Imperatives and Free Choice

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Abstract

The aim of this paper is to present a new account for imperatives and their interaction with free choice item *any* and disjunctive *or*. Specifically, I argue that free choice inferences are a conversational implicature rather than an entailment. To that, I show that indefinite *any* and disjunctive *or* are overt exhaustifiers of the set of alternatives introduced by imperatives and that the derivation of free choice inferences for *any* and *or* depend on different types of exhaustification: recursion and iteration, respectively.

Keywords: imperatives; alternatives; recursion; iteration; exhaustifiers; choice allocation

Introduction

Any and *or* differ in terms of presupposition, for example:

(1) Context: You want to lock the laptop's screen, so:
   a. Press a key to lock the screen
   b. Press any key to lock the screen
   c. Press the on/off button or press the ⊞ + L

Imagine that you are in the situation described in (1); which one of the sentences from (1a) - (1c) affords the follow up question *What key should I press?* Sentence in (1a) affords the follow up question *What key should I press?* as one seeks a specific key to lock the screen. Sentence in (1c) with the disjunctive *or* can also afford the follow up question because there is, again, a specific key among two (or more) options that will eventually lock the screen. If you press on/off (False [Lock the screen]) you will turn off the laptop, but if you press the ⊞ + L

(True [Lock the screen]) you lock the screen. However, asking the question *What key should I press?* after (1b) sounds a bit odd. The reason is that in the case of *any* one considers all alternatives corresponding to a criterion – locking the screen – and chooses one without falsifying the rest of the options (for example, other keys if pressed might lock the screen). In other words, *any* carries a presupposition that disjunctive *or* seems not to carry: one option among a number of equally and probably true options in all possible worlds is selected. Thus, while disjunctive *or* excludes the rest of the options by turning them false, *any* eliminates the rest of the options without turning them false. This distinguishing property indicates that the set of alternatives for *any* and *or* and the presupposition for each of them are quite different (contra Aloni 2004, 2007a/b). This observation will be further analyzed when we consider the issue of the logical properties of *any* and *or* and we test the validity of the claim that both indefinites and disjunction imply that at least one of the items in the alternative set they presuppose is true (Aloni 2004).

Free choice effects with *any* are licensed in possibility (2a), necessity (2b) and imperatives (2c) sentences. The examples imply that the addressee is permitted or required to act in a certain way according to the preferences of the speaker. *Any* is ungrammatical with free choice effect in episodic (2d) context which does not provide alternatives, as follows:

(2) a. You may talk to anyone
b. You should talk to anyone
c. Talk to anyone
d. # You talked to anyone
Required or permitted action: Talk to whatever person

Likewise the disjunctive *or* yields free choice effects in possibility (3a), necessity (3b) and imperatives (3c) with the exception of (3d) episodic context which lacks the free choice inference:

(3) a. You may take a pen or a pencil
b. You should take a pen or a pencil
c. Take a pen or a pencil
d. # You took a pen or a pencil

Required or permitted action: Take a pen or Take a pencil

Imperatives are interpreted as universal (see (4b), necessity statements) or existential (see (4a), possibility statements) quantifiers and, *any* and *or* seem to concord to the imperatives' quantifier (see Author 2014). If the imperative is a universal then the prejacent is universal but, if the imperative is existential the prejacent is existential, for example:

(4) a. Take (∃) any (∃) flower ⟹ among all similarly true options, you are permitted to choose one flower

a'. # Take (∃) any (∀) flower ⇏ among all similarly true options, you are permitted to choose all flowers

b. Confiscate (∀) any (∀) stolen artwork ⇒ among all similarly true options, you are required to confiscate all stolen artwork

b'. # Confiscate (∀) any (∃) stolen artwork ⇏ among all similarly true options, you are required to confiscate one stolen artwork

In example in (4a) the addressee is required or permitted to choose one flower not all (4a') among a set of flowers. Example in (4b) is required or permitted to confiscate the complete set of stolen artwork not only one (4b'). Free choice expressed with *any* free choice item (FCI henceforth), as we observe in examples in (4) contributes either an existential (4a) or a universal quantifier (4b) (see Giannakidou 2001; Aloni 2004, 2007a/b for an opposite view). The question that I am going to answer in this paper is when and how each quantifier is licensed and, argue that there is a quantifier concord between imperatives, *any* and *or*.

Disjunctive *or* yields free choice effects with either an existential or a universal imperative as well, for example:

(5) a. Drink milk or apple juice *permission*

b. Arrest Escobar or his partners *command*

Although examples with disjunctive *or* yield free choice the interpretation of the requirement (5b) or the permission (5a) differs when compared to *any* type of free choice. In (5a) and in (5b) the default interpretation is that between the two options choose one and exclude the other[1]. The default interpretation is that of an exclusive disjunction. Another observation is that while *any* FCI contributes a non definite number of options, disjunctive *or* does the opposite by contributing into the structure a definite and explicit number of options. Compare for example, the sentence *Take any flower* which means that a number of flowers corresponds to the prejacent *any flower*, for example, a $flower_1$, a $flower_2 \ldots flower_n$. Our choice is among a non-finite set of flowers. To the contrary, the sentence *Take a pen or a pencil* is fixed between two objects: *a pen* and *a pencil* and not something else, for example, *a marker*. Thus, another issue I will explore in this paper is the type of the set of alternative options realized as the imperatives' prejacent and what the consequences are for the interpretation of the free choice and imperatives.

Relative to the derivation of free choice is the following example featuring a comparison between a declarative and an imperative showing whether and what inferences imperatives license:

(6) a. You drank a cup of milk (A) ⇒ You drank a cup of milk (A) **or** you poured it in the sink (B)

b. Drink a cup of milk (A) ⇏ Drink a cup of milk (A) **or** pour it in the sink (B)

The inference yielding from the declarative in example (6a) is valid contrary to the inference that does not yield from the imperative in (6b). Ross's paradox (1941) as is known shows that while declaratives license the inference (A) or (B) from (A) in (6a), the same deducibility reasoning does not hold for imperatives. As it has been noted by several scholars (see Aloni 2007a/b; Portner 2010; Kaufmann 2012, among others) the natural interpretation of example in (6b) is that it offers a choice between actions; choose (A): *drink a cup of milk* or choose (B): *pour it in the sink*. This case in (6b) justifies the thesis that disjunctive *or* contributes to the structure a set of alternatives much like *any*. Indeed, the inference *Drink a cup of milk or pour it*

[1] I am not excluding here the possibility of choosing both options but this should be derived from the context. I will talk about inclusive disjunction later in our discussion (see section 3.3.2 and 3.3.3). For now I am considering the default case which is the exclusive disjunction.

in the sink from the imperative *Drink a cup of milk* seems odd. While *Drink a cup of milk or pour it in the sink* provides a set of alternative options (which is interpreted as permission), *Drink a cup of milk* provides one option (which is interpreted as command; there are not alternatives to be chosen). This is the paradox of the reasoning process in (6b).

Examples in (6) indicate something else too. If we are dealing with the same disjunctive *or* in both cases (6a) and (6b), and we do not have reasons to believe the opposite[2], then the minimal pair suggests that the disjunctive *or* creates a list of options to be selected. Choice, then, has to be somewhere else in the structure and not in the logical structure of disjunctive *or*.

A relative issue as to what is the source of free choice in sentences with disjunctive *or* is the puzzle of contradiction[3] (see Veltman 2009):

(7) a. Doctor Heinz: Drink milk **or** apple juice
b. Doctor Pepper: Do not drink milk

Examples in (7) suggest that there is a contradiction in the directions the two doctors are providing to a patient and that this contradiction baffles the patient. Imperatives according to Veltman (2009) are the source of a set of alternatives which create the free choice inference. Veltman (2009) argues that the source of inconsistency is the conflict produced between incoming imperatives: *Drink milk* and *Do not drink milk*. In our discussion we will see how the load of free choice meaning is shared between semantics and pragmatics and that it might not be that strange to find plain or disjunctive imperatives used as either a premise and/or an inference (conclusion) without creating a conflict.

A set of alternatives either in semantic (see for example, Menéndez-Benito 2005) or in pragmatic accounts (see for example, Alonso-Ovalle 2006) is considered as the set of available options from which the addressee is permitted or required to choose from. The set of alternatives can be analyzed by means of *exclusivity* (Menéndez-Benito 2005; Alonso-Ovalle 2006; Portner 2010) or *exhaustivity* (Giannakidou 2001; Fox 2007; Giannakidou & Quer 2013; Chierchia 2013) of the set of available options where only one disjunct is true and the rest are false. In other

[2] The reason is that we do not aim to proliferate grammar with multiple version of a linguistic item if we can develop a representation from which all possible functions can be produced.
[3] The pattern of reasoning is the following: Do x or do y
Do not do x
Therefore, do y

words, the set of alternatives offered by *any* and *or* is analyzed as an exclusive disjunction (see for example Aloni 2004, 2007a/b). However, this is part of the picture we have for alternatives:

(8) a. Take any pencil

b. Confiscate any guns

c. Take an apple or an orange

d. *Any student takes a pen

First, *any* cannot contribute alternatives (8d) on its own (Giannakidou 2001 but see Dayal 1998 for a different view on *any* and alternatives). It seems that *any*, as Chierchia (2013) argues, requires some sort of activation of the alternatives' set which will then be followed by exhaustification. Moreover, *any* with imperatives is not uniquely an exclusive disjunction. Consider the example *Take any pencil* in (8a) where you are permitted to choose one among many pencils. However, there is also the case where your choices are comprised of more than one options like the example in (8b) *Confiscate any gun*. In this case you conform to the requirement or you adjust to the permission by selecting more than one option. A similar observation has been made for *or* which is not only analyzed as an exclusive disjunction over possibilities (Aloni 2004, 2007a/b) but also as an inclusive disjunction (Asher & Bonevac 2005; Zimmermann 2006; Fox 2007; among others). In order to capture the nature of alternatives I propose that we consider cases in which the imperatives prejacent recursively includes the options available (for example, 8b) and not only those that are disjunctively represented (for example, 8a and 8c). In this paper, therefore, I will argue for a theoretical model of alternatives which accommodates conjunctive (inclusive) and disjunctive (exclusive) exhaustification thus predicting its recursive nature, a point that current theories do not capture or predict.

The puzzle of free choice inference has been discussed widely in the linguistic and philosophical literature and many approaches have been offered. Generally, there are five approaches that have been dealing with the locus and the variation of free choice and its relation to imperatives. The first approach argues that free choice is an implicature (Schulz 2005; Alonso-Ovalle 2006; Kaufmann 2012) and their relation with imperatives is explained via

Gricean reasoning (Aloni & van Rooij 2007). The second theoretical approach promotes the idea that free choice items (FCI) introduce a set of alternatives (Zimmermann 2000, 2009; Kratzer & Shimoyama 2002; Giannakidou 2001; Geurts 2005; Menéndez-Benito 2005; Alonso-Ovalle 2006; Aloni 2007a/b; Fox 2007; Portner 2010; Chierchia 2013; among many others). Imperatives much like the rest of the modals (for example, *may* and *must*) quantify over these sets of alternatives (Aloni 2007a/b) encompassing their range either by *distribution* (Kratzer & Shimoyama 2002), by *exhaustification* (Giannakidou 2001; Chierchia 2013; Giannakidou & Quer 2013; Aloni & Ciardelli 2013; among others) or by *exclusion* (Menéndez-Benito 2005). The third theoretical approach argues that imperatives and free choice inference constitute a special case of conditional reasoning for example, an imperative is something like 'If p, then q' (Anderson 1956; Asher & Bonevac 2005; Barker 2010). The fourth approach treats the free choice inference (van Rooij 2008; Ciardelli 2009) yielding with imperatives a case of dynamic semantics (Mastop 2005; Veltman 2009; Portner 2004, 2007, 2010; among many others). Dynamic semantics based on update of the common ground treats imperatives as preferences of an individual (Starr 2013; Author 2014). Imperatives enter the common ground dynamically changing what is mutually preferred in the conversation and free choice is the result of a preference update on the part of the participants (Starr 2013), or changes the To-Do-List of some agent (Lewis 1979; Han 1998; Mastop 2005; Veltman 2009). In spite of the fact that all mentioned theories have provided generalizations and important insight for interpreting imperatives and free choice inference the phenomena provided in (1) – (8) are a still a puzzle without a satisfactory answer. Thus, I propose that indefinite *any* and disjunctive *or* are overt exhaustifiers of the set of alternatives introduced by imperatives and that the derivation of free choice inferences for *any* and *or* depend on different types of exhaustification: recursion and iteration, respectively.

The paper is organized as follows. In section 2 I present the logical properties of imperatives, indefinite *any* and the connective *or*. In section 3 I present the type of alternatives that indefinite *any* and disjunctive *or* operate on as overt exhaustifiers and, I discuss the type of exhaustification *any* and *or* feature. In section 4 I provide the definitions of terms and the pragmatic background in which I will analyze the properties of imperatives and free choice. Finally, in section 5 I offer an application of the formal analysis as offered in this paper in order to solve some of the

paradoxes of imperatives and their interaction with indefinite *any* and disjunctive *or*. Section 6 concludes the paper.

2 Background

From the examples in the introduction we understand that the puzzle of free choice inferences is an issue of interaction of imperatives with disjunction[4] and indefinites as imperatives seem to interact with them in a different way and yield different inferences. Unlike declaratives, imperatives denote non-propositional content (see for example Portner 2004, 2007; Starr 2013; Author, 2014; among many others). Therefore, when analyzing the interpretation of imperatives in conjunction with linguistic items such as *any* and *or* that yield free choice inference, it is useful to know what properties each element contributes into the structure.

2.1 Imperatives

If we want to reduce the puzzle of discovering the principles of licensing and interpreting free choice with imperatives, logical connectives and indefinites we should focus on three factors that most affect its solution: (a) the propositional, if any, status of imperatives, (b) the quantificational force of imperatives and, (c) the inferences imperatives trigger. The assumptions made in this section will help us solve the puzzle of free choice with imperatives.

2.1.1 Propositional Status: the issue of truth values

In order to discuss the meaning of imperatives we need a way to represent them. The meaning of a declarative sentence is a proposition and can be *true* or *false*. In contrast, imperatives are considered as non-propositional (non-assertoric) due to their prominent performative (action oriented) nature, for example:

(9) a Declarative

Mum: The plants are watered.

Bill: That is true.

b. Imperative

[4] Logical connectives (*or*, *and*) more general. However, I am going to focus here on *or* and indefinite *any*.

Mum: Bill, water the plants!

Bill: # That is true!

But if we do not employ truth values for imperatives in order to discuss their meaning then what should we use? Many linguists offered analogues of propositions and truth values (truth and false) which can be applied and capture the imperatives' meaning. Imperatives denote actions (Naumann 2001; Lascarides & Asher 2003; Barker 2012). Portner (2004, 2007, 2010) Mastop (2005) and Veltman (2009) argue that imperatives denote properties that affect the discourse context and attribute to the addressee's To-Do-List (TDL). More specific, the permission imperatives and free choice phenomena are derived from the logical relation between the imperatives and the context to which it is added. Dynamic approaches have made important observations with regard to the update of information and the significant role of the relation holding between a proposition and the context. Imperatives as properties are validated within an update of the context to which they are added. Kaufmann (2012) argues that imperatives have close properties to declaratives (see also Vranas 2010; Starr 2011; Charlow 2013; Author, 2014 for a similar approach on the propositional status of imperatives). Aloni & Ciardelli (2013) argue that imperatives' are regulated by the satisfaction of their conducts (options) and are represented as disjunctive commands or as partial specifications of a set of options triggering genuine[5] sets of alternatives. Compliance conditions are identified with the set of alternatives induced by an imperative proposition p and FCI like *any* (Aloni & Ciardelli 2013) and turn an imperative proposition true. Starr (2013) promotes dynamic preference semantics a framework in which imperatives denote preferences; a mental state modeled in terms of content. This content represents according to Starr (2013) the alternatives in a binary preference relation that an individual considers.

In this paper, I adopt the following theses (a) that imperatives express the preferences set[6] of an individual, (b) that imperatives can be satisfied, violated or be indifferent to an individual and,

[5] I do not completely follow the term *genuine sets* of alternatives that Aloni uses, especially when we are not provided with a definition of what *non-genuine set* is.

[6] Starr (2013) argues that imperatives are *preferences*, however, the formal account offered in Author (2014) and here differs in formal details and motivation. Portner (2004, 2007a) also argues that imperatives are requirements, however, Author (2014) the account I adopt here argues that imperatives are degree expressions of required preferences and that the individual using an imperative does not commit the addressee to the realization of the required preference.

(c) that imperatives cannot be *true* or *false* (Portner 2004, 2007a; Author 2014; among others) for example:

(10) Comb your hair
Satisfaction: You comb your hair
Violation: You do not comb your hair
Indifference: You make your hair whatever you want.

Parallel to *truth* and *false* are *satisfaction*, *violation*[7] and *indifference* (10) (Vranas 2008; Author 2014; among others).

Another characteristic of imperatives is intentionality[8]. Imperatives are inherently intentional (see Author 2014) as they are interpreted with respect to an individual or anchor (for anchors see Farkas 1992; Giannakidou 1998, 1999; and most recently Harris & Potts 2010; for an opposite opinion Amaral, Roberts & Smith 2007). Consider the examples in Greek, English and Japanese:

(11) a. # Eksafanisu apo brosta mu! Ala min to kanis.
Get-2sg.IMP from front my! But not it do-2sg.INP
Get out of my sight! But don't do it.

b. # Koko-kara de-te ik-e! Demo soo suru-na!
Here-from leave-and go-IMP but so do-NEG.IMP
Get out from here! But don't do it.

If I utter *Get out of my sight* with the intention of sincerely preferring this over another preference (for example, *Don't get out of my sight; Do whatever you want* etc), then I express my commitment to the preference (not the realization of the preference) conveyed by the imperative namely that, *I want you to get out of my sight* (see the contradiction in 11a – b).

[7] The discussion about *satisfaction*, *violation* and *indifference* exceeds the purpose of this paper but see Vranas (2008).
[8] *Intentionality* in the sense that an individual expresses his/her intention (anticipated outcome; a goal; a volition to carry out something). In other words, intentionality describes the mental state an individual can be.

Imperative in (11a – b) is speaker-oriented[9] (in this example) thus, when negated yields a contradiction.

2.1.2 Quantificational Force

Imperatives[10] do not have a predetermined quantificational force[11] (see Author, 2014; for an opposite view Kaufmann 2012), for example:

(12) Take a left turn

i. You # may (∃) / must (∀) take a left turn

…as an order

ii. You may (∃) / # must (∀) take a left turn.

…as a suggestion

If we issue an imperative as an order (12i) then the imperative represents a universal quantifier. If we issue an imperative as a suggestion (12ii) then the imperative represents an existential quantifier. The interpretational variability is a strong indication that imperatives do not feature a predetermined (default) quantificational force and that the imperatives' modal base is underquantified (Author 2014).

I assume[12] therefore that imperatives involve a different mechanism of determining the quantificational force and that the set of alternative[13] propositions[14] (modal base) which

[9] *Speaker-oriented* means that the choice over a set of alternatives belongs to the speaker. Later (see section 4) we will talk about *choice allocation* according to which a choice is allocated to the addressee.

[10] Imperatives will be analyzed within an updated version of Kratzer's (1977, 19811, 1991) framework for modals.

[11] It is the individual and the ordering of his preferences within a context that will provide information on what the modal force will be.

[12] Author (2014) argues that imperatives convey preferred actions and actions have a variable state of appropriateness and degree of implementation requirement in our lives. An order, for example, like the interpretation of the imperative in (12i) most of the times is inescapable. An advice likewise incorporates the concept of guiding and directing someone to do something, but it lacks the same degree of implementation requirement; we do not impose an advice. A suggestion like the interpretation of the imperative in (12ii) expresses a lower degree of force when guiding someone. Preference Criterion in (13) is a formal representation of what we discussed.

[13] The set of propositions for imperatives' modal base is a set of alternative propositions. Think it this way. When one issues an order for example *Get up* there is another alternative proposition *Do not get up* which was not selected and/or preferred by the individual. Thus, as I propose here imperatives contribute the alternatives' set and then any and or the overt exhaustifiers produce with the mechanism I will describe the free choice inferences.

constitutes the basis of evaluation of imperatives will be interpreted according to partitive mechanism *Selection* which partitions the underquantified domain. Specifically, an imperative contributes a set of alternative propositions, then a *Selection* on the quantificational domain based on a rational individual's ordering source and a set of conditions determines the quantificational domain that imperatives quantify over (see Author 2014).

An imperative's quantificational force (existential or universal) is a matter of a strict or a weak ordering on an individual's preferences (Author, 2014). Imperatives reveal the preference of an individual on future actions. Thus, it is a rational individual that assigns, decides upon and/or prefers accessible worlds in the pursuit of a goal. To represent this formally, I use the following symbols $<$, $\leq$, $\equiv$ for a *strict, weak* and, *indifference* (or, *invariant*) ordering source, respectively. All orderings reflect an individual's preference ordering based on the *Preference Criterion* a standard for the binary relations that hold between preferences of a rational individual:

(13) Preference Criterion:

i) If an IMP and an IMP' are consistent preferences within a normative frame of a rational individual, then IMP is at least as preferred as IMP', IMP $\leq_{\text{preferred}}$ IMP', iff IMP $\subseteq$ IMP', and the most preferred proposition is that IMP s.t. IMP' is true that IMP' $<_{\text{preferred}}$ IMP.

ii) Imperatives express asymmetric relations, in that the order of the propositions in the modal base is significant, and the act of determining the quantificational domain relays different meaning.

Among comparative relations[15] that hold for imperatives we have different orderings (Author 2014). A strict ordering is defined when an individual prefers a world$_1$ to a world$_2$ but not world$_2$ to world$_1$ from the $\cap f(w)$. In this type of ordering there are no other worlds to be considered

[14] Propositions express preferences of a rational individual.
[15] Imperatives carry a certain degree of requirement and appropriateness (see Author 2014) within a normative context.

(exhaustive) or preferred (preference criterion (13i)) to that selected world by the individual. Strict ordering occurs when the preference for a certain action is considered as strictly necessary, for example, when an order is issued and is required to be implemented without wavering by anyone:

(14) Strict Ordering Source g_{strict} :

$\forall u, z \in W: u \neq z \Rightarrow u < z \wedge z > u$

A weak ordering is defined when an individual has a preference of at least a $world_x$ from $\cap f(w)$. Weak ordering occurs when the preference among actions in the modal base is considered as moderately required or appropriate because there might be other available actions. For example, when we provide an advice we do not expect that our recommendation will be fulfilled rigorously:

(15) Weak Ordering Source g_{weak} :

$\exists u, z \in W: u \neq z \wedge z \leq u$

Indifference is an equivalence relation on ordered worlds where an individual is indifferent, for example $world_1 > world_2 \equiv world_2 > world_1$ in $\cap f(w)$. This instance of ordering occurs when there is actually lack of preference among actions. For example consider a case when you really do not care what the addressee will do like *Turn left, turn right*:

(16) Invariant Ordering Source $g_{invariant}$:

$\forall u, z \in W: u \neq z \wedge (u < z \equiv u > z)$

The three types of ordering sources I argue that permute the propositions in the modal base and represent the accessible worlds according to an individual's preferences (see Author, 2014 for a detailed argumentation).

Imperatives are about an individual's preferences over situations, actions, etc, and by that I mean an individual has a *choice* over the set of accessible worlds $\cap f(w)$ by selecting the best

preferred worlds from $\cap f(w)$, the modal base. This selection is represented by a function – an abstract mapping function that shows the relation that holds between a type of ordering source g_i and a degree of force[16] D_F. Within a normative model[17] δ, the dimension providing a standard, an individual *i* makes some choices and accordingly assigns a degree of force based on the normative standard. Hence, this can be formally represented as follows:

(17) $Selection_{D_{(F)}}^{g(i)}$ where $g_{(i)}$ = the individual's ordering source

$D_{(F)}$ = degree of force

The *Selection* function maps an individual's ordering source g_i and a degree of force D_F into a partition $Selection_{D_{(F)}}^{g(i)}$ of the set of all accessible worlds in the modal base $\cap f(w)$ through g_i and D_F. In other words, this formal representation shows that an individual's ordering source g_i and the degree of force D_F assigned partition the quantificational domain of an individual's preferences. Both g_i and D_F indicate the level of intention that has an effect upon a situation and/or an addressee. For example, if an imperative has a strict ordering source g_{strict} and a high degree of force D_F then the imperative is an order. If an imperative has an indifference ordering source $g_{invariant}$ and a zero degree of force D_F, then the imperative has a free choice reading (equivalence – indifference relation). If there is a weak ordering g_{weak} with a medium degree of force D_F, then the imperative is an advice. *Selection* function, the partition process, will be useful when we want to represent the choice an individual has over a set of alternative options (see section insert number here).

Japanese exhibits a morphological distinction (see Author 2014) between different types of ordering source of the individual's preferences (degree of requirement). In the following example (18) morpheme *–tte* is appropriate only in the context of direction (a direction provided by a driving instructor), for example:

[16] Degrees of Force (see Author 2014)

Extreme requirement	D_E
High requirement	D_H
Medium requirement	D_M
Low requirement	D_L
Fair requirement	D_F
Zero requirements	D_Z

[17] The context providing all the relevant norms and requirements

(18) Context: A direction to a student

Hidari-ni maga-**tte**

Left-to turn-**IMP-direction**

Turn left

On the contrary, imperatives with the suffix *-e* (e.g. magar-e, 'turn-IMP') is appropriate in a context of a strong authoritative direction (for example, in the context of ordering soldiers), and it would never be used by a driving instructor; while, example in (19) features a much moderate requirement by an individual:

(19) Context: An order to a soldier

Hidari-ni maga-re

Left-to turn-**IMP-command**

Turn left

Thus, in Japanese one expresses the quantificational force variation with a morphological distinction between *–tte* and *–e*; which morpheme will be used is a matter of appropriateness determined by the individual according to the context he will be using it in. Thus, the assumption of an ordering source that reflects an individual's preferences and a degree of requirement is not just an abstractly motivated part of an analysis; rather it appears to be an essential component of imperatives' logical structure that is being featured implicitly or explicitly in the structure as shown in the examples from Greek, English and Japanese (see Author 2014). I believe that languages in general will have more or less similar ways to denote an individual's strong or weak predisposition, but what is part of that classification is a matter of future work. Therefore, in our discussion for the relation between imperatives and free choice I adopt the thesis that imperatives are underquantified modals. Imperatives do not have a prespecified quantificational force.

To sum up, in this section, I explained why imperatives exhibit high productivity and denote a wide range of quantified expressions varying from universal to existential to

indifference readings. It is because imperatives incorporate an underquantified modal base and an ordering source the permutations of which are determined by the individual preferences within a context. This theoretical framework will help in the interpretation of imperatives and free choice and, I think, will provide a theoretical background to solve the puzzles we saw in the Introduction.

2.1.3 Imperative Inference

In this section I make a brief presentation of the cases that, in my view, indicate imperatives can be used as an inference[18]. Consider the following example:

(20) a. Leave!;
b. # Therefore, leave or stay!

This example (20) is very odd and, we might want to conclude that imperatives, due to their prominent performative nature, cannot be premises or conclusions of inference. In other words, you cannot conclude (declare / state something) if you command (perform an action) (Franke 2005; Mastop 2005; Portner 2004, 2007; Veltman 2005; among others). However, consider the following examples where imperatives are used as an inference:

(21) Context-condition: If the door is open, call the police.
a. The door is open;
b. Therefore, call the police!

In the example above one can infer the imperative *Call the police* if the context-condition holds. The imperative in (21) is not odd. The following examples illustrate the case where imperatives (21) can be used as premises much like declaratives (22), for example:

(22) Context-condition: Yoko goes for a walk if she finishes her homework (stating)

[18] I do not intend to settle any issues in this controversial issue, but I hope to show that there is an advantage in accepting the view that imperatives are not the oddballs of logic and that their properties can be sufficiently formalized and described.

Therefore, if Yoko does not finish her homework she will not go for a walk (inferring)

(23) Context-condition: Yoko, go for a walk if you finish your homework (permitting)
Therefore, if Yoko does not finish her homework she will not go for a walk (inferring)

Imperatives likewise declaratives function as answers to questions (Kaufmann 2012) providing an answer to the interrogative, for example:

(24) Q: And what should I do now?
A: Well, leave and never come back!

We draw declarative and/or imperative inferences and/or syllogisms in our daily life (Vranas 2010). Imperatives like declarative sentences can be part of a syllogism either as premises or as conclusions to the inference, or both, for example:

(25) Declarative syllogism:
a. Minnie the cat is purring;
b. Purring indicates happiness;
c. Therefore Minnie is happy.

(26) Imperative syllogism:

a. Eat apples or eat pears	*permission*
b. Do not eat apples.	*denying permission*
c. Therefore, eat pears.	*imperative inference*
d. Therefore, I should eat pears	*deontic inference*

(27) Imperative inferences
Ann: Meet me at noon.
Mary: I can meet you at noon if I cancel my appointment with Joyce
Ann: Then cancel the appointment with Joyce

(28) a. Love thy neighbor[19]
b. All men[20] are neighbors;
c. Strangers[21] are men;
d. Therefore, love strangers.

(29) Read Hemingway!
Therefore, read *A Farewell to Arms*
Therefore, read *For Whom the Bell Tolls*

Imperatives carry information (Kaufmann 2012), for example:

(30) Q: How do I get to the Museum?
A: Take bus 106

Consider the declarative premise in the syllogism (25); a sentence is *true* or *false* depending on whether or not its meaning matches the way reality is. If Minnie is *in fact* purring then Minnie *is* happy. Thus, declaratives can be part of a syllogism because we consider them as being true. Can we say that imperatives can be part of a syllogism because we consider them as being true? Consider the example in (11) in section 2.1.1 where the imperative is contradicted. The individual utters an imperative with the sincere intention of preferring a specific action over a different one *I want you to get out of my sight* and *I do not want something else*. If the individual uttering the imperative *Get out of my sight* negates it *but don't do it* then there is a contradiction. This characteristic property[22] (sincere intention of preferring an action over another) — constitutes an individual's commitment to a preference conveyed by the imperative. Imperatives are not *true* or *false* (see Vranas 2008; Portner 2010; among many others). However, an imperative is believed to be a sincere intention within a normative context (Author 2014) for example when you say *Mary, eat all your vegetables* there is some sincere intention on your part

[19] *Neighbor* in the sense of the reciprocal relationship holding between one's self and others
[20] *Men* in the sense of the human being
[21] *Stranger* in the sense of anyone who does not belong in the environment in which they are found
[22] You cannot negate an imperative without contradiction.

that you make Mary eat her vegetables. Imperatives presuppose commitment by an individual to what he conveyed not to the actualization of the required action. This is why when we change our minds we make it clear by using either intonation or expressions that mark the semantic change on the requirement (for prosody and its significance in semantic change see Wichmann et al. 2010), for example:

(31) a. Mary, eat your vegetables. *Well*, eat the ice cream
b. Mary eat your vegetables OR THE ICE CREAM[23]

Otherwise the inference proves to be invalid likewise declaratives. Therefore, imperatives are legitimately used as premises and/or conclusions as examples in (26) – (30) illustrate.

Then, what makes example in (32) so different? Why imperative in (32) cannot be used as a conclusion?

(32) a. Leave!; *command / request / permission*
b. # Therefore, leave or stay! *free choice*

Imperatives seem to resist disjunction introduction[24] and present a different meaning when they are part of a disjunctive structure (32a; a command) to (32b; a choice). However, consider the following situation:

(33) Context: You have an allergic reaction and you ask from your friend to go to the pharmacy and pick up an OTC drug for you. You request (33a). Now, would you like your friend to decide like in (33b) or (33b') in case she does not find Claritin-D?

a. Buy Claritin-D
b. Therefore, buy Claritin-D or Allegra-D
b'. # Therefore buy Claritin-D or buy fruits

[23] Rise of the voice pitch to mark the actual permitted action.
[24] It is the rule of logic that makes it possible to introduce disjunction to logical proofs. It is the inference that if P is true, then P or Q (based on inclusive disjunction) must be true.

You most probably approve your friend's decision in (33b) and the explanation is the following. Although you have specifically asked your friend to buy Claritin-D (33a) the goal is to have a drug to help you relief your allergic reaction and, Allegra-D, the alternate disjunct in (33b) conforms to that goal. Choice of drug has passed to your friend and, your friend thinks towards a preferred goal: relief the allergic reaction. It is Allegra-D that will also help you achieve your preferred goal. Thus, it seems that, if the preference set[25] of the addressee is included in the preference set of the speaker then the disjunctive inference is valid. Recall that imperatives express the preference(s) of an individual on future actions (Starr 2013; Author 2014). Then, if both the speaker's and the addressee's preferences are considered, the disjunctive imperative reasoning is valid, contrary to the disjunctive imperative in (33b') which is absurd. Consider this scenario now:

(34) Context: A lieutenant orders his soldier:

a. Lieutenant: Fire!

b. Soldier: # Therefore, fire or kill the lieutenant!

If we contrast the scenarios illustrated in (33) and (34) we find that they differ in what inferences they trigger. In the scenario (33) which features a request the disjunction introduction does not seem to generate invalid inferences. To the contrary, issuing a request or permission seems to allow for a disjunction introduction with imperatives since the *choice* is shared with the addressee or passed by the speaker to the addressee. In the scenario (34) which features a command the choice in (34b) contrasts the imperative in (34a). While the disjunction introduction in (33) illustrates cooperation on the part of the addressee (the friend), the disjunction introduction in (34) shows the lack of cooperation and reaction against to what was required by an authority. Example in (34) lacks choice on the part of the addressee because the right to have a choice belongs to the lieutenant and only to him. It seems that, if the preference set of the addressee is not included in the preference set of the speaker then the disjunctive inference is invalid. I will say more in section about disjunction in section 3.

[25] The set of competing alternatives

A third observation is related to the locus of choice when we use disjunction introduction with imperatives. In other words, is the disjunction introduction itself the one that yields free choice inference? The answer is no. Consider the next inference with declaratives and its relation with disjunction introduction:

(35) a. You drank a cup of milk (A)

⇒ You drank a cup of milk (A) **or** you poured it in the sink (B)

Declarative in (35) allows for disjunction introduction added as an inference with no problem. Since the milk is missing from the cup I can infer that you either drunk it or you poured it. Now, if it is true that disjunction introduction semantically entails free choice (Aloni 2004, 2007a/b) then we should wonder why free choice is absent in the conclusion line in the example (35). There is no choice whatsoever because I do not choose among option but I infer a list of alternate explanations of a situation.

Therefore, I argue that disjunction introduction does not semantically entail free choice in imperatives but rather it is the imperatives that contribute a set of options and preferences. Imperatives contribute the set of alternatives that are ordered by the speaker or in case permission is granted they are ordered by the addressee. Choice, in other words, is not encoded in the semantics of the disjunction. The formal details of the interaction of disjunction introduction and imperatives will be presented in section 3.

In this section I argued that imperatives can be used as premises and/or conclusions because imperatives carry information about intentions, preferences and requirements and yield inference. Choice is not a semantic entailment of disjunction.

2.2 Indefinites and Logical Connectives

In this section I discuss the logical properties of indefinite *any* and the logical connective *or*.

2.2.1 *Any*

The discussion with regard to FCI exceeds the purpose and breadth of this paper. Therefore, I am going to focus only to those accounts that will provide us some understanding of the logical properties of *any* and those accounts that have analyzed *any* in conjunction with imperatives.

There are three approaches with regard to *any*. First, there are those accounts the most prominent among them Kadmon & Landman (1993) that argue *any* is an existential quantifier the semantic and pragmatic function of which is regulated by two principles: (a) *widening*; where *any* widens the interpretation of the common noun along a contextual parameter and, (b) *strengthening*; according to which *any* is licensed only if the domain widening that it induces creates a stronger statement. Aloni (2004, 2007a/b) (see also Barker 2010) adopts the existential account and further argues that imperatives' set of alternatives is induced by *any* as a semantic entailment (presupposition) thus, free choice inference is semantically encoded in the logical form of *any*. Imperatives in (36), if we adopt Aloni's thesis (2007a/b), do not all entail choice. Free choice is entailed only in the examples that feature *any*, for example:

(36) a. Take *any* flower

Paraphrase: Whatever flower you choose you may take it

b. Take *some* flower

Paraphrase: Whatever the quantity of flowers you choose you may take it

c. Take *every*[26] flower

Paraphrase: You may take each and all flowers you choose

d. Take *a* flower

Paraphrase: You may take one flower you choose

e. Take the flower

Paraphrase: There is a specific flower which you may take

However, if we consider free choice inference as the permission granted on the part of the speaker to an addressee (see for example Portner 2010), then all examples in (36a – d) imply some way or another a *choice* among options on the part of the addressee. Consider the interpretations provided in examples in (36a – d). Imperatives' quantified prejacent (36a – d)

[26] Can *every* imply choice? I think, yes, because *every* can refer either to a single set (collective interpretation) or to several individuals. *Take every flower* can be read as any of the paraphrases:

a. $(\forall$: x is a flower$)_x$ (you take x)

b. May $(\forall$: you choose (you take x$))_x$ (you take x)

The interpretation in (26b) leaves room for choice contrary to (26a). Besides, *every* does not imply *all* although they are both represented by a universal quantifier.

differs in terms of determining the set of objects that the addressee will choose and, imply a choice on the part of the addressee. In other words, the permission is granted with the imperative *Take [any, some, every, a];* what is to be taken *[whatever object (any), whatever quantity (some), each and all objects (every), one object (a)]* depends on the addressee. Thus, the inference of free choice is not encoded to the semantics of *any* (contra Aloni 2007a/b who argues that choice is a semantic entailment of *any*). Choice is present in examples (36a – d) but not in (36e). Example in (36e) requires or permits you take a specific object, thus there is no choice (see also footnote in 26). Choice and permission do not overlap as I have shown with the examples in (36). I will say more on this when I analyze imperatives in conjunction with *any*.

The cardinality of the sets with which quantifiers in (36a – c) determine plurality varies. The truth of (36b – d) is evaluated in the standard way, i.e. *some*[27], it is true iff there are at least two objects that are members of the set of flowers; *every*, it is true iff for all things x, x is a flower; *a*, it is true iff there is at least one thing x such that x is a flower. *Any* does not differ in terms of inherent plurality either; however, the inherent plurality of *any* involves the consideration of alternatives (see Giannakidou 2001; Aloni 2004; 2007a/b) as well. This feature of *any* renders it intensional (see Giannakidou 2001); a characteristic that the rest of quantifiers lack. Imperatives though are intensional[28] operators (Author, 2014), thus, I preliminary assume a concord of operators in terms of intensionality that affects the interpretation of *any* as either universal or existential.

Another problematic point in existential accounts (see for example Aloni 2004; 2007a/b) is the default quantificational force. *Any* does not provide an existential quantifier, for example:

(37) a. Confiscate *any* (∀) gun

⟹ You are allowed / required to confiscate the entirety of guns

⇏ You are required to confiscate a specific / whatever gun

b. Confiscate *every* (∀) gun

[27] *Some* is defined as the existential quantifier with both singularity and plurality marked on the noun phrase, for example:

a. Some cat is purring

b. Some cats are purring

[28] *Intensionality* describes the relativization of truth values to an index (criterion); intensionality is a property of a linguistic expression.

⟹ You are required to confiscate the entirety of guns

⇏ You are required to confiscate a specific / whatever gun

Universal *any* is just as acceptable with imperatives. Examples in (37) illustrate a case in which the requirement involves the entirety of objects in a restricted domain (see Kaufmann 2012 for the same claim). The difference between *any* and *every* is this; the quantificational domain of *every* corresponds to a set of particular things (extension), in contrast with the quantificational domain of *any* which corresponds to a set of possible things of the relevant kind (intension). Free choice seems to be the output of the interaction of *any* with imperatives and, intensionality seems to be an inherent feature of *any*. In fact, there are languages[29] among them Greek which morphologically marks the intensionality with the FC suffix *–dhipote* 'whatever' (Giannakidou 2001), for example:

(38) Aghorazo opjo-***dhipote*** vivlio vro
Buy.1sg DEF-who-***FC marker*** book find.1sg
I buy any book I find

Therefore, *any* is not an existential quantifier by default and choice is not inherent in the semantics of *any* as other items feature free choice as well. Intensionality is the component we should capture after all in order to explain FC inference.

The second approach treats *any* as a universal quantifier (Quine 1960; Horn 1972; Dayal 1998; Saebø 2001; among others) arguing that instances like (37a) correspond to the subtrigging[30] phenomenon (see LeGrand1975; Davison 1980; Carlson 1981; Dayal 1998; Giannakidou 2001; among others). Consider the imperative in (37a). The reading we obtain for *any* under an imperative denoting a necessity is *Confiscate any gun which is stolen.* In this case an overt restriction as is the relative clause *which is stolen* implies (Kaufmann 2012) and is considered as evidence (Dayal 1998) that *any* is universal. The above claim cannot be generalized. Consider the following example:

[29] Many languages such as Catalan, French, Spanish, Dutch, Korean and Japanese employ FC morphology (see Giannakidou & Quer 2013).

[30] Free choice readings of *any* in relative clause constructions are considered to be universal (subtrigging; see LeGrand 1975).

(39) Marry anyone you want!

⇏ Marry *every* person you want!

⇒ You are permitted to marry among all options the one you want.

Imperative in (39) does not imply that you are permitted to marry every man you want, but a man among equally possible options of men you might have. Thus, subtrigging is not a solid argument for excluding the possibility of imperatives with an existential *any* although there is a salient restriction (call it criterion) of its domain. Then, the split between an existential *any* (thus choice imperatives) and a universal *any* (thus no-choice imperatives) seems redundant (contra Aloni 2004, 2007a/b). The varying quantificational interpretation of *any* in the examples (37) and (39) cannot be explained if *any* has a predetermined quantificational force.

The existential treatment of FCI among them *any* has received criticism (Giannakidou 2001; Kratzer & Shimoyama 2002). Giannakidou (2001) argues that *any* is an indefinite having no quantificational force of its own, for example:

(40) * Anybody talked to me that afternoon.

The quantificational force of *any* depends on an operator higher in the structure, for example:

(41) a. Did you talk to anybody?

Paraphrase: Is there an x, such that x is a person and you talked to him/her?

b. Anybody can solve this problem

Paraphrase: Every person x is such that x can solve this problem

In (41a) sentence *anybody* seems to contribute an existential quantifier, while in (41b) sentence *anybody* seems to contribute a universal quantifier. Notice that the same observation holds for imperatives and *any*, for example:

(42) a. Take any card

Paraphrase: You are permitted to take one card (among many)

b. Confiscate any gun

Paraphrase: You are permitted to confiscate every gun

Any, based on Giannakidou (2001), contributes a predicate and world variable to be bound by an intensional and quantificational operator. Giannakidou's (2001) claim nicely combines with the formal analysis of Author (2014) who argues that imperatives are intensional and quantificational operators the quantificational force of which depends crucially on an individual's preferences (see Author, 2014). Thus, the indefinite *any* is bound by the imperatives in examples in (42) for its quantificational force and for the set of alternatives it will operate on as an overt exhaustifier. Thus, I propose that the semantic representation should be like the following:

(43) $\mathbf{IMP_{OP}}$[w, x] [… **any**-NP(x, w) …]

If the higher in the structure imperative, the binding operator, has existential force, then *any* will be interpreted existentially (see 42a). If the imperative has universal force, then *any* will be interpreted universally (see 42b). Such an analysis maintains a uniform analysis of *any*; we do not have to postulate multiple varieties of *any*.

Another welcome result is that we are able to explain why we do not have quantifier mismatches between imperatives and *any*. Remember the examples in (4) repeated here in (44):

(44) a. Take (∃) any (∃) flower ⇒ among all similarly true options, you are permitted to choose one flower

a'. # Take (∃) any (∀) flower ⇏ among all similarly true options, you are permitted to choose all flowers

b. Confiscate (∀) any (∀) stolen artwork ⇒ among all similarly true options, you are required to confiscate all stolen artwork

b'. # Confiscate (∀) any (∃) stolen artwork ⇏ among all similarly true options, you are required to confiscate one stolen artwork

Imperative in (44a) does not imply the inference in (44a') and imperative in (44b) does not imply the inference in (44b'). In addition, assuming that *any* is indefinite, we are able to predict that *any* depending on the quantifier (existential or universal) creates different sets of alternatives. Recall the concord I mentioned a few lines above. When the imperative is existential then the set of alternatives is analyzed as disjunction over possibilities, but when the imperative is universal then the set of alternatives is represented as a conjunction over possibilities. We will say more on concord and the type of set exhaustification in section 3 onwards for alternatives. Finally, we are able to avoid ambiguity; and that I think is a very welcome consequence after all.

To sum up, in this section we saw that *any* is neither an existential nor a universal quantifier but an indefinite the intensionality and variation of which are prominent features of it. *Any* as an intensional operator requires a higher in the structure operator to bind its free world variable and, imperatives can bind the world variable provided by *any* (see section – insert number here).

2.2.2 *Or*

Two are the puzzles when dealing with disjunction and imperatives: (1) the disjunctive imperatives seem to be ambiguous (free-choice interpretation; see Kamp 1973; Hamblin 1987; Aloni 2004; among others) and, (2) the disjunction introduction is impossible with imperatives (Ross's Paradox; Ross 1941). I will repeat here the characteristic set of contrastive minimal pairs:

(45) Free Choice

Do your homework or go for a walk …

i… you decide what to do	*free choice*[31]
ii… I don't know which / I don't care	*wide scope reading*

[31] *Free choice reading* can be found in the literature as *choice-offering* and *wide scope reading* can be found as *alternative-presenting*.

(46) Disjunction Introduction

a. You drank a cup of milk (A) *declarative*

⇒ You drank a cup of milk (A) **or** you poured it in the sink (B)

b. Drink a cup of milk (A) *imperative*

⇏ Drink a cup of milk (A) **or** pour it in the sink (B)

In section 2.1.3 I have presented the disjunction introduction and how it relates with imperatives, thus, I am not going to repeat the discussion here. I will only remind us that disjunctive imperative can function as an inference and, that choice is not a semantic entailment of the disjunction. If free choice was semantically entailed then we would be able to have free choice effect with declarative sentences as well, but we don't. The disjunction introduces overtly a list of alternative options contributed by the imperative and does not semantically entail choice.

Disjunctive imperatives are not ambiguous and, they do not induce independent representations for free choice and alternative (wide scope) readings. Earlier in our discussion (see section insert number) I argued that imperatives are intentional because what is conveyed with an imperative is determined by individual intention (see also Author 2014). The speaker intends to communicate something about a certain salient preference. The preference can be salient to various degrees, for example, the degree of permission granted to an addressee. Permission can come along with choice (47b) or not (47a) and, permission can be for a situation as a whole (47c), for example:

(47) a. Context: Authorization to shoot a fugitive

i. Fire!

b. Context: Support/endorsement to choose among types of beer.

ii. Buy lager or stout!

c. Context: Consent to act as one likes

iii. Leave, stay, I don't care what you want!

All imperatives in (47) convey the intention of granting permission to an addressee. However, permissions as we see in (47) come in a variety of degrees from zero choice (47a), to partial choice (47b) and to complete choice (47c) to the addressee (see Author 2014). Of course this is a naïve measure of the degrees of permission and I am not going to further discuss it in this paper. However, measuring strength by the existence of choice in permission indicates that disjunctive imperatives are not ambiguous. Instead the disjunctive imperatives are a case in which an addressee is provided with a specific set of options. The default interpretation of permission is that I, the speaker/authority, grant you, the addressee, permission and, I am not going to be involved in the process of choice (when choice is implied).

Another issue is whether imperative disjunctions should be interpreted as disjunctive/exclusive (Aloni 2004, 2007a/b), as conjunctive/inclusive (Zimmermann 2000; Schulz 2004; Geurts 2005; Fox 2007; Barker 2010; van Rooij 2010) lists of possibilities or as conditional (Asher & Bonevac 2005; Sæbø 2012; among others). In this paper I argue that what affects the interpretation of disjunctive imperatives as inclusive, exclusive is the incorporation or not of the preference set of an addressee. Recall the following examples from section 2.1.3 I repeat here:

(48) Context: You have an allergic reaction and you ask from your friend to go to the drugstore and pick up an OTC drug for you. You request (a). Now, would you like your friend to decide like in (48b) or (48b') in case she does not find Claritin-D?

a. Buy Claritin-D
b. Therefore, buy Claritin-D or Allegra-D
b'. # Therefore buy Claritin-D or buy butter

(49) Context: A lieutenant orders his soldier:
a. Lieutenant: Fire!
b. Soldier: # Therefore, fire or kill the lieutenant!

An inclusive disjunction holds whenever one and/or both of the disjuncts are true. The inclusive condition describes the scenario situation in (48) in which, if the preference set of the addressee is included in the preference set of the speaker, then the disjunctive inference is valid. An exclusive disjunction is false whenever both disjuncts are true. The exclusive condition describes the scenario situation in (49) in which, if the preference set of the addressee is not included in the preference set of the speaker then the disjunctive inference is invalid. Therefore, I argue that the inclusion or exclusion of the preference set of an addressee determines how a disjunctive imperative will be interpreted. Furthermore, it seems that disjunction must satisfy some requirement of relevance otherwise the disjunctive imperatives are unnatural. The inclusion or exclusion in imperatives is signaled by allocating choice to an addressee and, choice is conveyed by sets of options, the alternative set. This is the topic I discuss in detail in section 3.

To sum up, in this section about disjunction I argued that disjunctive imperatives are not ambiguous but, they carry a degree of choice for permission that has been granted. I also argued that the interpretation of a disjunctive imperative depends on whether the preference set of an addressee will be included or not in the preferences of the speaker.

3 Alternatives

In this section, I present the type of alternatives that indefinite *any* and disjunctive *or* operate on as overt exhaustifiers and, I discuss the type of exhaustification *any* and *or* feature.

3.1 ANY: Alternative propositions or alternative individuals?

Alternatives are all the options we consider in a domain of quantification[32]. The multiple alternatives available is a precondition on the felicitous use of FCI such as *any* and, the exhaustive variation defines the procedure in which all possible values of the quantificational domain are exhausted (see Giannakidou 2013). Therefore, I assume that whenever there are alternatives offered in the context either explicitly or implicitly, we deal with the choice of some individual(s).

There are two main approaches with regard to the analysis of the alternatives set that *any* contribute into the structure. The distinguishing characteristic is the variation about propositions

[32] Recall the set of alternative propositions contributed by an imperative.

or individuals. The first approach (Kratzer & Shimoyama 2002; Kratzer 2005; Menéndez-Benito 2005, 2010; Aloni 2004, 2007a/b) argues that the *any* (wh-indeterminate) is better interpreted as delivering a set of propositions that are closed by a higher in the structure sentential operator (explicit or implicit), for example:

(50) {? / ∀ / ∃} p …**p**: [**wh-indeterminate** VP]

In the second approach, *any* features a type e (individual) variable bound by quantificational operators (for English *any* Horn 2000a, 2005; for Greek Giannakidou 2001; for Mandarin Giannakidou & Cheng 2006; for Catalan and Spanish Quer 1998, 1999; for Hausa Zimmermann 2009; for French Jayez & Tovena 2005), for example:

(51) Q [w, **x**] […**indefinite-D NP** (**x**, w) … VP]

The two approaches share the same idea that the indefinite *any* has to bind to a higher sentential operator in order to be interpreted. In fact, *any* as an indefinite inherently carrying plurality and intensionality (an intensional NP and not an extensional) receives the force of the binder operator with which there is a concord/agreement in terms of quantificational force (Giannakidou 2001). *Any* exhibits sensitivity to episodicity, is licensed in nonveridical contexts (that allow quantificational variation) and, *any* shows quantificational variability (typical of FCI) (see Giannakidou 2001). In this paper, I adopted the thesis that *any* has to be bound by a higher sentential operator (see section 2) and, I further propose that *any* is itself an overt exhaustifier (contra Chierchia 2004; Fox 2007; Chierchia 2013; among others) on the set of individual alternatives which as I argued earlier (see 2.2.1) are introduced by a higher in the structure (sentential) operator; the imperative, as follows:

(52) IMP_{OP}[w, x] [… any_{exh}-NP(x, w) …]

Any features an indefinite type of alternativeness. Recall from the introduction that in the case of *any* one considers all alternatives corresponding to a criterion – condition and chooses one

option (alternative) without falsifying the rest of the options. In other words, *any* carries a presupposition that disjunctive *or* seems not to carry as we will see shortly in the next section: one option among a number of equally and probably true options in all possible worlds is selected. Thus, while disjunctive *or* excludes the rest of the options by turning them false, *any* eliminates the rest of the options without turning them false. The rest of the options are still true but not selected. This distinguishing property indicates that the set of alternatives for *any* and *or* and the presuppositions for each of them are quite different, for example:

(53) a. Take any card

Criterion – condition: If there is an x and that x is a card, you take it

Indefiniteness: The number of cards that can actually be selected because they correspond to the criterion – condition is not definite; select just one.

b. Remove any stains

Criterion – condition: If there is an x and that x is a card, you remove it

Indefiniteness: The number of stains that can actually be selected because they correspond to the criterion – condition is not definite; select more than two.

3.2 OR: Disjunction and Alternativeness

Disjunction features a definite[33] type of disjunction. In other words, disjunctive *or* arrays a set of alternative options and, after the selection (choice of an element from a set) excludes the rest of the options by turning them false, for example:

(54) Buy the apples or the pears …

a. … whatever you want — *permission – free choice – disjunctive*

b. … I don't care what — *no permission – no free choice – non disjunctive*

Criterion – condition: There is a definite number of options to choose from; when you choose you turn the rest of options, if any, false.

[33] The number of options is definite.

Definiteness: The number of options is definite; in this case you have one option

Disjunctive *or* introduces a sequence of alternative options (Winter 1995; Simons 2005 for a similar view) and, overtly, shows the partition of the alternatives set that an imperative contributes into the structure, for example:

(55) IMP ⟦p OR q⟧ = 1 iff $\exists ALT_{SET} \in \cap f(w)$: {⟦p⟧,⟦q⟧} $\subseteq ALT_{SET}$

Imperative sentence in (54) can receive either (54a) or (54b) reading. In the first reading (54a) an individual grants permission to an addressee and, presents the addressee with a set of alternative options. Thus, the addressee has a choice over the alternatives. The same, I argue here, holds for the second reading in (54b) which is traditionally called *no free choice.* Imperative with either the continuation in (54a) or in (54b) conveys the lack of involvement on the part of the speaker. Free choice is in fact the indifference conveyed by an individual when issuing an imperative (se Author 2014). Thus, I assume that disjunctive imperatives are indifference imperatives. Indifference imperatives, I argue, are indicative of an individual's ordering source denoting preference equivalence on ordered actions whatever those might be, strict or weak, and with a zero degree of force[34]. In other words, I propose that indifference represents a type of ordering relation where the corresponding outcomes of the permutations of the preferences are equally good or indifferent to the individual, and a degree of force that points to zero as the individual indicates the absence of effect on or will to influence the addressee. The choice to be made does not bear a hierarchical/dominance ordering to one another as the individual does not choose to posit any strict or weak ordering (see Author 2014). The individual is indifferent about the choices to be made because either of the disjuncts provides the same degree of appropriateness in same or similar situations. In other words, indifference is the unbiased impartial concern. A preliminary formal definition of indifference (invariance) is the following:

(56) Indifference (I): {Choice A ≡ Choice B iff A ≥ B and B ≥ A for an individual}

.

[34] *Force* means the degree of appropriateness required by the individual (see Author (2014) section 4.1 and the set of degrees in reference note (16) therein).

Therefore, the disjunctive imperatives imply indifference on the part of the individual/speaker and the choice is left to the addressee. Recall that disjunctive imperatives are valid especially when they involve the preference set of someone other than the speaker (see a similar approach to epistemic and deontic modal verbs by Simons 2005). The characteristic of disjunctive imperatives which is free choice is now formally restated in terms of indifference in (56).

3.3 Exhaustification Mechanism

Exhaustification, a process of deriving conversational implicatures, means that for each value e and a possible world w such that Q (e) (w) there is the requirement that ONLY (e) (w) in a domain of exhaustification Q (Fox 2007; Fox & Spector 2009; Chierchia et al. 2012; Sauerland 2012; Chierchia 2013; Giannakidou & Quer 2013). Exhaustification is represented as a covert operator of the form:

(57) $[\![\mathrm{EXH}_{\mathrm{only}}]\!](e, w) = 1$ iff $e(w) = 1 \;\&\; \forall e \in Q\,[e \not\in e' \rightarrow e'(w) = 0]$

However, in this paper I argue that the indefinite *any* and disjunctive *or* are overt exhaustifiers (contra Chierchia 2004; Fox 2007; Chierchia 2013; among others) themselves with a different meaning than that of EXH ≈ ONLY[35]. Specifically, in this section I show that the set of alternatives is exhaustified in a different manner depending on the type of alternativeness the descriptions of which I provided in section (insert section here).

In this paper, I take the most natural sets of alternatives to the indefinite *any* and the disjunctive *or*. Exhaustification with the indefinite *any* involves a mechanism of exhaustification within a set of alternative individuals (58a), while an exhaustification with *or* involves a mechanism of exhaustification between a disjoint union[36] of sets of individual alternatives (58b), as follows (compare with (59)):

(58) a. $\mathrm{ALT}^{\mathrm{set}}_{\mathrm{ANY}} = \{alternative_1,\ alternative_2\ alternative_3\ \ldots\ alternative_n\}$

[35] ONLY has a very restrictive meaning and does not represent the meaning of free choice properly. ONLY means that nothing else is included in the set of implicatures (the set of exhaustified items) besides the chosen item. However, as we will in this section, *any* implies that one is chosen but the rest are not falsified, while *or* means that one is chosen and the rest are falsified.

[36] A disjoint union in set theory represents a family of distinct sets the union of which is a pairwise disjoint.

b. $\text{ALT}_{\text{OR}}^{\text{set}} = (\text{ALT}_1^{\text{set}}: \{alternative_1\}\ \underline{\text{OR}}\ \text{ALT}_2^{\text{set}}: \{alternative_2\})$

The reason I take sets in (58) to be the sets on which an exhaustification mechanism applies is because FC inferences cannot be derived by scalar reasoning as it is argued in the current literature (for (59b) see Kratzer & Shimoyama 2002; Chierchia 2004; Alonso-Ovalle 2006; Fox 2007; Chierchia et al. 2013; for (59a) see Aloni & van Rooij 2007; among many others). Consider the following contrastive sets usually employed for the derivation of conversational implicatures and entailments:

(59) a. $\text{ALT}_{\text{set}} = \{\alpha_{\Box A}, \alpha_{\Box B}, \alpha_{\Box(\neg A)}, \alpha_{\Box(\neg B)}\}$

b. $\text{ALT}_{\text{set}} = \{\alpha_{\Diamond A}, \alpha_{\Diamond B}, \alpha_{\Diamond(A \vee B)}, \alpha_{\Diamond(A \wedge B)}\}$

where α = alternative

Theories that employ sets in (59) start the exhaustification of implicatures on sets that contain the implicatures already. Observe that the members of the sets in (59) are the implicatures we aim to derive not the actual individual non-exhaustified alternatives. If we aim to derive implicatures from a set of alternatives then the set of alternatives should contain non-exhaustified members; in other words sets in (59) are not the alternatives set. The exhaustification I propose here does not involve already exhaustified alternatives (contra Chierchia 2013). On the contrary, sets in (58) differ in that they contain the individual non-exhaustified alternatives. Exhaustification will apply on those sets and derive the conversational implicatures. The process I offer here is far less complex and more natural than the process in which the exhaustification is actually an exclusion process on a set of exhaustified alternatives.

The exhaustification I argue for includes two processes: (a) recursion and (b) iteration in order to derive the conversational implicatures. Recursion[37] as is defended in this paper is based on

[37] Recursion, a mathematical and computational concept, has been employed in linguistic analysis as well and its most notable use is in syntax by Chomsky (1965, 2006) who was the first in our field that introduced the relevant concept. Here, recursion is accordant with the following step-wise process (see Buck 1963; Brainerd & Landweber 1974; Chomsky 1981; Chomsky 1995; Kripke 1996; Fitch et al. 2005; among others): (a) a base statement is assumed to be true for 1 (base step), (b) then it is assumed to be true for n (induction hypothesis) and, (c) it is established that it holds for n + 1 (the complete set) (the induction step)

induction[38] a technique used to show a provided statement applies to a self referential set with an indefinite number of members. Iteration, on the other hand, involves repetition of a process that applies to disjoint union sets with a definite number of members.

Exhaustification is marked overtly (contra Chierchia 2013; among others) with the indefinite *any* and the disjunctive *or*. The meaning of the items themselves indicates we consider relevant and excludable alternatives, for example:

(60) a. Eat any cake

Eat (**ANY** {x: x is a cake})

b. Eat the cake or the ice-ream

Eat (**OR** {{x: x is a cake}, {x: x is an ice-cream}})

In the following sections I describe in detail a novel, to the best of my knowledge, mechanism of exhaustification which provides for the implicature calculation.

3.3.1 ANY: Recursion

In this section, I argue that *any* is an overt recursive exhaustifier of the alternatives set. Consider the following examples of imperatives with *any*, for example:

(61) a. Take any flower → You are allowed to take one flower of your choice

$\text{ALT}^{\text{set}}_{\text{Flowers}} = \{flower_1,\ flower_2\ flower_3\ \ldots\ flower_n\}$

ALT_{set} = {x ∈ $FLOWER_{set}$: x is a flower}

b. Remove any stains → You are authorized to remove all stains of your choice

$\text{ALT}^{\text{set}}_{\text{Stains}} = \{stain_1\ stain_2\ stain_3\ \ldots\ stain_n\}$

ALT_{set} = {x ∈ $STAINS_{set}$: x is a stain}

Examples in (61) illustrate two types of recursive exhaustification with *any*. Recall that *any* depends on a sentential operator to get quantificational force existential or universal. *Any* is the

[38] I will use a standard example provided in every math book: (a) if n = 1 then n! = 1 (base case), (b) if n > 1 then n! = n * (n – 1)! (recursive step). Induction is used to establish a provided statement for a set of numbers and, it is characterized by its self –referential nature (invocation of a step that has been used before).

overt exhaustifier of the alternatives contributed by the imperative in a recursive[39] manner (see Pinker & Jackendoff (2005) for recursion as a linguistic method when analyzing data). Dayal (1998), Quer (1998, 2000) and Giannakidou (2001) argue that the imperatives' prejacent like *anyone you want* is an underlying conditional structure in which *any* is bound by a universal quantifier contributed by an implicit conditional operator. The claim of an underlying conditional structure seems to have its merits and here I stay close to the spirit of their proposals. Specifically, I propose that *any* depends on a set of conditional steps (recursion) in order to exhaust the values in a quantificational domain the values of which are infinite. Recursion is the analytical tool allowing an individual to recursively derive the free choice inferences and to make a choice within a set of alternatives. I also argue that if imperative is interpreted existentially[40] (61a) then *any* recursively exhausts only a subset of alternative values. If imperative is interpreted universally[41] (61b) then *any* recursively exhausts all alternative values.

Imperative in (61a) will be satisfied if one takes flower_1, or, if one takes flower_2, or, if one takes flower_3 from a set of flowers; in other words, if there is an x and that x is a flower then one is permitted to take one x from the set of alternatives. Imperative *Take any flower* is satisfied if one option [Take (flower_x)] from the disjunction of available options [Take $\{flower_1, flower_2\ flower_3\ \ldots flower_n\}$] is satisfied. The computation of implicatures proceeds in a recursive manner (recursive exhaustification) in (61a) as follows: (a) the authority grants permission to the addressee [Take (flower)], (b) the authority suggests and the addressee assumes that the permission granted [Take (flower)] holds for *x* element of a given and with a common[42] property set, for (61a) ALT_{set} = {x $\in$ $FLOWER_{set}$: x is a flower}of options [Take (flower_x)], (c) the addressee understands that permission granted holds for elements x + 1 of the set of options and,

[39] I repeat the steps of Recursion:
a. Prove that a statement holds for an element of a set
b. Assume that the statement also holds for n element of a set
c. Establish that the statement is true for n + 1 (all) elements of the set

[40] In set theory, the existential quantifier distributes over disjunction but not conjunction:
$\exists x[P(x) \vee Q(x)] \equiv (\exists xP(x) \vee \exists x\, Q(x))$

[41] In set theory, the universal quantifier distributes over conjunction but not disjunction:
$\forall x[P(x) \wedge Q(x)] \equiv (\forall xP(x) \wedge \forall x\, Q(x))$

[42] Notice that *any* applies to a set with a common property which means that *any flower* set does not include anything else than flowers; the domain of exhaustification and selection process then will involve alternatives within the set. The contrast will become clearer when we put into the picture the set of alternatives for disjunctive *or*.

(d)[43] permission is valid for no more than one *Selection*[44]. According to the statements in (62) the overt exhaustivity operator applies to an individual value and the set of its alternatives and eliminates[45] all the alternatives that are not implied by e. The exhaustification of alternatives follows:

(62) Existential Recursive Exhaustification

Let $\mathrm{ALT}_{\mathrm{set}}$ be a non-singleton, non-empty and with a common property set of elements. An imperative proposition with the FCI any $[\![\mathrm{IMP}_{\exists}\ \mathrm{DET}_{\mathrm{any}}\ (p, q)]\!]^{w} = 1$ iff the following conditional steps are satisfied:

(a) IMP $[e] \subseteq \mathrm{ALT}_{\mathrm{set}}$

Permission is valid for a value e of the set of alternatives;

(b) IMP $[e'] \subseteq \mathrm{ALT}_{\mathrm{set}}$

The permission is valid for e_x value of a set of alternatives,

(c) Then IMP $[\mathrm{e}_{\mathrm{ANY}}] \subseteq \mathrm{ALT}_{\mathrm{set}}$

The permission is also valid for all values of the set of alternatives

(d) IMP $[\mathrm{e}_{\mathrm{ANY}}] \subseteq Selection_{XOR}$

Permission is valid for no more than one *Selection*

The *Selection* function in an existential recursive exhaustification is defined as:

Exclusive Selection ($\mathrm{ANY}_{\mathrm{XOR}}$) = 1 if a rational individual is committed to one choice and the rest of the choices although true[46] are eliminated and, if an IMP is a two-place operator taking each pair (e, x), where e is a possible input and x is a natural number, to an individual alternative e_x such that:

[43] Step (d) in (62) and (63) is the restriction in the recursive process that prevents an endless calculation of the implicatures.
[44] Refer to section 2.1.2 for imperatives where I explain the properties and functions of the partitive tool *Selection*. Here, I show in detail how its partitive properties are employed in the exhaustification process of conversational implicatures.
[45] I use *elimination* and not *negation* because I want to stress the implication that the rest of the alternatives are still true although not chosen/selected.
[46] The rest of the choices are true because they are allowed of being chosen even though they might not be chosen.

$Selection_{XOR}$= ∃e {e ∈ ALT_{set} = ∅ & ∃$f_{selection}$: *Selection* (e, w) ∈ ALT_{set}}

Let IMP be an operator with a free individual variable e, and let ALT be a set of individual alternatives. Then, there is a function $Selection_{XOR}$ such that ∃e {e ∈ ALT_{set} = ∅} that satisfy ($\text{IMP}_{\exists}$ (e_1, w)) as follows:

($\text{IMP}_{\exists}$ (e_1, w)); Take $flower_1$ in w_1
XOR or
($\text{IMP}_{\exists}$ (e_2, w)); Take $flower_2$ in w_2
XOR or
($\text{IMP}_{\exists}$ (e_3, w)); …. Take $flower_3$ in w_3
XOR or
($\text{IMP}_{\exists}$ (e_x, w)) Take $flower_n$ in w_n

Imperative in (61b) will be satisfied if one removes stain_1, and/or, if one removes stain_2, and/or, if one removes stain_3, and so on; in other words, for all x, if x is a stain then one is required to remove all or some x. Then *Remove any stains* is satisfied if, at least, more than two options [Remove (stain_n)] from the conjunction of available options [Remove {stain_1, stain_2, stain_3, stain_4, stain_5, stain_6}] are satisfied. The computation of implicatures proceeds in a recursive manner (recursive exhaustification) in (61b): (a) the authority issues a requirement for the addressee [Remove (stain)], (b) the authority suggests that the requirement issued [Remove (stain)] holds for *x* element of a given and with a common property set, for (61b) ALT_{set} = {x ∈ $STAINS_{set}$: x is a stain} of options [Remove (stain_x)] and, (c) the addressee understands that requirement issued holds for all elements x + 1 of the set of options. According to the statements in (63) the overt exhaustivity operator applies to an individual value and the set of its alternatives and selects all the alternatives that are implied by e as well. The exhaustification of alternatives follows:

(63) Universal Recursive Exhaustification:

Let $\mathrm{ALT_{set}}$ be a non-singleton, non-empty and with a common property set of elements. An imperative proposition with the FCI any $[\![\mathrm{IMP}_{\forall}\ \mathrm{DET_{any}}\ (p, q)]\!]^{w} = 1$ iff the following conditional steps are satisfied:

(a) IMP $[e] \subseteq \mathrm{ALT_{set}}$

The authorization is valid for a value e of the set of alternatives;

(b) IMP $[e'] \subseteq \mathrm{ALT_{set}}$

The authorization is valid for $\mathrm{e_x}$ value of a set of alternatives,

(c) Then IMP $[\mathrm{e_{ANY}}] \subseteq \mathrm{ALT_{set}}$

The authorization is also valid for all values of the set of alternatives

(d) IMP $[\mathrm{e_{ANY}}] \subseteq Selection_{OR}$

Permission is valid for at least one *Selection*

The *Selection* function in a universal recursive exhaustification is defined as:

Inclusive Selection $(\mathrm{ANY_{OR}}) = 1$ if a rational individual is committed to at least two choices and more (the rest of choices are not eliminated) and, if an IMP is a two-place operator taking each pair (e, x), where e is a possible input and x is a natural number, to an individual alternative e_x such that:

$Selection_{OR=} = \forall e\ \{e \in \mathrm{ALT_{set}} = \varnothing\ \&\ \exists f_{selection}$: *Selection* $(e, w) \in \mathrm{ALT_{set}}\}$

Let IMP be an operator with a free individual variable e, and let ALT be a set of individual alternatives. Then there is a function $Selection_{OR}$ such that $\forall e\ \{e \in \mathrm{ALT_{set}} = \varnothing\}$ that satisfy $(\mathrm{IMP}_{\forall}\ (e_1, w))$ as follows:

$(\mathrm{IMP}_{\forall}\ (e_1, w))$;	Remove $stain_1$ in w_1
OR	and/or
$(\mathrm{IMP}_{\forall}\ (e_2, w))$;	Remove $stain_2$ in w_1
OR	and/or

($IMP_{\forall}$ (e_3, w)); …. Remove $stain_3$ in w_1

OR and/or

($IMP_{\forall}$ (e_x, w)) Remove $stain_n$ in w_1

3.3.2 OR: Iteration

According to some authors (Zimmermann 2000; Asher & Bonevac 2005; Geurts 2005; Simons 2005; Aloni 2007a/b; among others) the formal representation of disjunction should be reformed in order to express conjunction as well. While for other authors (Kratzer & Shimoyama 2002; Alonso-Ovalle 2006; Schulz 2005; Franke 2009; among others) disjunction readings are the result of conversational implicatures. I side with the second group's proposal that the meaning of disjunction is based on context. However, here I propose a new formal model defining how these implicatures derive from and interpreted within a context.

Disjunctive and *any* imperatives likewise trigger the inference that a speaker appeals to the preference set of an addressee (see sections 2.1.3 and 2.2.2). Nevertheless, disjunctive imperatives feature a different type of exhaustification which suggests that *any* and *or* imperatives have a different[47] underlying logical structure for their exhaustification and selection process. Remember from sections 2.1.3, 3.1 and 3.3.1 that *any* presupposes the existence of one set which has a property. On the contrary, disjunctive *or* disjoints sets[48] (at least two) each one with its own property, for example:

(64) a. Eat any cake

ALT_{set} = {x ∈ $CAKE_{set}$: x is a cake}

b. Eat the cake or the ice-ream

ALT_{set} = {x ∈ $CAKE_{set}$: x is a cake} OR ALT_{set} = {x ∈ $ICECREAM_{set}$: x is a ice-cream}

[47] Recall that in this paper I argue (see 3.1) the interpretation of *any* depends on the sentential operator. This means that *any* can be equivalent to either a disjunction when interpreted existentially or a conjunction when interpreted universally.

[48] Disjoint sets are those sets the intersection of which is the empty set

Imperative in (64a) involves disjunction within elements of a set with a common property while disjunctive imperative in (64b) involves disjunction between two or more sets with different properties each set. Imperative in (64b) can be interpreted as either an exclusive or inclusive disjunction over alternatives. Exclusive imperative disjunction (EID henceforth) implies that one or other disjunct is true, but not both. While to use an inclusive imperative disjunction (IID henceforth) implies that at least one is true and, possibly both. Thus, the claim that *any* and *or* are identical featuring the same logical structure and the same type of exhaustification (Chierchia 2013; among others) does not hold. Exhaustification with *or* involves the selection between members of disjoint sets (64b) and not between members within a set which is the case of the indefinite *any* (64a). Thus, I assume that disjunctive *or* is an overt iterative exhaustifier of disjoint, alternative sets. Consider the following examples of imperatives with *or*, for example:

(65) Have coffee or tea

a. You are allowed to have coffee

b. You are allowed to have tea

c. You are allowed to have coffee AND you are ALSO allowed to have tea

If the imperative in (65) is interpreted in EID manner it will be satisfied if one has tea, or, if one has coffee, but not both. In other words, if there is an x and that x is member of either the set of tea or the set of coffee, but not both, then one is permitted to take one x from either the sets of alternatives. Imperative *Have tea or coffee* is satisfied if a member of the alternatives $\mathrm{ALT}_{\mathrm{set}}$ = {x $\in TEA_{set}$: x is tea} or if a member of the alternatives $\mathrm{ALT}_{\mathrm{set}}$ = {x $\in COFFEE_{set}$: x is coffee} is selected but not both members of the sets. The exclusive iterative exhaustification in (65) proceeds as follows: (a) the authority grants permission to the addressee [Have (x)], (b) the authority suggests to the addressee that the granted permission [Have (x)] holds for *x* element of either the sets $\mathrm{ALT}_{\mathrm{set}}$ = {x $\in TEA_{set}$: x is tea} OR $\mathrm{ALT}_{\mathrm{set}}$ = {x $\in COFFEE_{set}$: x is coffee} and, (c) When one *Selection* is complete then the rest of options are falsified:

(66) Exclusive Iterative Exhaustification:

Let exclusive imperative disjunction (EID) to be composed of at least two disjoint sets of alternatives $ALT^1_{set} \cap ALT^2_{set} \equiv \varnothing$ for $i \neq j$ and which are individually non-empty and with a common property. Then, an exclusive iterative exhaustification of alternatives proceeds as follows:

(a) IMP $[e_n] \subseteq (ALT^1_{set} \cup^* ALT^2_{set})$

Permission is valid for one value e_n of either the set of alternatives;

(b) IMP $[e_n] \subseteq Selection_{XOR}$

Permission is valid for no more than one *Selection*

$Selection_{XOR}$= $\exists!e$ {e $\subseteq$ $(ALT^1_{set} \cup^* ALT^2_{set})$ & $\exists f_{selection}$: *Selection* (e, w) $\in$ ALT^1_{set} $\vee_{XOR}$ ALT^2_{set}}

Let IMP be an operator with a free individual variable e, and let $(ALT^1_{set} \cup^* ALT^2_{set})$ be a disjoint union[49] of sets of individual alternatives. Then, there is a function $Selection_{XOR}$ such that $\exists!e$ {e $\subseteq$ $(ALT^1_{set} \cup^* ALT^2_{set})$ that satisfy ($IMP_{\exists}$ (e_1, w) OR (e_2, w)) as follows:

($IMP_{\exists}$ (e_1, w));	Eat the cake in w_1
XOR	or
($IMP_{\exists}$ (e_2, w)).	Eat the ice-ream in w_2

On the contrary, if the imperative in (65) is interpreted as IID it will be satisfied if one has tea, or, if one has coffee, and it can also be satisfied if one is allowed to have coffee AND one is allowed to have tea.

(67) Inclusive Iterative Exhaustification:

Let inclusive imperative disjunction (IID) to be composed of at least two disjoint sets of alternatives $ALT^1_{set} \cap ALT^2_{set} \equiv \varnothing$ for $i \neq j$ and which are individually singleton, non-

[49] A union of pairwise disjoint non-empty sets symbolized with $\cup^*$ operator

empty and with a common property. Then, an exclusive iterative exhaustification of alternatives proceeds as follows:

(a) IMP $[e_n] \subseteq (ALT^1_{set} \cup^* ALT^2_{set})$

Permission is valid for a value e_n of either the set of alternatives;

(b) IMP $[e_n] \subseteq Selection_{OR}$

Permission is valid for at least one *Selection*

$Selection_{OR=}$ = $\forall$e {e $\subseteq$ $(ALT^1_{set} \cup^* ALT^2_{set})$ & $\exists f_{selection}$: *Selection* (e, w) $\in$ ALT^1_{set} $\vee_{OR}$ ALT^2_{set}}

Let IMP be an operator with a free individual variable e, and let $(ALT^1_{set} \cup^* ALT^2_{set})$ be a disjoint union[50] of sets of individual alternatives. Then, there is a function $Selection_{OR}$ such that $\forall$e {e $\subseteq$ $(ALT^1_{set} \cup^* ALT^2_{set})$ that satisfy ($IMP_{\exists}$ (e_1, w) OR (e_2, w)) as follows:

($IMP_{\exists}$ (e_1, w)); Eat the cake in w_1

OR and/or

($IMP_{\exists}$ (e_2, w)). Eat the ice-ream in w_1

3.3.3 Disjunction Resolution

Earlier in this paper (see section 2.2) I argued that what affects the interpretation of disjunctive imperatives as inclusive or exclusive is the incorporation or not of the preference set of the addressee. Recall the examples from section 2.2. Imperative is a linguistic phenomenon involving either an individual's or the aggregate decision of a set of participants and the ways those decisions affect their world. In other terms imperatives convey preferences on future actions and those preferences belong either exclusively to one of the participants or inclusively to more than one. The *choice* between alternatives belongs either to an authority contextually determined or to someone which has been granted the permission to choose over alternatives. Thus, on a certain level of abstraction, we may consider that a disjunction resolution takes place

[50] A union of pairwise disjoint non-empty sets

against the background of an inclusion of preferences problem. If the set of preferences of a speaker (authority) is mapped to the set of preferences of the addressee then we have an exclusive disjunction. If the set of preferences of the addressee is mapped to the set of preferences of the speaker then we have an inclusive disjunction. In pragmatic terms this means that the speaker either keeps or allocates the choice to the addressee in a context but now we can restate the concept of allocation of choice formally.

A disjunction resolution involves a tuple $\mathcal{R} = \langle S_{pset}, A_{pset}, \iota \rangle$ where S_{pset} is the set of preferences of a speaker (authority), A_{pset} is the set of preferences of an addressee and ι is the inclusion map[51] of preferences. Therefore, in an inclusion of preferences problem a rational speaker (authority) allocates or not the choice on preferences and maps or not his/her preferences to an addressee, formally:

(68) Disjunction Resolution

Let $\mathcal{R} = \langle S_{pset}, A_{pset}, \iota \rangle$ be the tuple in which S_{pset} is the set of preferences of a speaker (authority), A_{pset} is the set of preferences of an addressee and ι is the inclusion[52] function mapping preferences between sets. Then:

(a) An *exclusive disjunction* is defined as the inclusion map of preferences from S_{pset} to A_{pset} such that ι: $S_{pset} \hookrightarrow A_{pset}$ and,

(b) An *inclusive disjunction* is defined as the inclusion map of preferences from A_{pset} to S_{pset} such that ι: $A_{pset} \hookrightarrow S_{pset}$

Statements in (68) describe formally the intentions of rational individuals and the inclusion map represents the non-equivalent structure of rational participants' intentions. Specifically, statement in (68a; see also Figure 1) means that the preferences of the speaker include the preference set of the addressee. In other words, the preferences of the speaker are those that outweigh the preferences of the addressee. Statement in (68b; see also Figure 2) means that the preferences of the addressee include the preference set of the speaker. This means that the addressee's

[51] A map, in set theory, is a process for getting from one set to another.

[52] The inclusion function belongs to the group of injective functions and, it is an embedding (inclusion) function mapping each element, x of A to x, treated as an element of B.

preferences outweigh the preferences of the speaker (see also section 4 for *Choice Allocation*). Definition in (68) provides a way of distributing the prevalent preference set over disjunction of preferences[53] within context (which is the case when we deal with disjunctive imperatives), as follows in the figures 1 and 2:

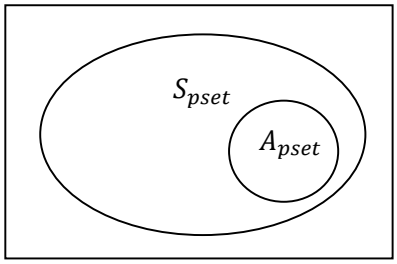

Figure 1 ι: $S_{pset} \hookrightarrow A_{pset}$

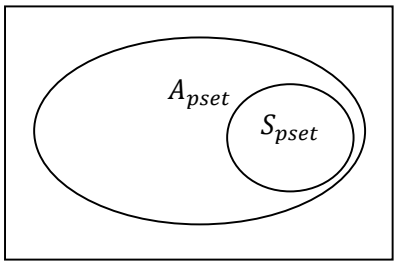

Figure 2 ι: $A_{pset} \hookrightarrow S_{pset}$

4 The Concept of (Free) Choice

Free choice usually is identified with the exhaustification of a set of alternatives (see Aloni 2004, 2007a/b; Menéndez-Benito 2005; Kaufmann 2012; Aloni & Ciarelli 2013; Giannakidou & Quer 2013; among others), the scopal interaction of universal quantifier and intensional operator and, the domain widening (Kadmon & Landman 1993; Kratzer & Shimoyama 2002; Chierchia 2004; Zimmermann 2009; among others). This description of *free choice* is limited. In this paper, I add another dimension of free choice; the pragmatics of free choice which involves a game of decision and allocation of choice.

Choice involves the preferences of a speaker and choice allocation. When the permission is granted by a speaker the choice passes onto the addressee. Free choice, I assume here, means that you are allowed or authorized to have a choice over a set of alternatives one way or the other based on a criterion. This view presupposes that both speaker and the addressee will have active roles in a decision game of authorization and permission (see Author 2014).

[53] Disjunction of preferences involves the speaker's set of preferences and the addressee's set of preferences. *Choice Allocation* and *Authority* are distinct properties meaning that one individual might have the right to choose but a different individual might be the authority in the context. Consider the contrastive case of permissions and orders. In permissions the *Authority* is different from the individual who will be authorized (*Choice*) to act in a certain way. In contrast, in the case of orders the *Authority* and the right to choose (*Choice*) belong to the same individual.

Permission occurs in the conversational background of a decision game among rational participants. Imperatives that translate into permission involve a game in which only one player (or a set of players) has a strict authoritative role and the other one doesn't. Thus, in the analysis of imperatives and free choice inferences I assume that there is a multiagent domain and employ the following concepts:

(1) A set[54] of rational participants $\mathcal{P}(\mathcal{S}, \mathcal{A})$[55]

(2) A set of alternative options ALT_{set}

(3) An exhaustification process for every alternative set depending on participants' Choice

Here I provide the definitions of terms and the pragmatic background I used or will be using in order to analyze the properties of imperatives and free choice.

(69) **Rational Participant**[56]

Rational Participant principle characterizes the participants' common knowledge of the permission game. A rational participant knows the permission game's structure and, is aware that each of them knows the permission game's structure and so on.

(70) **Choice**

Choice on a set of alternatives ALT_{set} is a mapping function such that $C_A \subseteq \text{ALT}_{\text{set}}$ for every $\text{A} \subseteq \text{ALT}_{\text{set}}$. *Choice* assigns to a set ALT_{set} the subset C_A of chosen alternatives from ALT_{set}. *Choice* is a property assigned to a *Rational Participant* by the *Authority*.

(71) **Authority**

$\mathcal{P}$ is considered as the authority on a conversational background f in a context c in a world w iff:

(a) A *Rational Participant* $\mathcal{P}_1$ decides and guides the decisions (see function of *Choice*) of a Rational Participant $\mathcal{P}_2$ and,

[54] For conciseness purposes I focus on a game with two participants. However, the analysis applies equally to games with more than two players.

[55] The *Rational Speaker* $\mathcal{S}$ and the *Rational Addressee* $\mathcal{A}$ sets are models of the most characteristic properties of an agent and an addressee.

[56] *Participant(s)* and *Individual(s)* will be used inadvertently throughout the paper.

(b) *Rational Participant* $\mathcal{P}_1$ contributes a better choice C to every plan of action of *Rational Participant* $\mathcal{P}_2$

Authority($\mathcal{P}$):= {f: W $\rightarrow$ ($\mathcal{P}_1$(C) > $\mathcal{P}_2$(C) (W)) | $\mathcal{P}_1$ is considered an authority on f in c}

Choice Allocation shows how the choice can shift from an authority to someone else in the context, i.e. the addressee.

(72) **Choice Allocation**

There is a set of participants $\mathcal{P}(\mathcal{S}, \mathcal{A})$. $\mathcal{S}$ and $\mathcal{A}$ are two rational participants and $\mathcal{S}$ has the right of choice then there exists a process from $\mathcal{S}$ to $\mathcal{A}$ that allocates the choice from $\mathcal{S}$ to $\mathcal{A}$ such that $choice_S \in \mathcal{S} \setminus \mathcal{A}$ then there exists $choice_A \in \mathcal{A} \setminus \mathcal{S}$ such that $\mathcal{S} \setminus choice_S \cup choice_A \in \mathcal{A}$. This is the authority allocation from $\mathcal{S}$ to $\mathcal{A}$. *Choice Allocation* $\{ \mathcal{S} \setminus choice_S \cup choice_A \in \mathcal{A}. \} = 1$ iff:

i. The *Authority* does not possess full knowledge $\mathcal{K}$ of a set of alternatives ALT_{set}

Authority ($\mathcal{K}$) $\not\subset ALT_{set}$

ii. The *Authority* is indifferent[57] on what choice to make in order to satisfy a decision problem

Authority ($\mathcal{C}$) $\equiv ALT_{set}$

iii. The *Addressee* does possess better knowledge $\mathcal{K}$ of a set of alternatives ALT_{set}

Addressee ($\mathcal{K}$) $\subset ALT_{set}$

Authority and *Choice* can be the properties of one and the same rational participant but, they can also be properties individually obtained by different rational participants. This is apparent in the case of permission. When permission is granted an *Authority* does not give up his/her status as defined in the relevant definition but he/she allocates one of the his/her properties namely *Choice* to another rational participant in the context. Permission is thus defines as:

[57] Recall that *Indifference* should be understood as the unbiased impartial concern.

(73) **Permission**[58]

Permission is the act of *Choice Allocation* from an *Authority* to another rational participant $\mathcal{P}$ other than the *Authority* itself.

5. Applications

In this section I show how the discussion on the formal properties of imperatives, indefinites and disjunction I presented might help in solving certain problems of imperatives and their interaction with free choice.

5.1 Ross's paradox

Ross's paradox involves disjunction introduction. While declaratives allow for disjunction introduction, inference in (74b) for imperatives does not seem to be valid. On the contrary, negated imperatives seem to allow for disjunction introduction as an inference in (74b), as follows:

(74) a. Post the letter

b. Therefore, post the letter or burn the letter

In analyzing the examples in (74) we discern two cases: (a) both[59] the premise and the inference belong to one and the same rational participant $\mathcal{P}_1$ and, (b) the premise belongs to one rational participant $\mathcal{P}_1$ and, the inference belongs to another rational participant $\mathcal{P}_2$.

Let us consider the case (a) for (74) which at the end of this section might not seem that odd as it has been advertized. Recall from sections 2.2.2 and 3.3.2 that disjunctive imperatives feature either an exclusive (75) or an inclusive (76) iterative type of exhaustification and, that disjunction represents a decision among options. If (74b) represents the exclusive iterative exhaustification and the decision of the same person then (74b) is not valid[60] because the exclusive iterative exhaustification turns one choice true and the rest of options false. It is

[58] A similar definitions can be employed for authorization (consider definition in (73)) because permission and authorization likewise imply *Choice Allocation*.

[59] It is not odd to use an imperative when you address yourself. Imagine you are late then, the following line it is not strange: Run! Come on, catch up the bus!

[60] It is not valid (in exclusive exhaustification) because the rational participant is committed to the one choice she made. Thus, if she chooses A, among A or B, then she cannot maintain B as a live option. She has to falsify it.

contradictory for a rational participant to hold both a valid *Post the letter* and a non-valid decision *Burn the letter*, formally:

(75) $Selection_{XOR}$= ∃!e {e ⊆ (ALT^1_{set} ∪* ALT^2_{set}) & ∃$f_{selection}$: *Selection* (e, w) ∈ ALT^1_{set} ∨XOR ALT^2_{set}}

If (74b) represents the inclusive iterative exhaustification and the decision of the same person then (74b) is valid[61] because the inclusive iterative exhaustification turns at least one choice true. In this scenario, a rational participant can choose either or both[62] disjuncts, formally:

(76) $Selection_{OR=}$ = ∀e {e ⊆ (ALT^1_{set} ∪* ALT^2_{set}) & ∃$f_{selection}$: *Selection* (e, w) ∈ ALT^1_{set} ∨OR ALT^2_{set}}

Practically this means that when a rational participant uses a disjunction she chooses the disjunct she wants to verify either in an exclusive or an inclusive manner. This is because the *Choice* is the property of the same participant.

Let us now consider the case (b) for (74). In this case, the premise belongs to a Rational Participant $\mathcal{P}_1$ who we will assume here is also the *Authority* and, the inference to another Rational Participant $\mathcal{P}_2$ in the context. If the set of preferences of a speaker (*Authority*) is mapped to the set of preferences of the addressee then we have an exclusive disjunction. In this case $\mathcal{P}_1$ in context provides $\mathcal{P}_2$ with his / her own set of preferences.

(77) An *exclusive disjunction* is defined as the inclusion map of preferences from S_{pset} to A_{pset} such that ι: $S_{pset} \hookrightarrow A_{pset}$ and,

[61] It is valid (in inclusive exhaustification) because the rational participant is committed to at least choice she made. Thus, if she chooses A, among A or B, then she still can maintain B as a live option. She can also choose B.
[62] In this particular case at hand *Post or burn the letter* we cannot do both for practical reasons. However, consider the following *Have an apple or a pear* a case in which both can be chosen.

If the set of preferences of the addressee is mapped to the set of preferences of the speaker which presupposes *Choice Allocation* then we have an inclusive disjunction. Either due to ignorance or indifference an Authority shifts Choice to $\mathcal{P}_2$ and can choice at least one disjunct:

(78) An *inclusive disjunction* is defined as the inclusion map of preferences from A_{pset} to S_{pset} such that ι: $A_{pset} \hookrightarrow S_{pset}$

5.2 Veltman's puzzle

Veltman's puzzle (2009) involves contradictory satisfaction conditions and, in my view, is an excellent example showing that imperatives can be used as an inference, a point I argue in favor here. Disjunctive imperatives as I pointed in other sections of this paper, involve a decision problem as is the Veltman's puzzle:

(79) a. Doctor A: Drink milk **or** apple juice

b. Doctor B: Do not drink milk

c. Patient: Therefore, drink apple juice

In (79) we deal with two types of imperatives, one comes with a disjunction (79a) and (79b) which is a negated imperative. Each imperative in (79) belongs to a different rational participant; let's call Doctor A the rational participant $\mathcal{P}_1$ and Doctor B the rational participant $\mathcal{P}_2$. Imperative in (79c) belongs to the patient who is the third rational participant $\mathcal{P}_3$ and who has to make a decision based on the imperatives issued by $\mathcal{P}_1$ and $\mathcal{P}_2$.

$\mathcal{P}_1$ allocates *Choice* by issuing a disjunctive imperative *Drink milk* (P) *or apple juice* (Q) thus $\mathcal{P}_3$ understands that he is authorized or permitted to choose one (exclusive exhaustification) or both (inclusive exhaustification) of the disjuncts. $\mathcal{P}_2$, however, negates an option, thus, does not allocates *Choice* to $\mathcal{P}_3$ by issuing a negated imperative *Do not drink milk* (¬P). $\mathcal{P}_2$ also leaves the consumption of apple juice open. Thus, $\mathcal{P}_3$ is faced with the following decision problem:

Participants	$\mathcal{P}_1$	$\mathcal{P}_2$	***Decision***
$\mathcal{P}_3$	P	¬P	*contradiction*
$\mathcal{P}_3$	Q	≡[63]	Q

The first line yields contradiction because while $Authority_1$ has shifted choice to $\mathcal{P}_3$ $Authority_2$ has not shifted choice to $\mathcal{P}_3$ thus halting *Choice* by $\mathcal{P}_3$. The second line yields the inference Drink apple juice because $Authority_1$ has shifted choice to $\mathcal{P}_3$ and $Authority_2$ has remained indifferent with regard to apple juice consumption. Therefore, $\mathcal{P}_3$ can infer he has been allocated *Choice*. Therefore, there is not any inconsistency rule (contra Veltman 2009) or presupposition satisfaction (contra Aloni & Ciardelli 2013) that produces the contradiction in the first line of Table 1 but, a conflict of *Choice Allocation* among participants.

Conclusions

In this paper I have shown that *any* and *or* are overt exhaustifiers on a set of alternatives which is contributed by the imperatives. Indefinite *any* and disjunctive *or* involve different types of exhaustification of the set of alternatives. Exhaustification with the indefinite *any* involves a mechanism of exhaustification within a set of alternative individuals while an exhaustification with *or* involves a mechanism of exhaustification between a disjoint union of sets of individual alternatives. Another contribution of the paper is disjunction resolution; a process which puts an end to ambiguity of disjunction by restating the problem in terms of inclusion of preferences set. Finally, the most important contribution of the paper is that it presents the pragmatics of free choice which involves a game of decision and allocation of choice.

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[63] $\mathcal{P}_2$ is indifferent or ignorant to the issue of apple juice consumption.

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