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An empirical test of the decision to lie component of the Activation-Decision-Construction-Action Theory (ADCAT)

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ABSTRACT

Meta-analyses reveal that behavioral differences between liars and truth tellers are small. To facilitate lie detection, researchers are currently developing interviewing approaches to increase these differences. Some of these approaches assume that lying is cognitively more difficult than truth telling; however, they are not based on specific cognitive theories of lie production, which are rare. Here we examined one existing theory, Walczyk et al.'s (2014) *Activation-Decision-Construction-Action Theory* (ADCAT). We tested the *Decision* component. According to ADCAT, people decide whether to lie or tell the truth as if they were using a specific mathematical formula to calculate the motivation to lie from (a) the probability of a number of outcomes derived from lying vs. telling the truth, and (b) the costs/benefits associated with each outcome. In this study, participants read several hypothetical scenarios and indicated whether they would lie or tell the truth in each scenario (Questionnaire 1). Next, they answered several questions about the consequences of lying vs. telling the truth in each scenario, and rated the probability and valence of each consequence (Questionnaire 2). Significant associations were found between the participants' dichotomous decision to lie/tell the truth in Questionnaire 1 and their motivation to lie scores calculated from the Questionnaire 2 data. However, interestingly, whereas the expected consequences of truth telling were associated with the decision to lie vs. tell the truth, the expected consequences of lying were not. Suggestions are made to refine ADCAT, which can be a useful theoretical framework to guide deception research.

1. Introduction

Over several decades, deception researchers have assumed that when individuals lie they spontaneously display specific behavioral indicators that reveal their deception. Ekman and Friesen's (1969, 1974) leakage hypothesis, Zuckerman, DePaulo, and Rosenthal's (1981) four-factor theory, and Buller and Burgoon's (1994, 1996) interpersonal deception theory are based on this premise. However, a number of meta-analyses conducted in recent years have shown that behavioral differences between liars and truth tellers are small and vary under the influence of a host of moderator variables (DePaulo et al., 2003; Hartwig & Bond, 2011; Hauch, Blandón-Gitlin, Masip, & Sporer, 2015; Sporer & Schwandt, 2006, 2007). Because behavioral cues are poorly diagnostic of deception, humans' ability to detect lies on the basis of behavior hardly exceeds chance probability (see meta-analyses by Aamodt & Custer, 2006; Bond & DePaulo, 2006), and cue-based training programs to detect deception have limited success in increasing the trainees' detection accuracy, particularly if these programs focus on nonverbal cues (see Frank & Feeley, 2003; Hauch, Sporer, Michael, & Meissner, 2014).

This evidence has produced a shift in deception research (see, e.g., Masip & Herrero, 2015a, 2015b). Researchers have reasoned that because the behavioral differences between liars and truth tellers are small, interviewing approaches should be designed that increase these differences (Hartwig & Bond, 2011). These interviewing approaches must be based on sound theories or models pinpointing the psychological differences between liars and truth tellers. A number of interview approaches to detect deception have been developed in recent years (see, e.g., Vrij & Granhag, 2012).

Some of these novel interview approaches are based on the premise that lying is cognitively more demanding that truth telling (Vrij, Fisher, Mann, & Leal, 2006). Inventing a story is more cognitively taxing than just describing a real memory, the liar's fabrications must not contradict whatever the deception target already knows or may learn, the liar must remember his or her false account to avoid contradictions in the future, must continuously monitor both his or her behavior (to avoid showing suspicious signs or making slips of the tongue) and the target's reactions, and must inhibit the truth to replace it with a fabrication (Vrij, Granhag, & Porter, 2010). All of these concurrent tasks can tax the cognitive system of the liar. Cognitive psychologists have argued that lying

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requires access to executive control processes to suppress the truth, retrieve information from long term memory, and build a lie in working memory (see Gombos, 2006; Sporer, 2016; Walczyk, Igou, Dixon, & Tcholakian, 2013; Walczyk, Harris, Duck, & Mulay, 2014).

Empirical research supports these contentions. For example, neuroimaging studies have demonstrated that a number of brain areas related with working memory, response conflict, inhibition, and multitasking are activated to a greater extent during deception compared with truth telling (for meta-analyses, see Christ, Van Essen, Watson, Brubaker, & McDermott, 2009; Farah, Hutchinson, Phelps, & Wagner, 2014; Lisofsky, Kazzer, Heekeren, & Prehn, 2014). Also, behavioral studies have revealed that compared with truth telling, lying requires greater access to key executive processes such as inhibitory control (e.g. Debey, Verschuere, & Crombez, 2012; Fenn, Blandón-Gitlin, Coons, Pineda, & Echon, 2015; Visu-Petra, Varga, Miclea, & Visu-Petra, 2013). Further, deceptive accounts contain some more linguistic markers of cognitive load than truthful accounts (Hauch et al., 2015).

These considerations engendered the idea that if cognitive load is artificially increased further during an interview, this will be more detrimental for liars (because liars already are making considerable mental effort) than for truth tellers. As a result, liars may show behavioral signs of cognitive overload that may expose them (e.g., Vrij, Granhag et al., 2010; Walczyk et al., 2013).

Based on these premises, researchers have tested a number of specific ways to increase the interviewees' cognitive demand with the goal of detecting deception. These are strategies such as asking interviewees to (a) tell the story in the reverse order (rather than the natural chronological order; Vrij et al., 2008; Vrij, Leal, Mann, & Fisher, 2012), (b) report the events in their non-native language (Evans, Michael, Meissner, & Brandon, 2013), and (c) stare at the interviewer's eyes (Vrij, Mann, Leal, & Fisher, 2010), as well as (d) depleting the interviewees' cognitive resources prior to the interview (Blandón-Gitlin, Echon & Pineda, 2013). Overall, the findings are encouraging.

1.1. Activation-Decision-Construction-Action Theory (ADCAT)

This area of research has a number of weaknesses. For example, research on Vrij, Granhag et al.'s (2010) reasons why lying is more cognitively demanding than truth telling is limited, and it has been argued that under some circumstances lying may be not more taxing than telling the truth (e.g., Blandón-Gitlin, López, Masip, & Fenn, 2016; Burgoon, 2015). Also, many of the lying tasks used in the neuroimaging studies and some other research are contrived and hardly allow for the use of countermeasures. However, we would like to underscore a more basic limitation: the fact that these cognitive load approaches are not based on detailed cognitive models of deception (Blandón-Gitlin, Fenn, Masip, & Yoo, 2014; Sporer, 2016; Walczyk et al., 2013).

Indeed, listing a set of reasons why lying is cognitively more taxing than telling the truth (Vrij, Granhag et al., 2010) falls short of providing detailed theoretical models specifying the cognitive mechanisms and processes involved in lie production. An accurate knowledge of these mechanisms and processes is essential to understand the boundary conditions for these approaches to work, to figure out under what circumstances higher cognitive load may be expected from truth tellers than from liars, to anticipate possible countermeasures to be used by liars to evade detection, to make *specific* predictions about behavioral cues, to refine the approaches, and so forth (see Blandón-Gitlin et al., 2014).

A remarkable exception to this dearth of theoretical models is Walczyk et al.'s (2014) *Activation-Decision-Construction-Action Theory* of lie production (ADCAT). ADCAT is an improvement over Walczyk, Roper, Seemann, and Humphrey's (2003) *Activation-Decision-Construction-Model* (ADCM), and has generated a promising interview approach to detect deception called TRI-Con (Time-Restricted Integrity Confirmation; Walczyk et al., 2005, 2012; Walczyk, Mahoney, Doverspike, & Griffith-Ross, 2009). Walczyk's framework heavily draws on Baddeley's (2000; Baddeley & Hitch, 1974) well-established model of working memory (see Walczyk et al., 2003, 2014). According to Walczyk et al. (2014), Activation, Decision, Construction, and Action are the four differentiated phases involved in lying. These occur in working memory (WM) but they require access to long term memory (LTM). When a question is asked that can be answered truthfully or deceptively, the question enters WM, and the relevant information is automatically activated in the semantic and episodic memory components of LTM and transferred to WM (*Activation*). Next, the person considers the costs and benefits of disclosing the relevant information versus lying, and makes a *Decision* as to whether to lie or tell the truth. During lie *Construction*, the liar inhibits truthful responding and assembles a lie, which involves consideration of the social context and access to LTM to retrieve relevant episodic, semantic, and emotional memories as well as script-based information. The lie is delivered during the *Action* component (Walczyk et al., 2014). ADCAT has an impressive level of refinement and complexity, considering aspects such as the speaker's motivation and emotions, and the role that the speaker's theory of mind plays throughout the four phases. Walczyk et al. also present the *plausibility principle*, which specifies the possible strategies to be used during lie construction. The theory allows for specific predictions concerning the degree of cognitive effort (and behavioral indicators of cognitive load) to be made when lying under a wide variety of circumstances relative to the liars' motivation, theory of mind, ease of access to the truth in LTM, rehearsal, and many more factors. A full description of ADCAT is beyond the limited scope of the current article, but we strongly encourage the reader to carefully read Walczyk et al.'s (2014) original paper detailing the theory.

A number of ADCAT aspects allow for empirical verification (see Table 5 in Walczyk et al.'s, 2014, article). In the current study, we focused on empirically testing some aspects of the ADCAT decision to lie component. According to Walczyk et al. (2014), speakers make their decision whether to lie or tell the truth in a quasi-rational way considering the probability of a number of outcomes along with the costs/benefits associated with each outcome. The authors presented a mathematical formula to determine the speakers' motivation to lie versus their motivation to tell the truth. According to Walczyk et al. (2014), speakers make their decision to lie or to tell the truth as if they were conceptually using this formula. However, to our knowledge, this notion has not been examined empirically. In the current study we tested whether the results of Walczyk et al.'s (2014) conceptual formulas correlated with participants' dichotomous decision to lie versus tell the truth in various hypothetical scenarios.

1.2. The decision to lie

According to Walczyk et al. (2014), the expected value (*EV*) of the decision to either lie or tell the truth can be calculated with the following formula:

$$\mathrm{EV} = \sum p_i v_i.$$

EV is the expected value of the decision, p_i is the probability of a particular outcome, and v_i is the gain or loss (valence) associated with that outcome. For example, if Ms. Fib decides to lie, what is the probability (p_i) that her lie will not be detected, and what are the benefits or costs (v_i) associated with her getting away with her lie? The sum of the $p_i v_i$ products "yields the payoff in the long run for a decision" (Walczyk et al., 2014, p. 27). Thus, the expected value of the decision to lie (EV_{lying}) is estimated, the expected value of the decision to tell the truth ($EV_{truth\ telling}$) is also estimated, and then the option (lying vs. telling the truth) with the highest *EV* is chosen (Walczyk et al., 2014). More specifically, the motivation to lie can be calculated with the following formula. The higher the value of *M*, the higher the likelihood of the person deciding to lie.

$$M = \mathrm{EV}_{\mathrm{lying}} - \mathrm{EV}_{\mathrm{truth\ telling}}$$

This can be illustrated with an example (see Walczyk et al., 2014). Mr. Cheat is considering whether to admit to an infidelity he had with a friend of his wife. That was a one-time event; he still loves his wife and wishes to stay happily married. Mr. Cheat believes that the probability of divorce ($p_{divorce}$) if he tells the truth to his wife is 0.90, and the associated consequences ($v_{divorce}$) are extremely negative, let us say −5 on a −5 to 5 scale (Walczyk et al., 2014). Alternatively, if divorce does not occur ($p_{no\ divorce} = 0.10$), trust and intimacy will be reduced in the relationship ($v_{no\ divorce} = -1$). Thus, the expected value of truth telling would be:

$$EV_{truth\ \ telling} = \sum p_i v_i = (p_{divorce} \times v_{divorce}) + (p_{no\ \ divorce} \times v_{no\ \ divorce}) = (.90\ \ x{-}5) + (.10\ \ x{-}1) = -4.6.$$

Mr. Cheat may also deny his affair. He estimates a 0.80 probability his wife will not detect his deception ($p_{no\ detection}$). This means he will stay married but happiness will be reduced because he is going to feel guilty ($v_{no\ detection} = 3$). If his wife detects the lie ($p_{detection} = 0.20$) they will divorce, which will entail very negative consequences ($v_{detection} = -5$). The expected value of lying would thus be:

$$EV_{lying} = \sum p_i v_i = (p_{no\ \ detection} \times v_{no\ \ detection}) + (p_{detection} \times v_{detection}) = (0.80 \times 3) + (0.20 \times -5) = 1.4$$

Then,

$$M = EV_{lying} - EV_{truth\ \ telling} = 1.4 - (-4.6) = 6.$$

Since the value is large and positive, Mr. Cheat would definitely decide to lie rather than to tell the truth.

1.3. The current study

We examined whether respondents actually make their decision to lie in this conceptual rational way. Participants first filled in Questionnaire 1, which contained ten brief hypothetical scenarios in which the protagonist could feel the temptation to lie. The participants had to indicate whether they would lie or tell the truth in each scenario. Next, Questionnaire 1 was collected and Questionnaire 2 was handed out to the participants. Questionnaire 2 contained a number of questions about the consequences associated with lying or telling the truth in each scenario, along with the probability and the valence of each of these consequences. These values allowed us to calculate EV_{lying}, $EV_{truth\ telling}$, and M.

If the decision to lie vs. to tell the truth is made as if the above conceptual formulas were used, then we would expect significant correlations between the decision to lie/tell the truth in filling in Questionnaire 1 and the M values calculated from the information collected with Questionnaire 2. We posed the hypothesis that the likelihood that a speaker decided to lie (Questionnaire 1) in a specific scenario would be higher the higher the value of M (Questionnaire 2) for that speaker in that scenario. We also tested some alternatives. For instance, maybe the expected value of lying matters little and people readily lie whenever the expected value of truth telling is low. Or maybe people consider only the expected value of lying, and not the expected value of truth telling. To test these alternative options, correlations between the decision to lie/tell the truth (Questionnaire 1) and EV_{lying} and $EV_{truth\ telling}$ (Questionnaire 2) were also calculated.

2. Method

2.1. Participants

Data were collected from 81 Spanish undergraduate students of Criminology during a regular lecture. In completing Questionnaire 2, a small number of participants either did not follow the instructions or did not answer the questions related to one or several scenarios. Those participants for whom we encountered one or both of these problems for more than one scenario were excluded because they may not have understood the instructions. The final sample contained 75 undergraduates (52 females and 23 males; $M_{age} = 20.00$, $SD = 1.27$, age range: 19 to 25 years old). Because participants who left only one scenario blank were not excluded, the total number of participants varied slightly across scenarios, ranging from 71 to 75.

2.2. Materials

To have participants engaged with the hypothetical scenarios, these had to contain topics and concerns typical of undergraduate students. We addressed this issue by creating brief scenarios on the basis of ten real situations described by undergraduates in a previous unpublished study conducted by the first author. In that study, undergraduate students were asked to briefly describe a real autobiographical situation in which they had to try hard to honestly or deceptively convince another person of something. However, because the situations described by the participants were very sketchy and contained little detail, we had to enrich them by adding details and providing context—but without changing the gist of the event.

2.2.1. Questionnaire 1

Questionnaire 1 contained the description of all ten scenarios. An English translation of the scenarios is displayed in Appendix A. In Questionnaire 1, each scenario was followed by the phrase "If I were in this situation, I would". The participants had to select either the "lie" or "tell the truth" option that was just under this phrase. The order of the lie vs. tell the truth options was counterbalanced—that is, one half of the questionnaires had the lie option first whereas the other half had the tell the truth option first.[1]

2.2.2. Questionnaire 2

Each page in Questionnaire 2 looked like Appendix B. First, the specific scenario was described. Then, in the left column, the respondent had to indicate the expected consequence ("possible reaction") of telling the truth, the probability (p_i) of this consequence, and its valence (v_i). The respondent also had to indicate the alternative consequence and its valence (the probability of the alternative consequence is always 1 minus the probability of the main consequence). In the right column, the respondent had to indicate what lie she or he would tell, the probability of this lie being undetected (p_i), the consequence of no detection, and the valence (v_i) of this consequence. From these figures, EV_{lying}, $EV_{truth\ telling}$, and M can be calculated with the ADCAT formulas.

Appendix B was included as an example in Questionnaire 2, and was used to explain participants how to fill in each of the following pages (one page for each hypothetical scenario). The scenario in Appendix B is similar to the Mr. Cheat example described earlier (which was modelled after Walczyk et al.'s (2014) example), but adapted to young students. The numerical values in Appendix B correspond to that example.

2.3. Procedure

The data were collected in a classroom during a regular lecture. Participants were asked to keep silent during the session, and empty seats were left between one participant and the next. The participants were not informed about the goals of the study. First, printed copies of Questionnaire 1 were handed out. The participants indicated in Questionnaire 1 whether they would lie or tell the truth in each of the hypothetical scenarios. Then Questionnaire 1 was collected and

[1] The scenario names displayed in Appendix A and used throughout this paper were not presented in the original questionnaire; they have been included here with the purpose of referring to each scenario using a meaningful label.

Questionnaire 2 was handed out. The first page of Questionnaire 2 was the Spanish version of Appendix B in the current article. This page was already filled in, just as in Appendix B, and was used to verbally describe the task to participants such that they could understand it easily. Next, the participants had to individually complete all of the other pages (one for each scenario) in Questionnaire 2. Demographics (gender and age) were collected in both questionnaires. Also, the participants were asked to write a "code" of their choice in both questionnaires so that we could know which two questionnaires corresponded to the same person. The participants were debriefed during a subsequent lecture.

3. Results

An Excel spreadsheet was programmed to calculate EV_{lying}, $EV_{truth\ telling}$, and M (motivation to lie) values from the Questionnaire 2 data. The resulting values were then transferred to a SPSS dataset where the Questionnaire 1 data had been entered. Separate point biserial correlation analyses were run for each scenario to analyze the relationship between the dichotomous lie/tell the truth dependent variable and the continuous EV_{lying}, $EV_{truth\ telling}$, and M values. However, because as explained below the magnitude of the point biserial correlation (r_{pb}) is affected by the specific split of the binomial variable, before running the correlation analyses we examined the frequency and percentage of participants who indicated they would lie vs. tell the truth in Questionnaire 1. This information is displayed in Table 1. The scenarios in Table 1 are sorted in terms of the absolute difference column. This column contains the absolute difference between the percentage of participants who indicated they would tell the truth in a specific scenario (percent true) and the percentage of participants who indicated they would lie in the same scenario (percent lie).

It is clear that the number of participants in each scenario (N column) varied slightly (Table 1). More importantly, the number of participants who said they would lie/tell the truth in a specific scenario ranged from $n = 2$ (Secret Scenario-truth and Unauthorized Use Scenario-lie) to $n = 73$ (Secret Scenario-lie). The absolute difference between the percentage of participants saying they would tell the truth and those saying they would lie ranged from 16.67 to 94.67 (Table 1). In short, for some scenarios, the split for the dependent variable in Questionnaire 1 was very unequal, and some frequencies in one of the categories were extremely small (as small as $n = 2$).

Small frequencies in one category are problematic for at least two reasons. First, these frequencies are not representative of the population, and just one outlier may distort the results considerably. Second, Kemery, Dunlap, and Griffeth (1988) showed that uneven proportions ($p \neq q$) in a dichotomous variable lead to a restriction in the variance for this variable. In turn, this variance restriction attenuates the calculated correlation coefficient, which therefore underestimates the true correlation between the two variables (see Kemery et al., 1988).

We resolved the first (representativeness/potential outliers) problem by dismissing those scenarios with extremely low frequencies. Specifically, we dismissed those scenarios in which (a) either $n_{\text{truth}} < 10$ or $n_{\text{lie}} < 10$, and (b) the absolute difference was >75 (see the final decision column in Table 1). However, the retained scenarios were still rather unbalanced in terms of the percentages for each of the categories in the dichotomous variable; therefore, we were still facing the second problem (i.e., underestimation of the actual correlation). This problem was addressed by using a correction for the point-biserial correlation coefficient. One such correction was proposed by Kemery et al. (1988); however, it was later questioned by Bass and Ager (1991) because it assumes a normal marginal distribution for the continuous variable, and this assumption may be wrong (see Bass & Ager, 1991). Bass and Ager also questioned Kemery et al.'s (1988) notion that the optimal split of the dichotomous variable is $q = p = 0.50$. According to Bass and Ager, this split is optimal only when the two within-group distributions on the continuous variable have the same variance. Because of these reasons, Bass and Ager recommended using the correction suggested by Carroll (1945, 1961) rather than the one suggested by Kemery et al. (1988).

Carroll's correction was proposed to adjust Pearson's product-moment correlation coefficient because "the limits of the correlation coefficient may contract" (Carroll, 1961, p. 349), that is, the actual range of the coefficient may not extend from −1 to +1. However, the correction can also be used for the point biserial correlation—which is a particular case of Pearson's correlation. According to Carroll (1961), "[t]he limiting case is provided when the two distributions are dichotomous and the points of the dichotomy are asymmetrical between the two distributions, for here the Pearsonian coefficient … does not, in general, range between plus and minus one" (p. 349).

Carroll provides a way to calculate, from the empirical data, the maximum possible value of the Pearson (or point biserial) correlation. Then, the $r_{pb}/r_{pb\ \max}$ fraction can be used as a correction (Bass & Ager, 1991). An example may help to understand how this correction works. Imagine that the empirical correlation between a dichotomous and a continuous variable is $r_{pb} = 0.25$. If the maximum possible value of this correlation is $r_{pb\ \max} = 1.00$, then $r_{pb}/r_{pb\ \max} = r_{pb}$, that is, 0.25/1.00 = 0.25. Therefore, 0.25 represents the true correlation on a −1 to +1 continuum. However, if the maximum possible correlation is $r_{pb\ \max} = 0.50$, then an empirical correlation of $r_{pb} = 0.25$ should correspond to a correlation of 0.50 on a −1 to +1 scale. Certainly, this is what the formula indicates: $r_{pb}/r_{pb\ \max} = 0.25/0.50 = 0.50$.

We calculated Carroll's (1961) $r_{pb\ \max}$ for each of the retained scenarios, and divided $r_{pb}/r_{pb\ \max}$ as suggested by Bass and Ager (1991).[2] As shown in Table 2, r_{pb} values for the correlations between the decision to lie/tell the truth and M (motivation to lie scores) ranged between 0.23 and 0.40, and were significant. When the procedure suggested by Carroll (1961) was used, it became apparent that in all four cases the range of the correlation was restricted, that is, for all four scenarios, $r_{pb\ \max} < 1$. This indicates that the empirical r_{pb} values underestimated the actual correlation. Indeed, when $r_{pb}/r_{pb\ \max}$ was calculated as a better estimate of the actual correlation the figures were somewhat higher (see Table 2). Most researchers are familiar with Cohen's d as a measure of the size of an effect. Thus, for ease of interpretation, we transformed both raw and corrected point-biserial correlations into Cohen's d. According to Cohen (1988), $d = 0.20$ is a small effect, $d = 0.50$ is a medium effect, and $d = 0.80$ is a large effect. As shown in Table 2, for the current data even the uncorrected effect sizes (d) ranged from medium to large. Corrected effect sizes (d') were somewhat larger. Cohen's guidelines are conventional rather than derived from typical findings in a research area. To compare the current effect sizes with those normally found in a related area, we examined Richard, Bond, and Stokes-Zoota's (2003) paper. Richard et al. reported that effect sizes typically found in social psychology research are, on average, $r = 0.21$, or $d = 0.43$. The current effect sizes compare well with these figures. In sum, these data appear to support the hypothesis that people decide whether to lie or not in a quasi-rational way as if they were evaluating options as conceptually represented in Walczyk et al.'s (2014) formulas.

However, when we examined the correlations (and the d values) between (a) the decision to lie/tell the truth, and (b) EV_{lying} and $EV_{truth\ telling}$, it became apparent that a simpler model worked the same as well. Specifically, as shown in Table 2, whereas for EV_{lying} the correlation was significant for only one scenario, for $EV_{truth\ telling}$ the correlation was substantial and significant for all four retained scenarios. In fact, $EV_{truth\ telling}$ (with absolute d values ranging between 0.48 and 1.04 and absolute d' values ranging between 0.57 and 1.52) appeared to be as much or slightly more predictive of the decision to lie/tell the truth than M (with d values ranging between 0.47 and 0.88 and d' values ranging between 0.58 and 1.04). These data suggest that people decide

[2] Please note that, for consistency, we called maximum *negative* correlations $r_{pb\ \max}$, not $r_{pb\ \min}$. Also, note that for the correction to work correctly, r_{pb} needs to be divided by the absolute $r_{pb\ \max}$ value (i.e., by $|r_{pb\ \max}|$). Otherwise, whenever the correlations are negative $r_{pb}/r_{pb\ \max}$ would always be positive.

Table 1
Frequencies and percentages of participants who indicated that they would lie or tell the truth in each scenario in Questionnaire 1, and decision as to whether the scenario was dismissed or retained for data analysis.

Scenario	*N*	n_{truth}	n_{lie}	Percent true	Percent lie	Absolute difference	Study decision
Cheating Friend	72	30	42	41.67	58.33	16.67	Retain
Car Scratch	75	50	25	66.67	33.33	33.33	Retain
Took Money	74	51	23	68.92	31.08	37.84	Retain
Theft	74	15	59	20.27	79.73	59.46	Retain
Predicament	71	63	8	88.73	11.27	77.46	Dismiss
Damage	74	66	8	89.19	10.81	78.38	Dismiss
Flatmate Infidelity	73	6	67	8.22	91.78	83.56	Dismiss
Unexpected Visit	75	69	6	92.00	8.00	84.00	Dismiss
Unauthorized Use	74	72	2	97.30	2.70	94.59	Dismiss
Secret	75	2	73	2.67	97.33	94.67	Dismiss

whether to tell the truth or lie based solely on the expected consequences of truth telling. The positive or negative consequences of lying play no role.

Additional analyses were run to examine how well participants who had chosen to lie or tell the truth in each retained scenario in completing Questionnaire 1 could be identified from their *M*, EV_{lying}, and $EV_{truth\ telling}$ scores in Questionnaire 2. First, the decision to lie in Questionnaire 1 was coded as 0 and the decision to tell the truth was coded as 1. Then, we dichotomized the continuous *M*, EV_{lying}, and $EV_{truth\ telling}$ values such that the percentage of decision to lie (vs. to tell the truth) was the same as in the dichotomous variable measured with Questionnaire 1. For example, in completing Questionnaire 1, 58% of participants indicated they would lie in the Cheating Friend Scenario (see Table 1). We calculated the 58th percentile under the distribution of *M* values (calculated from Questionnaire 2 data) for the Cheating Friend Scenario, which was −1.69. Then, values below −1.69 were coded as 0 (decision to lie) and values above −1.69 were coded as 1 (decision to tell the truth). In this way, the percentages of decision to lie vs. tell the truth in the dichotomized *M* scores variable (from Questionnaire 2) were the same as the percentages of decision to lie vs. tell the truth in the participants' answers to Questionnaire 1 (for the Cheating Friend Scenario, 58% [decision to lie] vs. 42% [decision to tell the truth]). If *M*, EV_{lying}, or $EV_{truth\ telling}$ scores were a *perfect* predictor of participants' decision, then *all* individuals who indicated they would lie in Questionnaire 1 would also be coded as liars (i.e., would be identified correctly) in the newly dichotomized *M*, EV_{lying}, or $EV_{truth\ telling}$ variables, and *all* individuals who indicated they would tell the truth in Questionnaire 1 would also be coded as truth tellers in the new dichotomized variables.

Table 3 displays the correct identification rates. In line with the previous results, overall identification rates were reasonably good for both the *M* scores (with values ranging from 63% to 73%) and the $EV_{truth\ telling}$ scores (61% to 75%) but were poorer for the EV_{lying} scores (Table 3). However, in some cases, the separate identification of potential truth tellers or potential liars was poor even for the *M* and $EV_{truth\ telling}$ scores (though not as poor as for the EV_{lying} scores). This happened mainly when the number of cases in the category was small (for example, only 20% of individuals in the Theft Scenario said they would tell the truth; this is only 15 individuals; in this case identification rate was always poor).

Receiver Operating Characteristic (ROC) analyses were also performed on the data (see Table 4). When considering the *M* scores, the area under the ROC curve ranged between 0.63 and 0.74. When considering the $EV_{truth\ telling}$ scores, the area ranged between 0.64 and 0.81. In both cases the area was significantly greater than 0.50 for three out of four scenarios. Conversely, when the EV_{lying} scores were used, the area under the ROC curve did not differ significantly from 0.50 for three out of four scenarios.

4. Discussion

4.1. Overview and findings

Recent meta-analyses have revealed that humans' ability to detect deception from the observation of behavior alone is poor (Aamodt & Custer, 2006; Bond & DePaulo, 2006). The reason for this low performance is that behavioral differences between liars and truth tellers are small and variable (DePaulo et al., 2003; Hartwig & Bond, 2011; Hauch et al., 2015; Sporer & Schwandt, 2006, 2007). Recently, researchers have suggested that interviewing approaches should be designed that increase the behavioral differences between liars and truth tellers (Hartwig & Bond, 2011). Some of these interviewing approaches are based on the notion that lying is cognitively more taxing than truth telling. However, in general, cognitive load approaches to detect deception are not based on specific cognitive models of deception (Blandón-Gitlin et al., 2014; Sporer, 2016; Walczyk et al., 2013). This is unfortunate, because such models are necessary to understand the underlying principles of the proposed techniques, to know their limits, to refine the techniques, and to anticipate countermeasures. Fortunately, Walczyk et al. (2003) provided one such model, which has been expanded and refined recently (Walczyk et al., 2014). This model, which is called *Activation-Decision-Construction-Action Theory* (ADCAT), specifies the mechanisms and processes involved in lie production, as well as the

Table 2
Correlations between the decision to lie or tell the truth in Questionnaire 1 and the measures calculated from the Questionnaire 2 ratings, and corresponding Cohen's *d* values.

Measure	Scenario	*N*	r_{pb}	*d*	*p*	$r_{pb\ max}$	$r_{pb}/\lvert r_{pb\ max}\rvert$	*d′*
M	*Cheating Friend*	72	0.40	0.88	<0.001	0.8693	0.46	1.04
	Car Scratch	75	0.23	0.48	0.046	0.8150	0.28	0.59
	Took Money	74	0.23	0.47	0.050	0.8189	0.28	0.58
	Theft	74	0.28	0.59	0.015	0.7815	0.36	0.77
EV_{lying}	*Cheating Friend*	72	0.27	0.56	0.021	0.8619	0.31	0.66
	Car Scratch	75	−0.18	−0.36	0.131	−0.8014	−0.22	−0.45
	Took Money	74	0.04	0.07	0.765	0.8434	0.04	0.08
	Theft	74	0.05	0.10	0.680	0.8964	0.05	0.11
$EV_{truth\ telling}$	*Cheating Friend*	72	−0.23	−0.48	0.047	−0.8568	−0.27	−0.57
	Car Scratch	75	−0.46	−1.04	<0.001	−0.7600	−0.60	−1.52
	Took Money	74	−0.25	−0.52	0.031	−0.7146	−0.35	−0.75
	Theft	74	−0.40	−0.88	<0.001	−0.8008	−0.50	−1.16

Table 3
Identification of potential liars and truth tellers from the dichotomized variables.

Dichotomized measures	Scenario	Percentile for cutoff	Identification		
			Liars	Truth tellers	Overall
M	*Cheating Friend*	$P_{58} = -1.69$	73.81%	60.00%	68.06%
	Car Scratch	$P_{33} = -2.10$	48.00%	70.00%	62.67%
	Took Money	$P_{31} = -1.60$	52.17%	76.47%	68.92%
	Theft	$P_{80} = 0.00$	84.75%	26.67%	72.97%
EV_{lying}	*Cheating Friend*	$P_{58} = 0.14$	54.76%	36.67%	47.22%
	Car Scratch	$P_{33} = -1.99$	40.00%	70.00%	60.00%
	Took Money	$P_{31} = -2.00$	26.09%	62.75%	51.35%
	Theft	$P_{80} = 2.00$	83.05%	13.33%	68.92%
$EV_{truth\ telling}$	*Cheating Friend*	$P_{58} = -3.37$	66.67%	53.33%	61.11%
	Car Scratch	$P_{33} = -3.00$	68.00%	78.00%	74.67%
	Took Money	$P_{31} = -2.20$	43.48%	70.59%	62.16%
	Theft	$P_{80} = -3.00$	84.75%	33.33%	74.32%

circumstances under which lying is cognitively more complex than truth telling. It also allows for specific predictions concerning cognitive load indicators of deception—such as response time and contradictions—when a specific, theory-based interviewing approach called TRI-Con is used (see Walczyk et al., 2005, 2009, 2012). ADCAT is therefore a much needed contribution in deception detection research. However, many aspects of the theory call for an empirical confirmation.

In the current study, we tested a specific aspect of ADCAT, namely, whether the decision to lie is made in a quasi-rational way as if the formulas provided by Walczyk et al. (2014), which consider the probability of different outcomes and their associated valence, were conceptually used by senders. Our findings revealed that the relationship (measured with the point biserial correlation coefficient) between the motivation to lie (*M*) as calculated with Walczyk et al.'s formula and the participants' dichotomous decision to lie or tell the truth in Questionnaire 1 was substantial and significant. However, the relationship between the expected value of telling the truth ($EV_{truth\ telling}$) and the participants' decision to lie or tell the truth was about the same as large and also significant. On the contrary, the correlation between the expected value of lying (EV_{lying}) and the binary lie/tell the truth decisions was not significant. Recall that *M* is calculated by subtracting $EV_{truth\ telling}$ from EV_{lying}. The current data suggest that EV_{lying} contributes little to the motivation to lie, and that *M* could be equated to $EV_{truth\ telling}$. In non-mathematical (and more practical) terms, people tell the truth if they estimate that truth telling will probably produce positive consequences, and resort to lying if they estimate that truth telling will probably yield negative consequences. The possible outcomes of lying and their valence appear to play no role in people's lying vs. truth telling decisions.

More sophisticated analyses correcting the correlation coefficients for range restriction using Carroll's (1945, 1961) procedure in the way suggested by Bass and Ager (1991) strengthened these conclusions. Corresponding Cohen's *d* ranged from medium to large for those correlations involving *M* and $EV_{truth\ telling}$, and compared well with the average effect size found in the social psychology literature (Richard et al., 2003). However, effect sizes for the relation between EV_{lying} and the binary lie/tell the truth decision were smaller.

When two separate groups, one of potential liars and one of potential truth tellers, were created for each retained scenario based on the *M* scores, overall correct identification ranged from 63% to 73% (even though separate identification rates for truth tellers and liars was understandably low for those categories with few cases). We subsequently calculated the area under the ROC curve, which ranged from 0.63 to 0.74 and was significantly larger than 0.50 (with one exception). Parallel analyses for the $EV_{truth\ telling}$ scores produced similar outcomes. However, the analyses involving EV_{lying} yielded lower classification rates and areas under the ROC curve that did not differ significantly from 0.50 (with one exception).

To summarize (and reiterate), this evidence strongly suggests that, in line with ADCAT, people make the decision whether to lie in a quasi-rational way; however, unlike what is suggested by ADCAT, in making that decision people likely only consider the expected value of truth telling, disregarding the expected value of lying. This finding is consistent with Levine, Kim, and Hamel's (2010) *veracity principle* (see also Proposition 5 of Levine's (2014) Truth Default Theory). The *veracity principle* holds that people normally tell the truth, but when honesty is deemed to be ineffectual, inefficient or counterproductive in goal attainment, people will resort to lying. Research has found support for this principle (see Levine et al., 2010).

The finding that only the consequences of telling the truth—and not those of lying—are likely considered by the speaker has important implications for ADCAT. ADCAT is a cognitive load theory. Walczyk et al. (2014) argue that the decision making process whether to lie requires

Table 4
Outcomes of the Receiver Operating Characteristic (ROC) analyses.

Measure	Scenario	AUC	*SE*	*p*	95% CI	
					Lower	Upper
M	*Cheating Friend*	0.74	0.06	0.001	0.63	0.86
	Car Scratch	0.64	0.07	0.043	0.52	0.77
	Took Money	0.63	0.08	0.077	0.48	0.78
	Theft	0.70	0.07	0.020	0.56	0.83
EV_{lying}	*Cheating Friend*	0.66	0.07	0.026	0.52	0.79
	Car Scratch	0.41	0.07	0.196	0.27	0.55
	Took Money	0.55	0.07	0.532	0.40	0.69
	Theft	0.55	0.08	0.554	0.39	0.71
$EV_{truth\ telling}$	*Cheating Friend*	0.64	0.07	0.049	0.51	0.77
	Car Scratch	0.81	0.05	< 0.001	0.71	0.91
	Took Money	0.64	0.07	0.064	0.50	0.77
	Theft	0.77	0.07	0.001	0.64	0.90

Note. AUC = Area under the Receiver Operating Characteristic (ROC) curve.

time and cognitive resources. However, if that process is simpler than depicted by Walczyk et al., then the amount of time and cognitive resources that are required will be smaller than implied in the theory.

4.2. Limitations and further considerations

Critics may argue that the participants' answers to Questionnaire 1 may have influenced their replies to Questionnaire 2. However, because the hypothesis of the current study can only be tested with a within-participant design, the only available alternative was asking participants to fill in Questionnaire 2 first. This would have been much more problematic, as the participants would have indicated whether they would lie or tell the truth in each scenario just after having *consciously* assessed the likely outcomes and valence of lying vs. telling the truth in each scenario. Please note that our hypothesis was that participants would intuitively make their decisions as if they were conceptually using the ADCAT formulas. By administering Questionnaire 1 first, we ensured respondents' decision making was spontaneous and did not incorporate considerations other than those they normally deem relevant. Further, Questionnaire 2 was somewhat complex; therefore, we believe the purpose of administering it was not apparent to participants. In hindsight, however, it would have been good to ask participants after the experiment whether they could tell what the purpose of the experiment was. Future research should incorporate this refinement.

Another limitation of the current study was that the split of the decision to lie vs. tell the truth variable was very unequal, which forced us to dismiss a number of scenarios and adjust the empirical point biserial correlations for the retained scenarios. However, these skewed responses reveal much about people's real-life decision making. It should be stressed that the scenarios were based on real situations. It is reasonable to assume that some real circumstances might primarily prompt lie decisions whereas some others might primarily prompt truth telling decisions. For example, it is not surprising that dealing with the friend's infidelity almost always led to participants' decision to lie. One can speculate that choosing to protect the flatmate's relationship protects the participant's friendship and leaves the hard decision to the flatmate who is doing the cheating. Conversely, in the Predicament Scenario, where participants had to decide whether to tell the friend about the parents' death, it is not surprising that most participants chose to tell the truth. The truth in that case will be revealed soon enough given the outcome, so there is no point in hiding it. The direction of the decision in those real world situations might be easier or obvious for the sender. ADCAT accounts for this by suggesting that the weights in the decision-making process will be determined by the social context and the individual's knowledge base (Walczyk et al., 2014). We hope that reporting the raw data (Table 1) associated with those scenarios not included in the statistical analyses will help researchers to have a realistic starting point in future tests of ADCAT.

These arguments have some practical relevance. Police detectives and other practitioners might benefit from a systematic understanding of the conditions under which senders will be more likely to lie or to the truth, or when it could be either way. This would allow them to prepare more optimally the interview process. These considerations are in line with a new trend in deception research that shows that in real life, contextual cues (such as people's motives) may be revealing indicators of truth or deception (see Blair, Levine, Reimer, & McCluskey, 2012; Blair, Levine, & Shaw, 2010; Bond, Howard, Hutchison, & Masip, 2013; Levine, 2014; Masip & Herrero, 2015b, 2015c; Park, Levine, McCornack, Morrison, & Ferrara, 2002).

Even though we had to dismiss several scenarios, the findings remained generally consistent across all of the retained ones. In other words, the findings were quite robust. However, it is important to stress that the present data are correlational. Caution is therefore warranted in terms of deriving strong causal attributions.

4.3. Future directions

There is room for improvement of ADCAT. More research is needed, but he current data suggest that the *Decision* component would be more parsimonious if EV_{lying} were dropped from the formula and M were equated to $EV_{truth\ telling}$. As stated above, the finding that the decision to tell the truth vs. lie depends almost exclusively on $EV_{truth\ telling}$, is consistent with Levine et al.'s (2010) *veracity principle*. Other research has shown that humans have a general aversion to lying (e.g. Ariely, 2012; Gneezy, 2005; Hurkens & Kartik, 2009). Deception is used only when the truth poses an obstacle to goal attainment (Levine et al., 2010), a notable percentage of senders do not lie even when the lie benefits both the sender and the receiver (Erat & Gneezy, 2012), and studies examining the prevalence of lying have revealed that even though a few individuals lie a lot, most people normally do not lie (e.g. Halevy, Shalvi, & Verschuere, 2014; Serota, Levine, & Boster, 2010). ADCAT should formally acknowledge this general tendency to truth telling (e.g., by weighting the positive consequences of truth telling more heavily than its negative consequences). This is a task for future research into ADCAT.

Similarly, behavioral economics research has shown that the decision to lie (vs. to tell the truth) is under the influence of a number of variables, such as whether the lie is personal (Cappelen, Sørensen, & Tungodden, 2013), the costs and benefits of the lie not only for the sender but also for the receiver (Erat & Gneezy, 2012; Gneezy, 2005), whether the motivation for lying is a potential gain or avoidance of loss (Sakamoto, Laine, & Farber, 2013), social norms (see Erat & Gneezy, 2012), and so forth. More generally, a number of situational factors influence people's honest vs. dishonest behavior (see Ariely, 2012, for a review). Research has also explored individual (e.g. Halevy et al., 2014; Hurkens & Kartik, 2009) and cross-national (Gächter & Schultz, 2016) differences in lie propensity. ADCAT would benefit from incorporating these factors, thus allowing for even more precise predictions. The reader should note that even though M and $EV_{truth\ telling}$ were correlated with, and predictive of the binary lie vs. tell the truth decision, a substantial proportion of the variance remained unexplained. This indicates that there are additional factors influencing the decision.

It should also be noted that the ADCAT view that senders normally make their decision to lie or tell the truth as if they were conceptually using mathematical formulae considering the costs and benefits of deceptive vs. honest behavior reflects a *homo economicus* or classical criminology view of the human being (Beccaria, 1764/1986; Becker, 1968). According to this view, humans are selfish and fully rational. Faced with the opportunity of committing a transgression, they objectively weight the costs and benefits associated with virtuous vs. deviant behavior and choose the best (i.e., more beneficial or less disadvantageous) course of action (for reviews, see, e.g., Hochstetler, 2009; Paternoster & Bachman, 2001).

However, it has become apparent from the 1970s that humans' decision making is fraught with a number of heuristics and biases (Tversky & Kahneman, 1974), and research has found that, while costs and benefits still are important in the decision making process, humans' decisions fall short of being fully rational. For instance, increasing the costs associated with crimes in the form of increased incarceration has a negligible effect on the crime decline (Roeder, Eisen, & Bowling, 2015); the individuals' *subjective perceptions* of certainty [that they will be caught if they commit a misdeed] and severity [of the punishment] are more important than *objective* certainty and severity (Williams & Hawkins, 1986); subjective certainty has a stronger influence on behavior than subjective severity (Williams & Hawkins, 1986); offenders tend to consider the benefits of the crime rather than its costs (Piliavin, Gartner, Thornton, & Matsueda, 1986); and property crime offenders reported that thoughts about being caught or punished were distracting, so they focused on the potential benefits of the crime instead (Tunnel, 1992). Human honesty is indeed much more common that it would be according to a strict *homo economicus* view, and a variety of

influences besides costs and benefits have been shown to influence honest vs. dishonest behavior (see Ariely, 2012, for a review). Even though the bulk of this research mainly focuses on the decision to commit immoral or criminal behaviors rather than specifically on the decision to lie, its findings may nevertheless be relevant. It is clear from our data that the probability ("certainty") and valence ("severity") of positive and negative outcomes derived from truth telling ($EV_{truth\ telling}$) had a significant impact on the participants' decision to lie or tell the truth. However, the strong rationality of the ADCAT decision making formulae is at odds with these nuanced views of human moral decision making.

It is important to stress, nevertheless, that ADCAT acknowledges that there are limits to human rationality when it comes to deciding whether to lie. Walczyk et al. (2014) explain that a quasi-rational decision-making process does not necessarily lead to the best *objective* option. Instead, it leads to the option that *is subjectively perceived* as the best one *by the speaker*. However, the speaker may be inaccurate in estimating outcome utilities and their probabilities, in part because s/he may use heuristics in making these estimates (Walczyk et al., 2014). Using heuristics may be more likely under certain specific circumstances. For instance, Walczyk et al. (2014) maintain that whenever respondents must decide quickly or are under intense stress, tired, or intoxicated, heuristic usage very likely replaces thoughtful decision making processes.

In relation with these arguments, future research should test theoretically-based predictions concerning the degree to which the decision to lie vs. tell the truth is made in a rational way. It would be reasonable to predict that the decision would be more strongly correlated with *M* and $EV_{truth\ telling}$ under circumstances that favor systematic or analytic rather than heuristic information processing (see, e.g., Chaiken & Trope, 1999; J. S. B. T. Evans, 2008). For example, more rational decisions should be made when participants have unlimited time to decide than under time constraints that may hinder their rational decision-making process.

In addition, future research should explore the ADCAT *Decision* component with scenarios other than the ones we used, as well as with paradigms more realistic than hypothetical scenarios. Maybe our failure to find significant associations between EV_{lying} and the decision to lie vs. tell the truth is a consequence of having used hypothetical scenarios (no matter how realistic they were). Maybe in real life potential liars do weight the costs and benefits associated with lying. These issues can only be examined if more ecologically valid studies are conducted. For instance, researchers could place participants in a realistic situation where they have to make the decision to either lie or tell the truth. Later on, participants could be asked to report the likely outcomes of each decision and their valence. Some paradigms have been used in deception detection research where participants are induced to cheat during a task by another "participant" (actually a research assistant). Later, cheaters must decide whether to confess or hide their transgression when asked to explain their high performance on the task to the researcher (e.g. Feeley & deTurck, 1998; Levine et al., 2010). This paradigm could be used to examine the decision to lie according to ADCAT.

Research should also be conducted with older and more diverse individuals. All participants in the current study were young educated undergraduates. Because of this, scenarios relevant for young students were chosen (see Appendix A) so that they could easily place themselves in the protagonists' shoes. Along with using non-student samples, future research should also widen the scope of the type of scenarios employed in the current study.

4.4. Conclusion

We believe the current contribution is a modest but significant step towards providing empirical validation of one of the many testable aspects of Walczyk et al.'s (2014) ADCAT. Our findings suggest that the *Decision* component of ADCAT would be more parsimonious if the motivation to lie vs. tell the truth were equated to the expected value of truth telling, disregarding the expected value of lying. In our view, ADCAT is a promising, detailed theory that furthers our understanding of lie production and can help design deception detection procedures. We hope ADCAT or revised models have a significant impact on future deception research.

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Appendix A. Scenarios used in the current research in the order in which they were presented in both questionnaires

Scenario 1 (Damage)

Today in the evening you were at your parents' home while they were out. Because you were bored and had nothing to do, you turned on the stereo and began to dance. However, you got carried away and, after an unfortunate spin, you accidentally hit a vase with a hand. The vase crashed to the floor. Your parents are going to ask you what happened to the vase. Even though the vase was not very valuable, you are concerned about the situation.

Scenario 2 (Took Money)

Today your parents went out for lunch. Because you don't like the meal you mom cooked for you, you got rid of it and made a phone call to order a pizza. At the time you had to pay the delivery person, you realized all the cash you had with you was just five Euros. Therefore, you decided to take some money from a wallet your dad had forgotten at home. You are aware that tonight, during dinner, your dad will probably tell you there is some money missing from his wallet and will ask you about it.

Scenario 3 (Cheating Friend)

During yesterday's exam, you let a friend to copy your answers because she said she had not been able to study hard enough. The professor, very serious, asked you to go to his office to talk about the exam. He indeed realized your exam is very similar to your friend's exam and you are afraid he will give a "fail" grade to both of you. He is going to ask you to tell him about the exam.

Scenario 4 (Unexpected Visit)

Finally, you managed to get the tickets for that concert of your favorite band. But then you get a phone call from your parents. They tell you that, after considerable effort, they managed to get the time to travel to town to visit you. Unfortunately, they are planning to come on the day of the concert. Your mom asks you what you think about this plan.

Scenario 5 (Theft)

You know your brother stole computer equipment from the company he is working for. He said he was with you in the evening when the theft occurred. The Judge orders you to testify and make a statement to corroborate your brother's alibi.

Scenario 6 (Car Scratch)

Yesterday you used your parents' car without them knowing. While parking, you did not estimate the distance properly, and slightly scratched the car against a street light. Today you are afraid about your dad asking you about the car scratch.

Scenario 7 (Flatmate Infidelity)

Last night your flatmate returned late from a party. S/he came with someone and they locked up themselves in the bedroom. It is somewhat late today, but they are still sleeping. Suddenly, the phone rings, and you pick it up. It's your flatmate's significant other. S/he is worried because your flatmate's cell phone appears to be switched off. S/he asks you whether your flatmate is at home and can you get him/her on the phone.

Scenario 8 (Secret)

Your friend stayed talking with the teacher after class, so you and some other friends take this opportunity to discuss the details of the surprise birthday party you all are preparing for her. However, she suddenly shows up and sees all of you secretly whispering. When you see her, you all abruptly shut up and then switch topic. She gets annoyed because she suspects you were criticizing her. She takes you to the side and very angrily asks you what you were talking about.

Scenario 9 (Predicament)

Last night you had an unfortunate accident when driving back to your little village. You got distracted, your car moved to the wrong lane and crashed against another car moving in the opposite direction. You passed out and now you feel battered, but the couple in the other car died. Suddenly, you get a phone call from a friend. Your friend tells you s/he just saw the accident in the news and asks you whether you know if her/his parents are okay. You know her/his parents were the occupants in the other car.

Scenario 10 (Unauthorized Use)

You are in charge of taking your home's rental fee to the landlord. Yesterday, your flatmates left their share of money on the living room's table. You promised you would meet the landlord before the end of the week. However, today you had an emergency and took some of your flatmates' money. Your flatmates realized there is some money missing. You know when you get back home tonight they will ask you about the missing money.

Appendix B. First page (example page) of Questionnaire 2

Code _____ Age _____ years Gender: O Male O Female

Last night you went out without your partner, who stayed at home studying for tomorrow's exam. You met an irresistibly attractive, funny, and interesting person, and you both ended up together in bed. You partner is going to ask you what you did last night, where did you go, with whom, at what time did you go to sleep, etc. You do not want a one-night stand to ruin your relationship.

If you tell the truth:	If you lie:
• Possible reaction: My partner will break up with me • Probability of this reaction [*i.e., probability of your partner breaking up with you*]: 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 **0.9** 1.0 (Will not happen) (Will certainly happen) • Consequences of this reaction: **-5** -4 -3 -2 -1 0 +1 +2 +3 +4 +5 (Extremely Negative) (Neutral) (Extremely Positive)	• ¿What lie would you tell?: I would say that I had dinner with some classmates at McDonald's, that then we went to have some drinks at Barvel and Bisú, and that then I felt tired and was somewhat drunk so I went home to sleep. I was about 2.30 a.m. • Probability that your lie goes undetected: 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 **0.8** 0.9 1.0 (Certainly detected) (Certainly undetected)
• Alternative reaction: My partner will NOT break up with me • Consequences of this reaction: • What would the consequences be?: Lack of trust within the relationship • How would these consequences be? -5 -4 -3 -2 **-1** 0 +1 +2 +3 +4 +5 (Extremely Negative) (Neutral) (Extremely Positive)	• Consequences: • What would the consequences be?: My partner will not break up with me--but I'm gonna feel guilty. • How would these consequences be? -5 -4 -3 -2 -1 0 +1 +2 **+3** +4 +5 (Extremely Negative) (Neutral) (Extremely Positive)

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