# ONLINE APPENDIX:

## *A Notion of Prominence for Games with Natural-Language Labels*

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# APPENDIX A

*Additional figures and tables*

**Study 1**

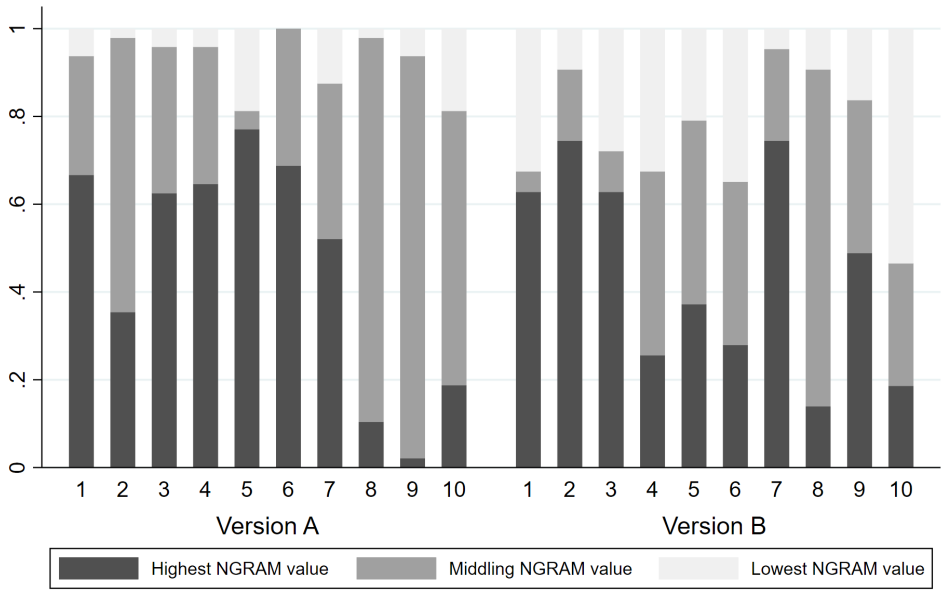


**Figure 1A** - Frequency distributions of individual-level choices in each of the 1-10 games in Version A (left panel) and Version B (right panel). For visual clarity, in each of the bars, the options have been arranged according to their NGRAM values: darker shades of gray represent options with relatively higher NGRAM values. For the list of labels in each of the games, see Table 1 in the body of the paper.

**Study 2**

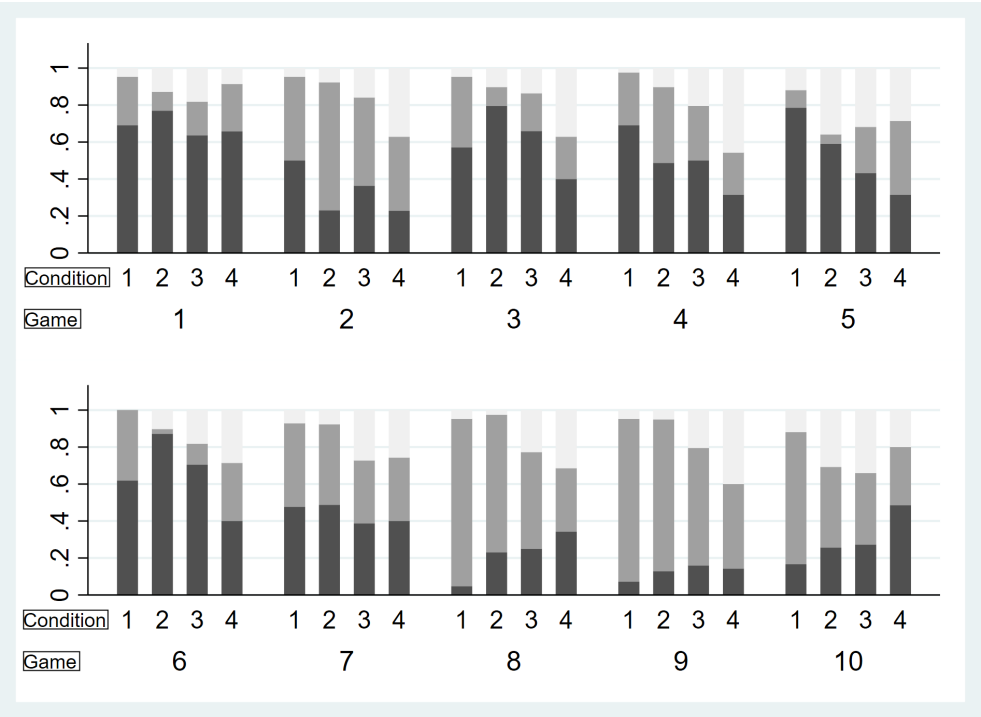


**Figure 2A** - Frequency distributions of individual-level choices in each of the *1-10 games* and for each of the *1-4 conditions*. Conditions 1-4 refer to "Coordinate", "Pick", "Seek", and "Hide", respectively. For visual clarity, in each of the bars, the options have been arranged according to their NGRAM values (i.e., darker shades of gray represent options with relatively higher NGRAM values). For the list of labels in each of the 1-10 games, see the left panel of Table 1 in the body of the paper.

We now present a set of alternative-specific conditional logit models ("asclogit"; McFadden's choice model, 1973). Before describing the list of predictors, note that asclogit analysis differs from other logistic models in that it accounts for "alternative-specific" variables, as well as "case-specific" variables, as defined below.

*Alternative-specific* variables represent attributes that may vary across each of the options in a choice task (e.g., the labels' numerical NGRAM value varies across the three options). If an alternative-specific predictor has a positive coefficient, then it implies that the alternative featuring a higher value is more likely selected than the other alternatives, whichever they are. Relatedly, note that alternative-specific predictors do not have an explicit base category; for further discussion, see Cameron and Trivedi (2010, pp. 503-511).

*Case-specific* variables, on the other hand, represent attributes that are common to each of the three options in a given choice task (e.g., the experimental condition). Coefficients of case-specific predictors are interpreted as parameters of an ordinary multinomial logit model against the base category. Note that the following tables present an upper section, which lists alternative-specific predictors, and a lower bifurcated section that lists case-specific predictors.

In particular, our models consist of the following predictors: *i.* a continuous variable "WF" representing the word frequency of a label (quantified by the NGRAM values in Table 1 in the body of the paper); *ii.* a dummy variable "C" indicating the experimental condition to which a triplet belongs, as specified in the table notes below; *iii.* an interaction variable "WFC" (which captures how the impact of a change in a label's NGRAM varies with the experimental condition). For a formal characterization of the McFadden (1973) choice model, see footnote 25 in the body of the paper.

| | **[1]** ***Pick & Coordinate*** | | **[2]** ***Coordinate & Seek*** | |
|---|---|---|---|---|
| **Choice of option** | | | | |
| Relative word frequency ("WF") | .637*** (.161) | | .707*** (.111) | |
| Relative word frequency * *Condition* ("WFC") | -.050 (.104) | | -.119** (.049) | |
| | **Center label** | **Bottom label** | **Center label** | **Bottom label** |
| Condition ("C") | -.948*** (.212) | -.853*** (.212) | 1.157*** (.227) | .896*** (.214) |
| Constant | -.357*** (.115) | -.098 (.110) | -1.305*** (.177) | -.951*** (.181) |
| Log pseudolikelihood | -746.093 | | -824.402 | |
| Obs. | 810 | | 860 | |

**Table 1A** - Alternative-specific conditional logit model coefficients; in parentheses are standard errors clustered on the subjects (*, **, and *** indicate $p < 0.10$, $p < 0.05$ and $p < 0.01$, respectively, for the relevant Z Statistic, two-tailed tests).
Model [1]: *C* takes on value 0 if a subject is assigned to Pick, and value 1 if assigned to Coordinate.
Model [2]: *C* takes on value 0 if a subject is assigned to Coordinate, and value 1 if assigned to Seek.

We begin by discussing model [1] – in the left panel of Table 1A – which uses the full set of option triplets (i.e., ten games per subject) from the Pick and Coordinate conditions, with standard errors clustered on the subjects. First of all, *WF* confirms a significant positive impact of word frequency on choice behavior. This means that the higher the NGRAM value of a label, the more likely it is for that option to be selected, regardless of other attributes such as the experimental condition or the labels' position (i.e., top, center, or bottom of the list). We further note that *WFC* is non-significant in model [1]. This means that there is no difference in the relative impact of word frequency between Pickers and Coordinators.

A few more comments are in order. The coefficients for dummy *C* (i.e., -.948 and -.853) of model [1] capture the impact of a change in experimental conditions on the attractiveness of the center and bottom options (against the top option): they are both negative, indicating that center and bottom options are selected less often by Coordinators than Pickers. Finally, the two *constant* terms (i.e., -.357 and -.098) of model [1] respectively capture the attractiveness of the center and bottom options (against the top option), due to unmeasured attributes of the alternatives. Both terms are negative (although one is non-significant), reflecting the greater attractiveness of the options located at the top of the list.

Next, model [2] – in the right panel of Table 1A – uses the full set of triplets from the Coordinate and Seek conditions. Model [3] in Table 2A below (left panel) uses the full set of triplets from the Pick and Hide conditions, whereas model [4] (right panel) uses the full set of triplets from the Seek and Hide conditions. Note that *WF* is positive and significant in all such models. Also note that *WFC* is negative and significant in models [2], [3], [4]: this implies that the most frequently-mentioned label is selected less often when moving from Coordinate to Seek (model [2]), from Pick to Hide (model [3]), and from Seek to Hide (model [4]), thereby confirming our stated hypotheses.

| | **[3]** ***Pick & Hide*** | | **[4]** ***Seek & Hide*** | |
|---|---|---|---|---|
| **Choice of option** | | | | |
| Relative word frequency (“WF”) | .940*** (.171) | | .991*** (.350) | |
| Relative word frequency * *Condition* (“WFC”) | -.201*** (.053) | | -.214** (.100) | |
| | **Center label** | **Bottom label** | **Center label** | **Bottom label** |
| Condition (“C”) | .535*** (.174) | .169 (.168) | .325* (.192) | .126 (.172) |
| Constant | -.357*** (.115) | -.098 (.110) | -.148 (.141) | -.054 (.115) |
| Log pseudolikelihood | -767.819 | | -846.129 | |
| Obs. | 740 | | 790 | |

**Table 2A** - Alternative-specific conditional logit model coefficients; in parentheses are standard errors clustered on the subjects (*, **, and *** indicate $p < 0.10$, $p < 0.05$ and $p < 0.01$, respectively, for the relevant Z Statistic, two-tailed tests).
Model [3]: *C* takes on value 0 if a subject is assigned to Pick, and value 1 if assigned to Hide.
Model [4]: *C* takes on value 0 if a subject is assigned to Seek, and value 1 if assigned to Hide.

**Study 3**

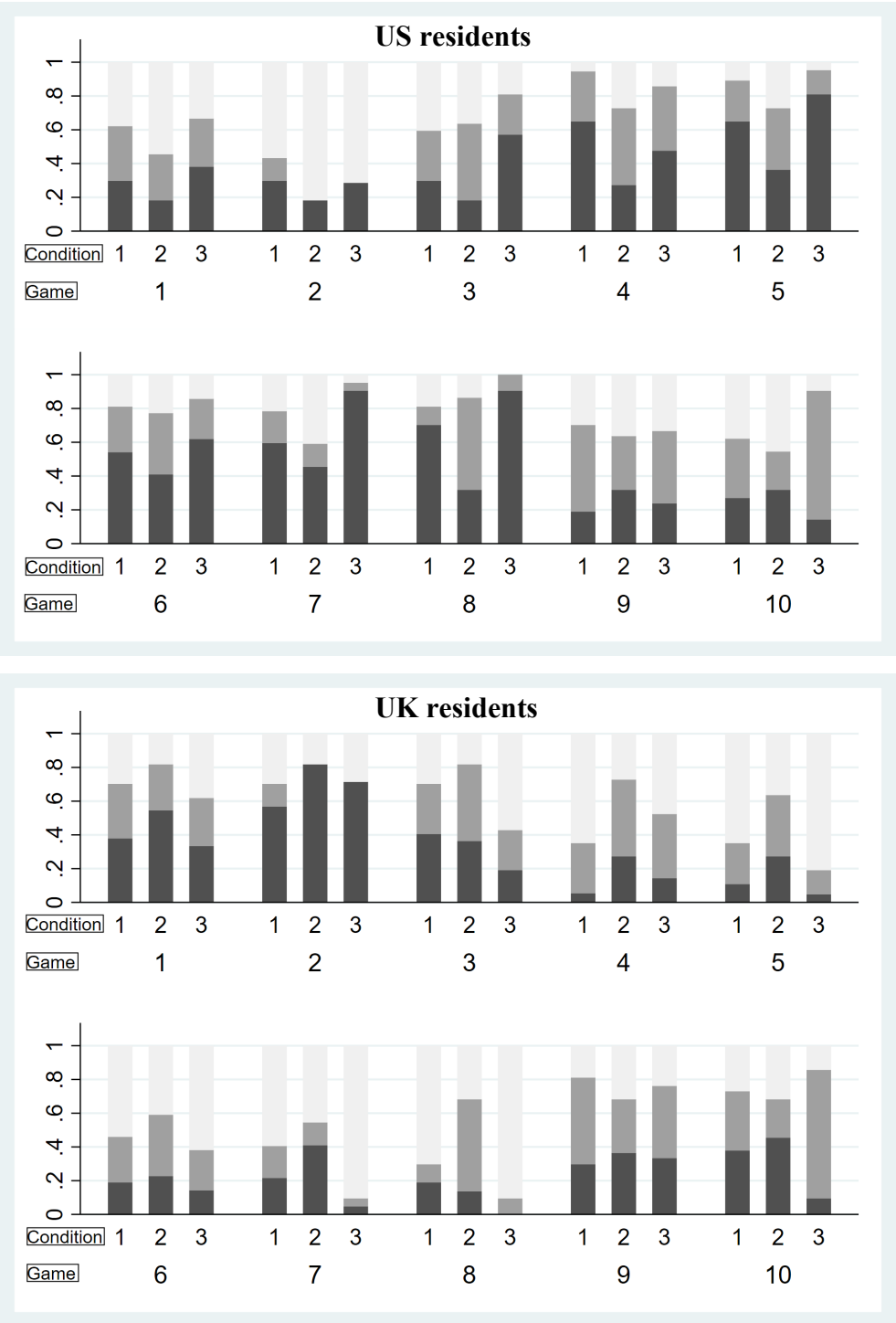


**Figure 3A** - Frequency distributions of individual-level choices for each of the *1-10 games* and for each of the *1-3 information conditions*. Conditions 1-3 refer to "No-info", "know-UK", and "know-US", respectively. In each of the bars, the options have been arranged according to their NGRAM values (i.e., darker shades of gray represent options with relatively higher NGRAM values in the *relevant* vocabulary; that is, American- and British-English for US and UK residents, respectively). For the list of labels in each of the 1-10 games, see Table 3 in the body of the paper.

| Choice by word frequency | US residents | | | UK residents | | |
|---|---|---|---|---|---|---|
| | ***NO-Info*** | ***Know-UK*** | ***Know-US*** | ***NO-Info*** | ***Know-UK*** | ***Know-US*** |
| Strategy-label with *highest* NGRAM metric is chosen [$f_H$], % | 47.89 (.1812) | 35.00 (.2173) | 57.27 (.1618) | 35.00 (.1617) | 43.33 (.1775) | 26.00 (.1577) |
| Strategy-label with *middling* NGRAM metric is chosen [$f_M$], % | 31.05 (.1663) | 32.00 (.1475) | 27.27 (.1902) | 23.33 (.1533) | 30.83 (.1378) | 25.00 (.1715) |
| Strategy-label with *lowest* NGRAM metric is chosen [$f_L$], % | 21.06 (.1559) | 33.00 (.1828) | 15.46 (.0934) | 41.67 (.1617) | 25.84 (.1443) | 49.00 (.1663) |
| Total, % | 100 | 100 | 100 | 100 | 100 | 100 |
| Total # triplets | 190 | 100 | 110 | 180 | 120 | 100 |
| Subjects | 19 | 10 | 11 | 18 | 12 | 10 |

**Table 3A** - (Per-subject) mean choices, given a classification of the labels based on the *relevant* n-gram frequency; that is, American- and British-English vocabularies for US and UK residents, respectively (regardless of their information condition). In parentheses is the standard deviation.

For robustness purposes, Table 4A below presents alternative-specific conditional logit models (McFadden, 1973; for general commentary on asclogit analysis, see p. 2 above). In short, model [5] involves US residents' choices, whereas [6] involves UK residents' choices. Each model uses observations from the *know-UK* and *know-US* conditions (as usual, standard errors are clustered on the subjects). Both models consist of the following predictors: *i.* a continuous variable "WF" representing the word frequency of a label in the subject's own vocabulary (quantified by the relevant NGRAM values in Table 3 in the body of the paper); *ii.* a dummy "C" taking on value 0 (1) if a subject is informed that the counterpart resides in the same (different) country; *iii.* an interaction variable "WFC".

A glance at Table 4A reveals that *WF* is positive and significant in both models: this means that the higher the NGRAM value of a label (in the subject's own vocabulary), the more likely it is for that option to be selected. Also, note that *WFC* is negative and significant in both models: this implies that if one is informed that the counterpart resides in a different country, one will less likely select the option with the highest NGRAM in one's vocabulary.

| Choice of option | [5] *US residents* | | [6] *UK residents* | |
|---|---|---|---|---|
| Relative word frequency (“WF”) | 4.479*** (.747) | | 1.841** (.861) | |
| Relative word frequency * *Condition* (“WFC”) | -4.316*** (1.471) | | -4.218*** (1.436) | |
| | **Center label** | **Bottom label** | **Center label** | **Bottom label** |
| Condition (“C”) | .193 (.550) | .478 (.508) | -.261 (.412) | -.750* (.437) |
| Constant | -.491 (.395) | -1.078*** (.316) | -.233 (.313) | -.496 (.329) |
| Log pseudolikelihood | -203.014 | | -220.462 | |
| Obs. | 210 | | 220 | |

**Table 4A** - Alternative-specific conditional logit model coefficients; in parentheses are standard errors clustered on the subjects (*, **, and *** indicate $p < 0.10$, $p < 0.05$ and $p < 0.01$, respectively, for the relevant Z Statistic, two-tailed tests).
Model [5]: US sample; *WF* refers to the American-English vocabulary. Dummy *C* takes on value 0 if a subject is assigned to *know-US*, and value 1 if assigned to *know-UK*.
Model [6]: UK sample; *WF* refers to the British-English vocabulary. Dummy *C* takes on value 0 if a subject is assigned to *know-UK*, and value 1 if assigned to *know-US*.

## APPENDIX B

*Experimental instructions and screen shots*

**Study 1**

INSTRUCTIONS

Welcome. In this study we are interested in how people coordinate. Please read the following instructions carefully. Note that you may earn a bonus payment in the amount of £0.10 per question, as follows. Specifically, the bonus payment will be determined by your own choices and those made by some other participant, according to the rules described below.

In this experiment each participant (a *Prolific* worker) will be given the same choice tasks, and each participant will be assigned a partner at random (another *Prolific* worker). Note that you will not know the identity of your partner nor will you be able to communicate with him/her.

Both you and your partner will be given 10 multiple-choice questions, with three options in each. If you both select the same option in a given question you will have "coordinated." If you select different options in a given question you will have "miscoordinated." Your goal is to select the same option as your partner (that is, to coordinate with your partner) on as many questions as possible. Recall that you will not know the identity of your partner nor will you be able to communicate with him/her.

Hence, consider a question that asks you to select an option among three, for example, *green*, *blue* and *yellow*. If both you and your partner select the same option (i.e. you both select green, or you both select blue, or you both select yellow) then you will have coordinated. If you select different options (e.g. you select green and your partner selects blue) then you will have miscoordinated.

In short, you will receive a bonus payment of £0.10 per coordinated answer. So - given that this study comprises 10 questions - the total range of bonus payments you can expect to receive is [£0, £1].

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Below is an example of an experimental task.

Please choose one option. Each of you and your partner will receive £0.10 if you both choose the same option, £0 otherwise.

- butter
- peppermint
- cocoa

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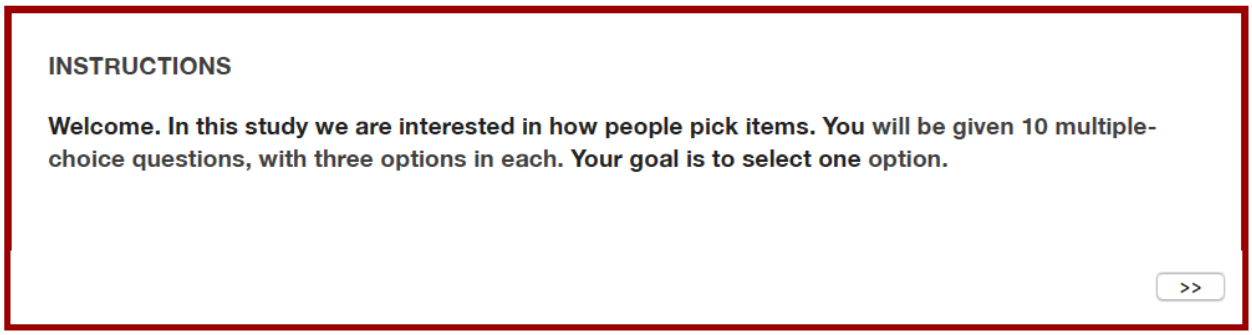
## Study 2

### *Coordinate*

Same instructions as in Study 1 above.

### *Pick*




Below is an example of an experimental task in the *Pick* condition.

*Hide-and-Seek*

**INSTRUCTIONS**

**Welcome. In this study we are interested in how people choose among options. Please read the following instructions carefully. Note that you may earn a bonus payment in the amount of £0.10 per question, as follows. Specifically, the bonus payment will be determined by your own choices and those made by some other participant, according to the rules described below.**

**In this experiment each participant (a *Prolific* worker) will be randomly assigned one of two roles (either "Hider" or "Seeker") and matched with a partner of a different role (another *Prolific* worker). Note that you will not know the identity of your partner nor will you be able to communicate with him/her.**

**Both you and your partner will be given 10 multiple-choice questions, with three options in each. In each question (whether you are assigned the role of Hider or Seeker) you will have to select one of the three options.**

**Specifically, if you are assigned the role of *Seeker*, your objective will be to select the *same* option as your partner.**

**Instead, if you are assigned the role of *Hider*, your objective will be to select a *different* option from your partner.**

**(Recall that you will not be able to communicate with him/her.)**

**For example, consider a question that asks you to select an option among, say, *green*, *blue* and *yellow*. If both you and your partner select the same option (i.e. you both select green, or you both select blue, or you both select yellow), then the Seeker will receive a bonus payment of £0.10 while the Hider will receive nothing.**

**On the other hand, if you and your partner select a different option (e.g. you select green and instead your partner selects blue or yellow), then the Hider will receive a bonus payment of £0.10 while the Seeker will receive nothing.**

**In summary, you may receive a bonus payment of £0.10 per answer depending on your role and the choices of you and your partner. Hence - given that this study comprises 10 questions - the total range of bonus payments you can expect to receive is [£0, £1].**

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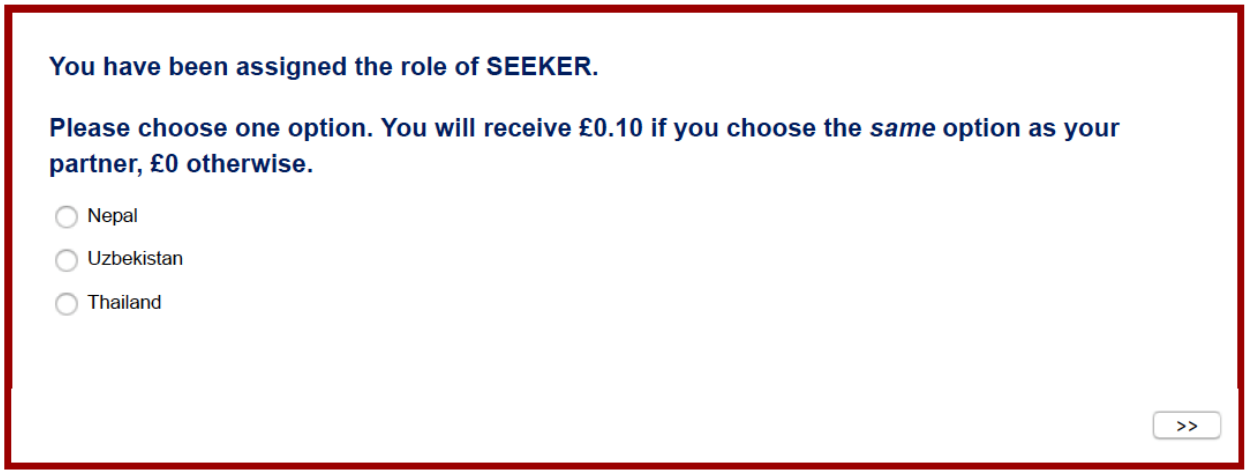
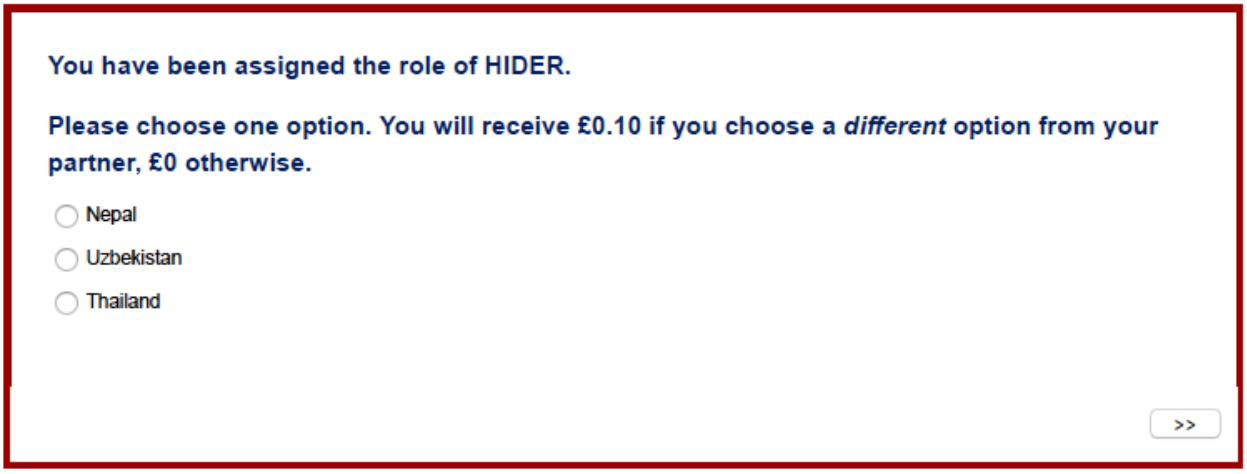
Below is an example of an experimental task in the *Seek* condition.




Below is an example of an experimental task in the *Hide* condition.



## Study 3

**INSTRUCTIONS**

Welcome. In this study we are interested in how people coordinate. Please read the following instructions carefully. Note that you may earn a bonus payment in the amount of £0.10 per question, as follows. Specifically, the bonus payment will be determined by your own choices and those made by some other participant, according to the rules described below.

In this experiment each participant (a *Prolific* worker) will be given the same choice tasks, and each participant will be assigned a partner at random (another *Prolific* worker). Note that you will not know the identity of your partner nor will you be able to communicate with him/her.

Both you and your partner will be given 10 multiple-choice questions, with three options in each. If you both select the same option in a given question you will have "coordinated." If you select different options in a given question you will have "miscoordinated." Your goal is to select the same option as your partner (that is, to coordinate with your partner) on as many questions as possible. Recall that you will not know the identity of your partner nor will you be able to communicate with him/her.

Hence, consider a question that asks you to select an option among three, for example, *green*, *blue* and *yellow*. If both you and your partner select the same option (i.e. you both select green, or you both select blue, or you both select yellow) then you will have coordinated. If you select different options (e.g. you select green and your partner selects blue) then you will have miscoordinated.

In short, you will receive a bonus payment of £0.10 per coordinated answer. So - given that this study comprises 10 questions - the total range of bonus payments you can expect to receive is [£0, £1].

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Below is an example of an experimental task in the *No-info* condition.

**Please choose one option. Each of you and your partner receive £0.10 if you both choose the same option, £0 otherwise.**

- peach
- pineapple
- pear

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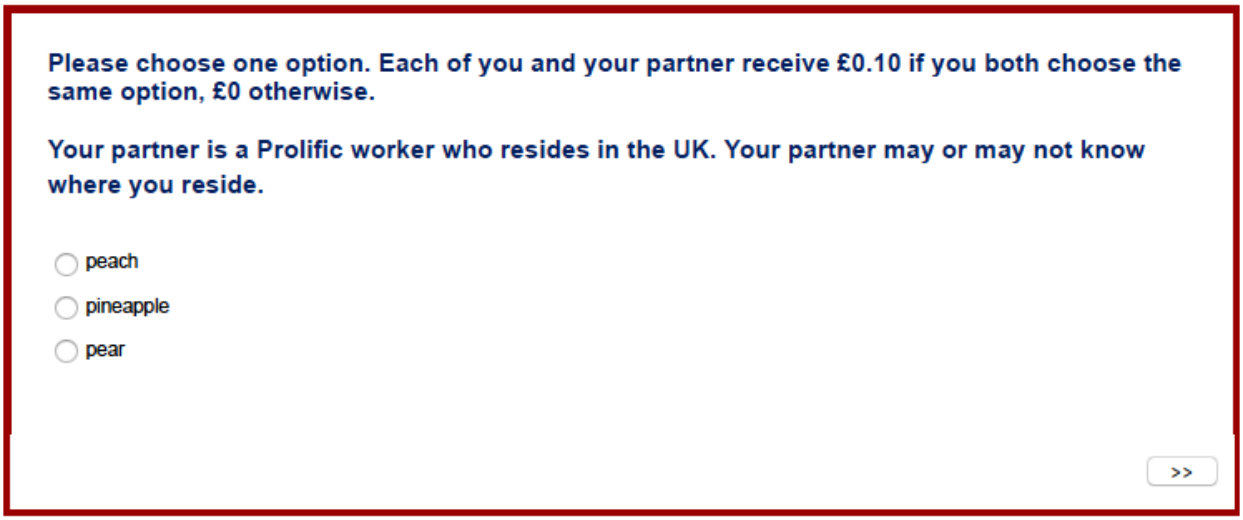
Below is an example of an experimental task in the *know-UK* condition.




Below is an example of an experimental task in the *know-US* condition.