypothesis 1, as PPK is indeed higher for niche political parties compared to mainstream parties.

4.2. Experimental Effect of VAA Use on PPK

We now turn to the experimental findings comparing the PPK of the control and treatment groups. This section tests Hypothesis 2, which held that VAA exposure increases PPK, Hypothesis 3, which posited that a youth-oriented VAA (De Jongerenstemtest) would have a stronger effect on youth than a generic VAA (De Stemtest), and Hypothesis 4, claiming that VAA learning effects would be moderated by party type (mainstream vs. niche).

Model 1 of Table B12 in Supplementary File 2 examines the overall effect of VAA exposure on PPK, regardless of whether the knowledge items were included in the VAA presented to respondents. It tests for potential learning effects that extend beyond the specific content of the VAA itself. Results show no significant difference between the group exposed to the generic VAA (De Stemtest) and the control group (OR = 0.99, p = .895). But, in contrast, respondents in the youth VAA group (De Jongerenstemtest) demonstrated a modest but significant increase in correct responses compared to the control group (OR = 1.14, p = .020). These findings imply that Hypothesis 2 is only partially supported, as an overall effect of VAA exposure on PPK was observed only for the youth VAA. Panel A of Figure 5 visualizes this overall treatment effect: the predicted probability is nearly identical for the control group and De Stemtest, while De Jongerenstemtest shows a slightly higher probability (approximately 30%).

Model 2 extends the analysis by adding an interaction between treatment group and knowledge item type. This interaction was included to examine whether respondents improved particularly on the items that were included in their assigned VAA, under the assumption that exposure effects would be strongest for these items. For De Stemtest, again, no significant interaction was found (OR = 0.94, p = .110), suggesting no additional benefit for items included in the generic VAA. However, a significant interaction was observed for De Jongerenstemtest (OR = 1.14, $p < .001$), indicating that participants in the youth VAA group were better able to identify party positions on the items they had been confronted with during the VAA. It is essential to note that the baseline accuracy for De Stemtest items was already higher in the control group, leaving less room for improvement compared to the De Jongerenstemtest items, which started at a lower level. These findings provide support for Hypothesis 3, demonstrating that the youth-oriented VAA was more effective in improving knowledge, particularly for its own included items. These item-specific treatment effects are

visualized in Panel B of Figure 5, where the predicted probabilities are separated by item type: general VAA items (circles) consistently show higher baseline accuracy. In contrast, youth-VAA items (triangles) start lower but increase notably in the De Jongerenstemtest condition.

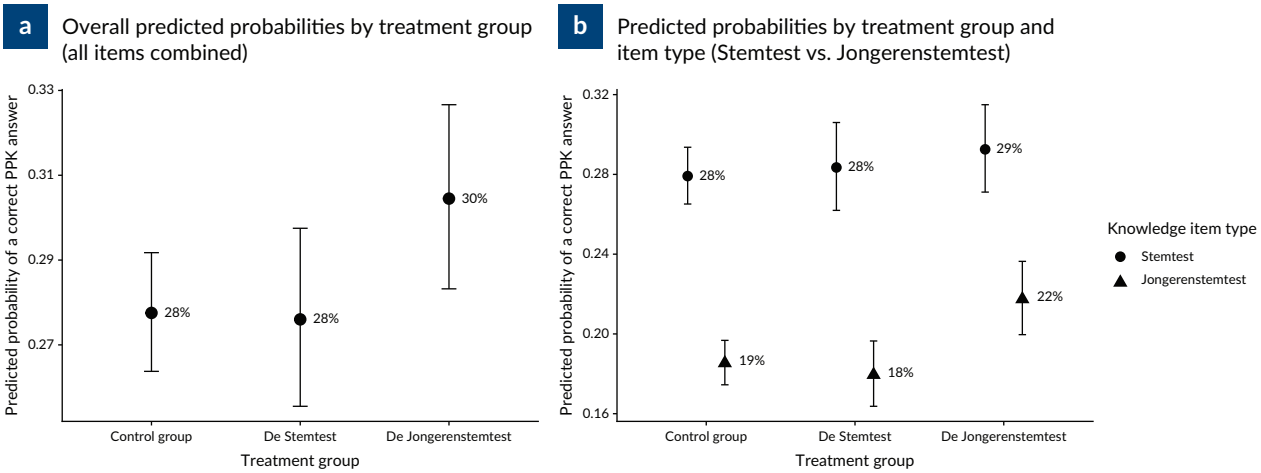

Figure 5. Predicted probabilities of correctly identifying party positions (N = 2291): Panel A displays overall treatment group differences, Panel B displays the treatment effects separately for general VAA items (*De Stemtest*, circles) and youth VAA items (*De Jongerenstemtest*, triangles). Note: Estimates are based on mixed-effects logistic regression models (see Table B12 in Supplementary File 2).

We now move on to testing Hypothesis 4 and further examining the potentially moderating role of party characteristics. As earlier results demonstrated that only exposure to De Jongerenstemtest was associated with improved PPK, these additional analyses focus exclusively on the youth VAA treatment group compared to the control group. The full output of the models we ran to test this hypothesis is presented in Table B13 in Supplementary File 2. Here, we only show the relevant figures.

In Figure 6, we present the results of a model that includes interaction terms between the treatment group and each party. None of these interactions reached statistical significance (all $p > 0.05$), suggesting that the knowledge gains associated with the De Jongerenstemtest were consistent across parties. As a robustness check, we re-estimated the interaction model using CD&V as the reference category. As reported in Table B14 in Supplementary File 2, this alternative specification yields the same substantive conclusion: none of the treatment and party interactions reach statistical significance.

Finally, Figure 7 underneath examines whether the learning effect differed between mainstream and niche parties. The interaction between exposure to De Jongerenstemtest and niche party classification was non-significant (OR = 0.97, $p = .594$). This suggests that the treatment effect was uniform across party types. Overall, these results do not support Hypothesis 4. The learning effect of De Jongerenstemtest appears to reflect a general improvement in PPK rather than targeted effects for specific parties or party types.

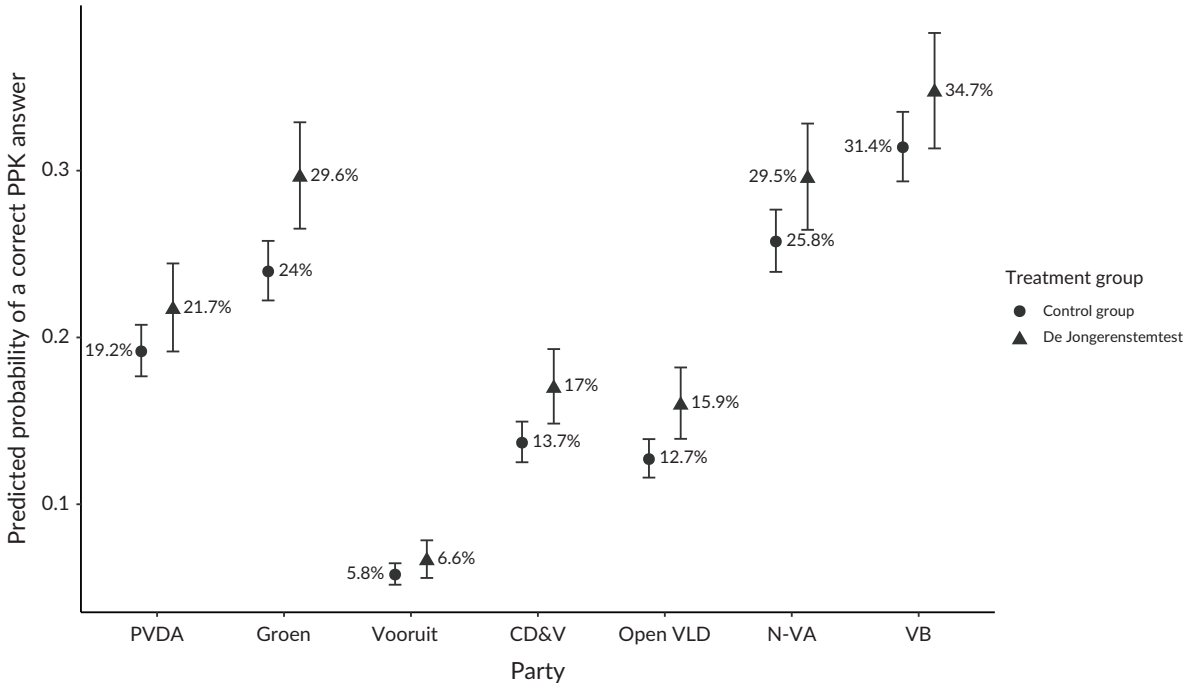

Figure 6. Predicted probabilities of PPK by party and treatment group (N = 1827). Notes: Estimates are based on mixed-effects logistic regression (see Table B13 in Supplementary File 2), circles represent the control group, and triangles represent the De Jongerenstemtest group, percentages indicate predicted probabilities of providing a correct answer for each party.

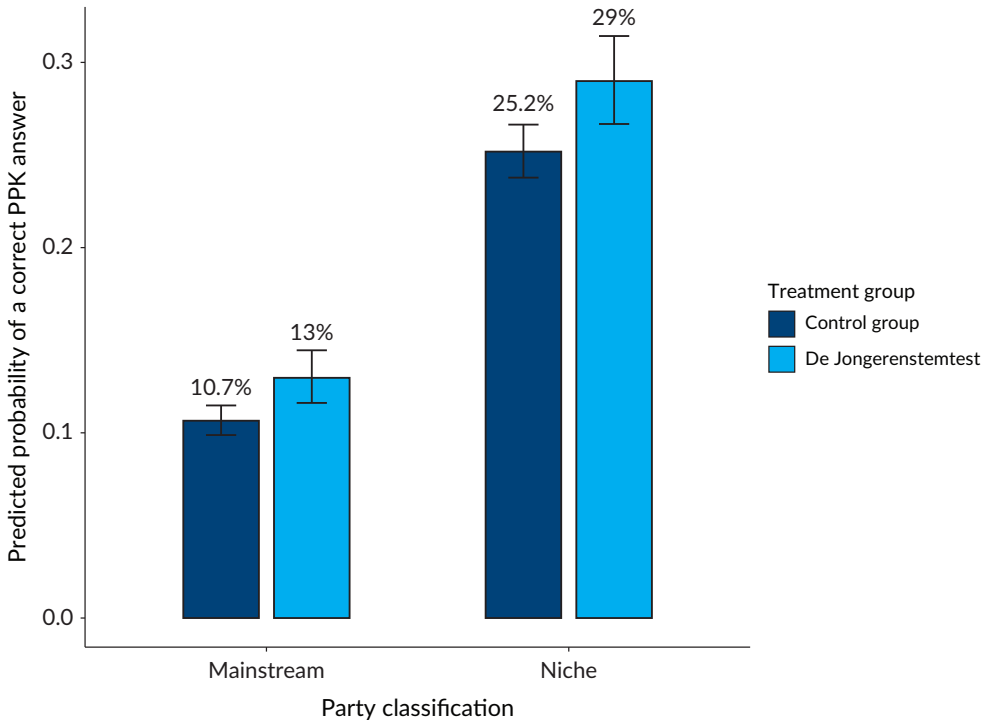

Figure 7. Predicted probabilities of PPK by party classification and treatment group (N = 1827). Notes: Estimates are based on mixed-effects logistic regression (see Table B13 in Supplementary File 2), dark bars represent the control group, while light bars represent the De Jongerenstemtest group, percentages above each bar indicate predicted probabilities of providing a correct answer.

5. Conclusion

PPK is essential for representative democracy to function properly. It allows voters to make a party choice that matches their policy preferences, thereby increasing the likelihood that the actual policies passed by parties align with popular opinion. Most work on PPK has focused on the individual drivers of PPK, but some studies have also examined the information that voters are exposed to. This study examined one type of information—yet an increasingly popular and, in some countries, even dominant type—VAAs. Millions of people use these applications when elections are due, but do these online algorithms make people better informed about party positions?

Our study shows that they do, under certain circumstances. Our experimental design with young Belgian voters revealed that those who were exposed to a youth VAA did indeed see their PPK increase. However, the young voters who used a generic VAA not specifically targeted at the young did not exhibit any increase in PPK. This suggests that the degree of engagement that a VAA can elicit may be key to explaining how PPK learning through VAAs works. VAAs that manage to draw attention and appear to be relevant are better at generating knowledge effects. Our experimental design cannot tell us what exactly is in the youth VAA we used that causes the effect. The youth VAA we used presented a bundled treatment that differed in quite some aspects from the generic VAA. The selected policies were more relevant for youngsters, more information was given, the VAA was simpler, the layout and look were different, and there were more interactive options. Follow-up work should aim to identify what aspects of VAAs capture people's attention and engage them, as this appears to be crucial for explaining learning through VAA use. A further limitation concerns the durability of these learning effects: as our design captures outcomes immediately after VAA use, we cannot assess how long such gains persist. Future work should incorporate follow-up measurements to examine their longevity.

Another unknown is how the learning through VAAs exactly works. Do people learn indirectly through the revealed distance between their own positions and by attributing their own positions to the parties they were told to be close to (and vice versa)? Or is it only those who dug deeper and used the additional features of direct information about parties' positions who learned a few things? We cannot tell based on our findings. However, we hope future work will take up the challenge to identify the exact mechanisms. Future research should examine more closely why citizens seem more knowledgeable about niche parties than mainstream parties, for example, by investigating how young people inform themselves during election campaigns and the specific media diet and sources they rely on. In this article, we provided only a general test based on six issues, but our results also cautiously suggest that—while overall young citizens had more knowledge of niche parties—the clarity of party cues partly depends on issue ownership. Expanding the issue scope in future studies could help assess these patterns more systematically, providing a more nuanced understanding (see Rovny & Polk, 2020).

Our study dealt with young voters. While there are good reasons to focus on youngsters, the question remains to what extent our results can be generalized to voters more generally. Again, we cannot tell. We did not have adult subjects and cannot tell whether they would have increased their PPK after being exposed to the generic (or the youth) VAA. However, we argue that the logic of engagement would also likely apply to adult voters. The more a VAA, through its content and design, manages to engage its users, the more likely it is that positive effects on knowledge will emerge.

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Conflict of Interests

The authors declare no conflict of interest.

Data Availability

Due to the nature of the research and in accordance with ethical and legal restrictions, supporting data are not available. We report data on minors (youngsters from 16 to 30), but we are restricted in sharing our data due to the sensitive nature and restrictions imposed by our ethical board and university privacy commission.

LLMs Disclosure

We used OpenAI's ChatGPT (GPT-5) as a supportive tool to streamline R code for data preparation and analysis; the authors made all substantive decisions and interpretations.

Supplementary Material

Supplementary material for this article is available online in the format provided by the authors (unedited).

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About the Authors

Joke Matthieu is a postdoctoral researcher at the Department of Political Science (M²P research group) at the University of Antwerp and at the Department of Political Science (DFUTURE research group) at Vrije Universiteit Brussel. Her main expertise lies in inequalities within political socialization processes.

Laura Jacobs is a postdoctoral researcher and guest professor at the Department of Political Science and M²P research group of the University of Antwerp. Her research interests include anti-immigrant attitudes, media effects, voting for the radical right, effects of the cordon sanitaire, elite discourse, and political communication.

Matthias Van Campenhout is a PhD researcher affiliated with the M²P research group within the Department of Political Science at the University of Antwerp. His research primarily focuses on the political knowledge of (young) citizens.

Stefaan Walgrave is a professor of political science at the University of Antwerp and head of the M²P research group. His research focuses on social movements, political communication, elections, and political representation.