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Mandarin-accented Dutch Prosody

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**MANDARIN-ACCENTED
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MANDARIN-ACCENTED DUTCH PROSODY

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Chapter 1

Introduction

1.1 Rationale of the investigation

There are about 120,000 Chinese (about 0.82% of the total population) living in the Netherlands, who immigrated from Mainland China (35%), Hong Kong (23%), Indonesia (20%), Surinam (6%) and other areas (16%), according to the Chinese Embassy in the Netherlands and the investigation by Li (1999). Most of those who are from Mainland China originate from Shenzhen and Dapeng (Canton Province), Wenzhou and Qingtian (Zhejiang Province), Fuzhou and Changle (Fujian Province). They have formed Chinese communities in Amsterdam, Rotterdam, The Hague, Eindhoven and other places. With the development of China, more and more Chinese are coming to the Netherlands to work or study. They learn Dutch and have mastered the language with a certain level of proficiency. A study of how Chinese people speak Dutch is therefore a significant enterprise, and this is one of the reasons why the research programme 'Intonation of varieties of Dutch' (NWO 360-70-180) contains a sub-project 'Mandarin-accented Dutch'. The present research represents the main result of this sub-project. It focuses on the prosody of Dutch spoken by Mandarin learners from the northern part of Mainland China.

It is generally accepted that individuals will be found to speak a second language (L2) with detectable foreign accents when they learn it after a certain age (Flege, Patkowski, 1990; Scovel, 1988; Major 2001; Munro 2008, Munro & Mackay, 1995). Perceptually, the foreign accent is defined as "the extent to which an L2 learner's speech is perceived to differ from native speaker norms" (Munro & Derwing, 1998: 160). The severity of the foreign accent is influenced by age of learning, length of residence, gender, motivation, aptitude, use of language, speech rate, instruction and social factors (Flege, 1988; Flege, Munro & MacKay, 1995; Gut, 2009; Hansen Edwards, 2008; Moyer, 2004). Foreign-

speakers of English increased significantly by replacing original durations and the original f_0 contour by the durations taken from those of a native speaker of English and with durationally manipulated monotonies, respectively. The results showed that the Dutch speakers of English used segment durations and f_0 contours that signalled foreign accent to native English listeners and that the accent was stronger when the learners spoke than when they sang (Hagen, Kerkhoff & Gussenhoven, 2011). If less foreign accent in sung speech is specific to Dutch speakers of English, it would be reasonable to assume that language pairs like Chinese and Dutch, which are typologically more different, show even greater such effects due to the greater difference in their prosodic features. If the relative contributions of duration and f_0 contours to foreign accent vary with language-relatedness, the question is whether the prediction is right for the Mandarin-accented Dutch. In other words, the differences in prosody between Mandarin and Dutch naturally lead us to focus on the prosodic aspects of the Mandarin-accented Dutch.

In the present thesis, I will compare the performance of Mandarin speakers of Dutch with that of native speakers of Dutch in order to uncover the prosodic characteristics of Mandarin-accented Dutch in terms of sentence pitch accent, intonation, phrasing, pitch range, pauses, rhythm, speech rate and articulation rate.

1.2 Chinese dialects

Chinese is spoken in Mainland China, Taiwan, Hong Kong, Malaysia, Singapore, Vietnam, and the United States by more people than any other language in the world. Chinese has been an official language of the United Nations since the founding of the organization in 1945. Chinese speakers speak different varieties of Chinese. They all belong to the Sino-Tibetan family of languages and each one has its own dialects and sub-dialects, which are more or less mutually intelligible. The dialects of the language differ from each other in pronunciation, vocabulary and grammar. And the difference in pronunciation is the most outstanding. It is not unusual to distinguish the nine dialects of Chinese, as shown in the map in Figure 1.1. They are Wu, Min, Yue, Xiang, Gan, Jing Yu, Hui Yu, Hakka and Mandarin.

symbols adapted from the Roman alphabet, was adopted in 1958. Its main aims are to facilitate the spread of *Putonghua* and the learning of Chinese characters..

China is a large country with more than a billion inhabitants, and having a common language is good for its administration as well as for cultural exchange and information transmission between ethnic groups and people in different places. More than 2000 years ago, the Chinese had realized that a common language should be used in social intercourse. Putonghua serves those purposes well and allows for efficient communication between people in different areas and from different ethnic groups. The Chinese government attaches great importance to popularizing Mandarin and encourages people to learn it. Today, it is the main language of government, the media and education in both China and Taiwan, and one of the four official languages in Singapore.

As the map in Figure 1.2 shows, Mandarin has developed into eight sub-dialects: Northeastern, Beijing, Ji Lu, Jiao Liao, Zhongyuan, Lan Yin, Jianghuai and Southern Mandarin. There can be variations in pronunciation, vocabulary and grammar, but the language remains understandable to people from other regions within the Mandarin area (Tang, 2009; Tang & van Heuven; 2009).

Figure 1.2. Mandarin dialects in Mainland China

linguistic common ground and are used to facilitate communication between people from widely separated regions.

All Chinese dialects are tonal. This means that each syllable can have a number of different meanings depending on the tone with which it is pronounced. For example, Mandarin has 4 tones, (1) high level tone; (2) rising tone; (3) low dipping tone; (4) falling tone. The southern dialects have richer tone inventories than Mandarin. For example, Cantonese has between 6 and 9 tones (depending on the local dialect and in the depth of the analysis), Min between 6 and 8 and Wu between 7 and 8 (Hou, 2002).

Phonologically speaking, most Chinese in the Netherlands come from the regions of Cantonese, Min and Wu dialects, and many of them can speak or have been exposed to the Standard Chinese. We chose our participants for our experiments from the places around Beijing area in order to reduce the deviations caused by participants' dialects. Eleven of them are from Beijing, one from Tianjin, and two from Hebei. Tianjin and Hebei are very close to Beijing, so they are all Beijing Mandarin speakers. One participant grew up in Henan (Zhongyuan Mandarin) and educated in Shandong (Ji Lu and Jiao Liao Mandarin). Another one is from Xi'an (Zhongyuan Mandarin). The other four are from the northeast of China (Northern east Mandarin). That is to say, all participants in our experiments are all Mandarin speakers. As Hou (2002) put it, Mandarin speakers, though living several thousands of *Li* away from each other (one *Li* equals 500 metres), have no problem in communication while non-Mandarin speakers cannot understand each other even if they live only several *Li* away. This traditional idea about intelligibility of Chinese dialects is supported by the quantitative data on mutual intelligibility of Mandarin and non-Mandarin Chinese dialects (Tang, 2009; Tang & van Heuven, 2009). On the other hand, all participants, aged from 17 to 53, are very proficient in Putonghua (self-report and checked by the present author in the interview before experimenting) because they received formal education in schools in Mainland China when they were young.

!H*	Lowered level from accented syllable (downstepped level)
H*LH	Pre-nuclear steep fall followed by a gradual rise towards the next accented syllable (pre-nuclear fall-rise)
L*!HL	Low rise fall from accented syllable (downstepped delayed peak)
L*H	Rise from low from accented syllable
H*!H	Vocative chant

The seven nuclear pitch accents listed above (i.e. all except H*LH) can form 21 nuclear contours in combination with the three final boundary conditions.

Figure 1.3. An example of Dutch sentence *'Dat alles heeft ons zo bang gemaakt!'* transcribed in ToBI.

The Fall is transcribed as H*L L%, as in an alternative question:

with high pitch. Functionally, the occurrence of H*L H% may signal a question, or a reminder, or a suggestion which may have a ring of self-evidence. It often goes with *toch* 'not' or with modal particles *hè* or *hoor*, as in the following two examples:

4. *Je hoeft niet meer te werken. Je hebt toch al genoeg gedaan deze week?*

$\%L$
|
 H^*L
 $H\%$

You don't have to work anymore. Haven't you done enough this week?

5. *Het wordt laat. Maar je moet wel je eten opeten, hoor!*

$\%L$
|
 H^*L
 $H\%$

It's getting late. But you should finish you meal!

The IP-final high rise auditorily begins at mid pitch, which continues until a rise at the IP-boundary. The mid pitch is usually reached late in the accented syllable while the beginning is low, as is commonly the case for H*. The contour is mostly used in questions or frequently used utterance-internally to indicate that another IP follows. We transcribe it as H* H%.

6. *Zei je nou echt dat je naar buiten wilde? In de regen?*

$\%L$
|
 $H^* H\%$

Did you really say you were going to go out? In the rain?

The vocative chant consists of a high level and a mid level tone. The H* begins on the accented syllable, and the !H, the mid level, is realized on the last syllable, or on a stressed syllable if there is one between the accented syllable and the last syllable. The accented syllable and the syllable on which the !H begins are often lengthened. When the accented syllable is the last syllable, the two levels are both pronounced on that syllable, which as a result is broken into two sections. The lengthening does not occur when the level pitch of H* is spread over more than two syllables. No lengthening is used when the contour is used to mark continuation, which sometimes occurs in instructions which the speaker wishes to sound unproblematic. The vocative chant is also used on utterances with an early accent in which case each of the following

consonant and vowel contrasts that are not present in the ambient languages, but they lose the ability and can only distinguish the contrasts of their native language like adults by the end of the first year when they can produce the first words due to the exposure to the native language (Kuhl & Iverson, 1995). The language-specific phonetic perception is robust and automatic because adults require few cognitive resources to extract the phonetic information from the acoustic signal (Fikkert, 2007; Ohala, 2008; Strange & Shafer, 2008).

As a result, for almost all late L2 learners, their oral production is foreign accented. We do not know whether L2 learners have difficulty in perceiving the phonological features, such resulting in the foreign accents in their production. It is generally thought that a major determinant of the foreign accent in production is the underlying problem in perceiving the L2 phonological structures (Flege, 1995). If learners cannot hear given contrasts the way native speakers do, the perceptual problems will cause problems in pronunciation. They sometimes have more difficulty perceiving the difference in an L2 sound which is relatively close to a sound in L2 than a new sound in L2 which is completely distinct from any sound in the L1 inventory (Best, 1995; Flege, 1995). Native Japanese listeners with different learning experience are found to have extreme difficulty in producing the English consonant contrast /r/~/l/ and to perform significantly poorer than the native English speaker in judging in a variety of stimulus materials and tasks (Bradlow, 2008; Strange & Shafer, 2008). However, not all mispronunciation is caused by erroneous perception. For articulatory reasons, L2 learners may not produce certain contrasts though they perceive accurately their representation in the L2. But in some studies, L2 sound production was found to surpass perception (Bohn & Flege, 1996; Brière, 1966; Gass, 1984; Kluge et al. 2007; Neufeld, 1988; Sheldon & Strange, 1982; Strange, 1995), indicating that production of L2 sounds can be more accurate than perception. For example, the ability for many Japanese learners of English to produce the English /r/~/l/ contrast accurately was stronger than the ability to perceive them, particularly in the early stages of acquisition (Yamada, Strange, Magnuson, Pruitt & Clarke, 1994). Pedagogically, learners' perceptual skills may be as important as their production ability. Studies have shown that perceptual training can improve production (Chun, Hardison & Pennington, 2008). The relation between perception and production is too complex to make a straight-forward conclusion that production precedes perception, or

Actually, CA has seen a resurgent interest and importance in second language acquisition research since the 1980s (Major, 2008).

Besides the linguistic transfers, L1 skills can also transfer into L2 learning and proficiency. In a recent study by Sparks, Patton, Ganschow and Humbach (2009), high school students transferred their L1 English skills in reading, spelling, vocabulary, phonological awareness and listening comprehension to L2 Spanish, French or German, and their early L1 skills played an important role in their L2 attainment.

Transfer plays different roles in different theories or models of phonological acquisition, which can be seen from the following theories or models.

1.4.2.1 Best's PAM

The Perceptual Assimilation Model (PAM) (Best, 1993, 1994a, 1994b, 1995; Best, McRoberts & Sithole, 1988) employs the metaphor of a phonological space in which native categories (gestural constellations) are arrayed according to similarities/differences in their articulatory-phonetic structure. PAM was developed primarily to account for patterns of nonnative segmental perception by naïve listeners with no experience with the L2. Best & Tyler (2007) later extended the PAM to predict patterns of speech perception by more advanced L2 learners (PAM-L2). It incorporates a combination of perception and production factors. In the very early stages of language acquisition, an infant establishes categories for native language sounds by learning to articulate them. Once the categories have been established, phonemic categories that are non-native will be assimilated to native categories on the basis of perceived similarities.

There are six possible assimilation scenarios in this model, depending on how each member of a non-native contrast is assimilated into native categories: Two-Category (TC) contrasts, where each member is assimilated into a different native category; Single-Category (SC) contrasts, where both members are assimilated into a single native category (equally well or poorly); Category-Goodness (CG) contrasts, where both members are assimilated into the same native category but with one being a closer match to that category; Uncategorized-

sound, the prototype forces the learner to perceive the new sound as the L1 prototype.

The model also predicts the difficulty in discrimination of L2 sound contrasts. Under the proximity principle (Kuhl, 1991), the accuracy to discriminate more prototypical exemplars of a phonetic category is lower than that to discriminate less prototypical exemplars. The difficulty in discriminating L2 sound contrasts increases as the similarity to L1 sounds increases.

The explanatory power of the model was challenged in some studies (Lacerda, 1995; Lively & Pisoni, 1997), but the influence of early language experience on the L2 sound perception cannot be denied.

1.4.2.3 Flege's SLM

Flege's (1995, 1999, 2002) Speech Learning Model (SLM) consists of four postulates and seven hypotheses to account for age-related pronunciation of vowels and consonants in an L2. The four postulates are: (i) The mechanisms and processes used in learning the L1 sound system, including category formation, remain intact over the life span and can be applied to L2 learning; (ii) Language-specific aspects of speech sounds are specified in long-term memory representations called 'phonetic categories'; (iii) Phonetic categories established in childhood for L1 sounds evolve over the life span reflect the properties of all L1 and L2 phones identified as a realization of each category; (iv) Bilinguals strive to maintain contrast between L1 and L2 phonetic categories, which coexist in a common phonological space. The four postulates mean that speakers use the same cognitive resources in L1 and L2 learning, share and have mental representations of the contrastive sounds of their native language, and can create new categories in L1 and modify them in L2 acquisition though they strive not to mix the categories in L1 and L2. The acquisition of L2 sounds that do not exist in their L1 is to establish new categories and the categories in L1 work as filters in the L2 phonological acquisition.

The seven hypotheses in SLM predict the preconditions and stages of phoneme acquisition. The mechanisms needed to produce new sounds remain intact, but perception changes with development. Language

means the evolutionary development of groups of organisms. Similarly, when they are borrowed into language, the former means the life cycle of an individual's language and the latter the life cycle of all languages and language types (Major, 1994, 1996, 2001; Major & Faudree, 1996). So OPM deals with both individual and evolutionary development of languages. It incorporates markedness and predicts longitudinal phonological acquisition of L2 or dialects by individuals or groups of speakers over generations. It holds that an interlanguage is composed of elements of L1, the required L2 and universals. If L2 acquisition increases, L1 transfer decreases, and universals increase and then decrease. For similar phenomena in L1 and L2, L2 acquisition proceeds slowly, transfer persists, and consequently the role of universals gets relatively small, compared to the norm which is neither similar nor marked. For marked phenomena, L2 acquisition increases slowly; L1 transfer decreases slowly, while the influence of universals increases rapidly and then decreases slowly. Different from the other models, individuals' difference, social and demographic factors affecting L2 phonology are considered important in this model.

OPM was supported in the studies on the acquisition of phonemes and syllable structure, however, no evidence was found to support the claim L1 transfer decreases with increasing degree of L2 formality of speech style. The model can be applied not only in phonological acquisition but also in non-phonological fields. However, 'universals' are not clearly defined and the interrelation of the three proposed elements in interlanguage remains open to speculation. Nor does OPM offer a psycholinguistic account for how L2 phonological learning takes place over time during which the learning is considered as progressing from non-target to target L2 forms through variable performance by trial and error (Trofimovich, Gatbonton & Segalowitz, 2007). Though non-linguistic factors are considered important in the model, it does not specify how such factors influence learning over time.

1.4.2.5 Eckman's MDH and SCH

The difference between L1 and L2 is insufficient to explain the learner error, and should be supplemented by the explanatory principle of typological markedness. Eckman's (1977, 1984, 1985, 2008) Markedness Differential Hypothesis (MDH) states that a structure A is more marked

Both MDH and SCH claim that learners have fewer difficulties and proceed faster in acquisition of unmarked patterns than in the acquisition of marked ones. Due to their scope and explanatory power, the limitation of both hypotheses can be seen. Relying on the concept of linguistic universals, their scope is restricted to linguistic areas such as syllable structures or the frequency of segmental speech sounds for which linguistic universals have been proposed. Other phonological features, phonological process and the prosodic phenomena have not been classified in term of typological markedness, so the two hypotheses cannot predict acquisition phenomena in those fields. Non-linguistic factors influencing phonological acquisition are not put into consideration.

1.4.2.6 Optimality Theory

Since Prince and Smolensky's seminal manuscript on Optimality Theory (OT) was introduced in 1993, numerous efforts have been made to test and develop the theory in the areas of phonology, syntax and discourse studies. Phonology is greatly impacted by the theory and applied linguists have begun to adopt an OT approach to understand observed phenomena in L2 phonological acquisition, though most of the studies focus on L2 syllable structure (Hancin-Bhatt, 2008).

OT grammars consist of a universal set of constraints divided into two subgroups: Markedness and Faithfulness. The Markedness constraints are generalizations on the marked and unmarked patterns in a language. Linguistic patterns that commonly occur in natural languages are unmarked and those that do not are marked. Faithfulness constraints ensure the congruence between patterns in the input and those in the output. The two types of inherently conflicting constraints can be violable, and ranked relatively to each other. The higher the ranking of a constraint is, the more serious its violation. The candidate in the outputs which has the least serious constraint violations is the most optimal and wins. The constraint rankings are language-specific, so acquisition is to learn the constraint rankings that hold for the target language (Boersma, 1998; Hancin-Bhatt, 2008). In the OT framework, L2 acquisition starts from the existing L1 constraint ranking and then proceeds from the least marked to the most marked rankings. Transfer takes place from L1 ranking, but patterns that are like neither L1 nor L2 are the result of

/vig/	NO VOICED OBS CODA	MAX , DEP	IDENT (VOI)
vig	*!		
vi<g>		*!	
vi.gE		*!	
vik			*

OT takes interlanguage grammars as natural and dynamic systems which can accommodate new inputs and as the consequence of L1 influence and markedness effects. By the re-ranking the constraints, the interlanguage development can be explained without any other extra special rules.

Though the above models or theories are all based upon the studies on segmentals, they can be employed to explain the suprasegmental or prosodic acquisition. Theoretically, both segmental and suprasegmental learning may be driven by similar learning mechanisms (Pierrehumbert, 2003) and may be influenced by common factors (Trofimovich & Baker, 2006; Wang, Spence, Jongman & Sereno, 1999). Since they intend to explain some phenomenon in certain aspects, it would be partial to explain all phenomena by exploiting any of them individually due to their respective limitations. Interlanguage is the interactive result of the linguistic factors (L1, L2, universals and transfer) and non-linguistic factors like the individual differences of learners (linguistic aptitude, age of learning, length of residence, motivation and other social factors).

1.4.3 The age issue

Age is a crucial variable in the second language acquisition, especially in pronunciation (Flege, Yeni-Komshian & Liu, 1999; Ioup 1984). Previous studies confirm that later learners are not likely to achieve native-like pronunciation and show that native-like L2 phonology is normally found only with a very early onset of L2 learning; the likelihood to be native-like diminishes as the onset age increases. As Lenneberg (1967) predicted in his critical period hypothesis (CP), the end of neural plasticity and the completion of hemispheric lateralization of human brain at puberty results in a decline of the ability to pronounce foreign languages in a native-like fashion. Of the early Spanish learners of Swedish in a large-

to have detectable accents in their L2. Except the continued use of L1, some other individual differences contributed to the learner's foreign accent. These are the amount of L2 use, length of residence, target language input, instruction or training, attitude, the cognitive variables of field independence and right hemispheric specialization, social identity and aptitude (Abrahamsson & Hyltenstam, 2008; Ioup, 2008). Due to such individual differences, some adults may be judged more native-like than others and can even outperform children. Though it is still a hot debate whether biological factors or non age-related individual differences lead to foreign accents, Ioup (2008: 57) concluded that "by and large both the nature of the accent and the degree to which it is manifest is influenced primarily by the age at which language acquisition began".

1.5 Structure of the thesis

The present Chapter 1 has sketched the research background and identified relevant issues to the present research on the phonology. Chapters 2 and 3 will describe two perception tests.

Chapter 2 is on pitch accent location. A set of sentences were presented in two versions, each with a different location of the pitch accent, one correct and one incorrect, as informed by different linguistic generalizations. The purpose of the test is to study how well Chinese learners of Dutch identify the correct accentuation pattern in Dutch sentences in a forced choice decision task.

Chapter 3 deals with melody choice. An 'ideal' reading of the fable *Winterkoninkje* was divided into 26 fragments and produced naturally with a number of alternative 'incorrect' intonations. Each fragment was presented to a group of 20 native Dutch and 20 Chinese-Dutch listeners with four intonation contours. One of these was the intended best intonation contour, and the other three were intended as less felicitous versions with different melodies. Working chronologically through the story, the participants listened to the four versions of each fragment and its preceding context as often as they wished, and then selected the best contour for each fragment. The hypothesis is that Dutch listeners show greater agreement in carrying out this task than Chinese listeners.

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MANDARIN-ACCENTED DUTCH PROSODY

Een wetenschappelijke proeve op het gebied van de Letteren

Proefschrift

ter verkrijging van de graad van doctor
aan de Radboud Universiteit Nijmegen
op gezag van de rector magnificus prof. mr. S.C.J.J. Kortmann,
volgens besluit van het College van Decanen
in het openbaar te verdedigen op 3 december 2012
om 10.30 uur precies

door

Xuliang He

geboren op 9 augustus 1971
te Huanggang, provincie Hubei, China

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Last but not least, I would like to thank my family. I could not have done this without the constant love, support and encouragement from my wife, parents and siblings.

This project was part of the research programme *Intonation in Varieties of Dutch*, awarded by the Netherlands Organisation for Scientific Research (NWO project number 360-70-180), and was co-funded by the Arts Faculty of Radboud University Nijmegen.

Preface

Language is mysterious.

In 2003, I went to work in Nantong University, which borders on the Wu and Jianghuai Mandarin Dialect areas, after I had completed my three-year MA programme in Xi'an, a city in the north-west of the Zhongyuan Dialect area. When I talked with the students there, they assumed I was from the northern part of China, because they thought I spoke with a northern accent. But I spoke, or intended to speak, in the Standard Chinese pronunciation (Putonghua). During my stay in Xi'an, I had been told I spoke with a strong southern accent. When the teacher of a course in 'translation' commented on a presentation of mine, he said my English was easier to understand than my Chinese. After having been away for about ten years from my hometown – a small town whose dialect is influenced by Jianghuai Mandarin and the Gan Dialect – my relatives teased me, because I could not speak the local dialect well enough when I visited my relatives in my hometown. How mysterious language is! Language intrigued me. At that time, I dreamed of studying speech and uncovering its mysterious veil someday.

Luckily enough, Professor Hua Chen, the first Chinese scholar who applied modern computer technology to the study of how Chinese learners speak English, introduced me to the field of phonological acquisition. Enlightened by the literature on phonetics and phonology she gave to her work team, I began to work for her research project. Later, I got the Ph.D. position in the Netherlands to work on the sub-programme 'Mandarin-accented Dutch' of the research programme 'Intonation of Varieties of Dutch' (NWO 360-70-180, 2006-2010) with Professor Carlos Gussenhoven as the principal investigator.

In the sub-programme, I studied the prosody in Dutch by Chinese speakers who live in the Netherlands but originally hailed from areas of Mandarin dialects in Mainland China. Geographically, they are from places around Beijing. The research questions are: How do they accentuate words in Dutch sentences? How do they produce different

intonation contours some of which do not exist in Mandarin? Do speakers of Mandarin, a tone language, transfer their native-language (L1) knowledge to their target language (L2) Dutch? Do learners with higher proficiency in Dutch perform better than the ones with lower proficiency? Are the findings in line with previous findings in this general field? Five experiments (two perception tests and three production tests) were designed to answer the questions. Chapter 2 and Chapter 3 give an account of the two perception tests. The former is on pitch accents in Dutch sentences and the latter is on the acceptability of Dutch intonation patterns in a fable for children. Chapter 4, 5 and 6 describe the three production tests. Chapter 4 deals with unconstrained read-aloud production intended to study melodic choices. Chapters 5 and 6 are about controlled speech production after a brief training session before recording. Chapter 5 studies the phonetic strategies adopted by speakers in the production of melodies (H*L L%; L*H H%; H*L H%) under time pressure created by phonologically different vowels and codas. Chapter 6 studies the effects of three types of focus (broad focus, narrow focus, and corrective focus) in falling intonation contours (H*L L%). The last chapter is the summary.

Though I have finished the project, I do not feel I removed the mysterious veil, even though I may have lifted one of two corners. I still have long way to go.

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Chapter 1

Introduction

1.1 Rationale of the investigation

There are about 120,000 Chinese (about 0.82% of the total population) living in the Netherlands, who immigrated from Mainland China (35%), Hong Kong (23%), Indonesia (20%), Surinam (6%) and other areas (16%), according to the Chinese Embassy in the Netherlands and the investigation by Li (1999). Most of those who are from Mainland China originate from Shenzhen and Dapeng (Canton Province), Wenzhou and Qingtian (Zhejiang Province), Fuzhou and Changle (Fujian Province). They have formed Chinese communities in Amsterdam, Rotterdam, The Hague, Eindhoven and other places. With the development of China, more and more Chinese are coming to the Netherlands to work or study. They learn Dutch and have mastered the language with a certain level of proficiency. A study of how Chinese people speak Dutch is therefore a significant enterprise, and this is one of the reasons why the research programme 'Intonation of varieties of Dutch' (NWO 360-70-180) contains a sub-project 'Mandarin-accented Dutch'. The present research represents the main result of this sub-project. It focuses on the prosody of Dutch spoken by Mandarin learners from the northern part of Mainland China.

It is generally accepted that individuals will be found to speak a second language (L2) with detectable foreign accents when they learn it after a certain age (Flege, Patkowski, 1990; Scovel, 1988; Major 2001; Munro 2008, Munro & Mackay, 1995). Perceptually, the foreign accent is defined as "the extent to which an L2 learner's speech is perceived to differ from native speaker norms" (Munro & Derwing, 1998: 160). The severity of the foreign accent is influenced by age of learning, length of residence, gender, motivation, aptitude, use of language, speech rate, instruction and social factors (Flege, 1988; Flege, Munro & MacKay, 1995; Gut, 2009; Hansen Edwards, 2008; Moyer, 2004). Foreign-

accented speech shows different pronunciation patterns at segmental and suprasegmental levels compared with the native norm. At the segmental level, numerous studies show that the speech differs from native speech in consonant articulation (N 2007) and vowel articulation (Bohn & Flege, 1992; Flege, Bohn 1997; McAllister, Flege & Piske, 2002). For example, Voice Onset Time (VOT) for stop consonants (Flege, 1987; Flege & Eeftink-Magloire & Green, 1999; Major, 1992; Schmidt & Flege, 1996) and articulation (Aoyama, Flege, Guion, Akahane-Yamada & Yamada, 1986) have been shown to differ between native and L2 speakers. At the suprasegmental level, non-native speakers generally delete or substitute one phone for another (Gut, 2009; Munro, 2008; Munro, 2008), have different patterns of stress placement (Archibald, 1997) and other prosodic features besides stress patterns (Aoyama, Guion, 2007; Chen, 2008; Guion, Flege, Liu & Yeni-Komshian, 2000, 2003, 2005, 2009; Trouvain & Gut, 2007). Studies show that prosodic errors contribute significantly to ratings of foreign accent and are more detrimental to listeners' comprehensibility and intelligibility than segmental errors (Anderson-Hsieh, Johnson & Koehn, 1997; Derwing & Munro, 1997; Hash, 1972; Johansson, 1978; Munro, 1995; Derwing, 1995; Rasier & Hiligsmann, 2007; Trofimovitch & Baker, 2007). Pedagogically, a global pronunciation instruction that focuses on prosodic factors (stress, intonation and rhythm) improved comprehensibility and fluency significantly better than a segmental instruction (Derwing & Rossiter, 2003; Derwing, Munro & Wiebking, 2008). Furthermore, prosody-focused instruction may also improve oral production at the segmental level (Chun, Hardison & Peterson, 2008). On the other hand, there are few studies at the suprasegmental level in L2 phonological acquisition, especially when it comes to rhythm, intonation and utterance stress. Most of the existing studies focus on English as an L2, but the studies on other languages for L2 phonological acquisition as L2s are relatively few (Gut, 2009; Trofimovitch & Baker, 2007; Zampini, 2008).

Mandarin Chinese and Dutch belong to different language families. The former belongs to the Sino-Tibetan family and the latter is a Germanic language. The linguistic distance between Mandarin Chinese and Dutch is clearly larger than the distance between English and Dutch. The accents may be related to the linguistic distance between the languages in the language pairs. For instance, the authenticity of English

speakers of English increased significantly by replacing original durations and the original f_0 contour by the durations taken from those of a native speaker of English and with durationally manipulated monotonies, respectively. The results showed that the Dutch speakers of English used segment durations and f_0 contours that signalled foreign accent to native English listeners and that the accent was stronger when the learners spoke than when they sang (Hagen, Kerkhoff & Gussenhoven, 2011). If less foreign accent in sung speech is specific to Dutch speakers of English, it would be reasonable to assume that language pairs like Chinese and Dutch, which are typologically more different, show even greater such effects due to the greater difference in their prosodic features. If the relative contributions of duration and f_0 contours to foreign accent vary with language-relatedness, the question is whether the prediction is right for the Mandarin-accented Dutch. In other words, the differences in prosody between Mandarin and Dutch naturally lead us to focus on the prosodic aspects of the Mandarin-accented Dutch.

In the present thesis, I will compare the performance of Mandarin speakers of Dutch with that of native speakers of Dutch in order to uncover the prosodic characteristics of Mandarin-accented Dutch in terms of sentence pitch accent, intonation, phrasing, pitch range, pauses, rhythm, speech rate and articulation rate.

1.2 Chinese dialects

Chinese is spoken in Mainland China, Taiwan, Hong Kong, Malaysia, Singapore, Vietnam, and the United States by more people than any other language in the world. Chinese has been an official language of the United Nations since the founding of the organization in 1945. Chinese speakers speak different varieties of Chinese. They all belong to the Sino-Tibetan family of languages and each one has its own dialects and sub-dialects, which are more or less mutually intelligible. The dialects of the language differ from each other in pronunciation, vocabulary and grammar. And the difference in pronunciation is the most outstanding. It is not unusual to distinguish the nine dialects of Chinese, as shown in the map in Figure 1.1. They are Wu, Min, Yue, Xiang, Gan, Jing Yu, Hui Yu, Hakka and Mandarin.

Figure 1.1. The distribution of Chinese dialects (Chinese Academy of Social Sciences, Australian Academy of the Humanities, 1990)

The name “Mandarin” was first used by the Portuguese to refer to the language of the magistrates of the Imperial Chinese Court and the language of the northern and western regions. Mandarin has a wide range of dialects in the northern, central, and western regions. North Mandarin, as found in Beijing, is the basis of the modern standard language, *Putonghua* (common language). This language was chosen as a standard for the whole of China, and was promulgated under this name after the establishment of the People's Republic of China in 1949. It embodies the pronunciation of the Beijing dialect, the grammar of the Mandarin dialects and the vocabulary of the Chinese literature. In 1956, it became the medium of instruction in schools, and a policy of promoting its use began. It is now the most widely used form of spoken Chinese, and is the normal written form of Chinese for almost all kinds of publication. *Pinyin*, a writing system

symbols adapted from the Roman alphabet, was adopted in 1958. Its main aims are to facilitate the spread of *Putonghua* and the learning of Chinese characters..

China is a large country with more than a billion inhabitants, and having a common language is good for its administration as well as for cultural exchange and information transmission between ethnic groups and people in different places. More than 2000 years ago, the Chinese had realized that a common language should be used in social intercourse. Putonghua serves those purposes well and allows for efficient communication between people in different areas and from different ethnic groups. The Chinese government attaches great importance to popularizing Mandarin and encourages people to learn it. Today, it is the main language of government, the media and education in both China and Taiwan, and one of the four official languages in Singapore.

As the map in Figure 1.2 shows, Mandarin has developed into eight sub-dialects: Northeastern, Beijing, Ji Lu, Jiao Liao, Zhongyuan, Lan Yin, Jianghuai and Southern Mandarin. There can be variations in pronunciation, vocabulary and grammar, but the language remains understandable to people from other regions within the Mandarin area (Tang, 2009; Tang & van Heuven; 2009).

Figure 1.2. Mandarin dialects in Mainland China

Wu is spoken in Zhejiang and Jiangsu provinces, parts of Anhui Province, Shanghai and Hong Kong.

Cantonese is spoken in Guangdong and Guangxi provinces and Hainan Island in China, and also in Hong Kong, Macau, Singapore, Malaysia and many other countries.

Min can be divided into Min Nan (Southern Min), Min Bei (Northern Min), Min Dong (Eastern Min) and Min Zhong (Central Min). Min Nan is in the south of Fujian province, Guangdong Province, Hainan Island, the south of Zhejiang and Jiangxi provinces, Taiwan and also in Singapore and many other countries. Min Bei is spoken in Northern Fujian Province and Singapore. Min Dong is spoken in the east central Fujian Province and also in Brunei, Indonesia (Java), Malaysia (Peninsular), Singapore, Thailand. Min Zhong is spoken in central Fujian Province.

Jin Yu is spoken mainly in Shanxi Province and also in Shaanxi and Henan provinces. Hui Yu is spoken in southern Anhui and Zhejiang provinces. They used to be considered as dialects of Chinese but now are thought to be separate varieties of Chinese (Hou, 2000).

Hakka is widespread, especially between Fujian and Guangdong. It is spoken in south eastern China, parts of Taiwan and in the Territories of Hong Kong. There are also significant communities of Hakka speakers in such countries as the USA, French Guiana, Canada and the UK.

Xiang (Hunanese) is spoken mainly in Hunan Province, and also in Sichuan, Guangxi and Guangdong provinces. Gan is spoken in Jiangxi Province and in parts of Hubei, Anhui, Hunan and Fujian provinces.

Because there has long been a single writing system for Chinese, the common literary and cultural history, the main varieties of Chinese in China are traditionally referred to as dialects. The same characters are used for the different dialects and can even be used for basic communication in Japanese. But they are in fact different languages. Each other mainly in pronunciation and vocabulary. Speakers of different dialects except Mandarin speakers will not be able to easily communicate with each other, so the written Chinese and Standard Mandarin

linguistic common ground and are used to facilitate communication between people from widely separated regions.

All Chinese dialects are tonal. This means that each syllable can have a number of different meanings depending on the tone with which it is pronounced. For example, Mandarin has 4 tones, (1) high level tone; (2) rising tone; (3) low dipping tone; (4) falling tone. The southern dialects have richer tone inventories than Mandarin. For example, Cantonese has between 6 and 9 tones (depending on the local dialect and in the depth of the analysis), Min between 6 and 8 and Wu between 7 and 8 (Hou, 2002).

Phonologically speaking, most Chinese in the Netherlands come from the regions of Cantonese, Min and Wu dialects, and many of them can speak or have been exposed to the Standard Chinese. We chose our participants for our experiments from the places around Beijing area in order to reduce the deviations caused by participants' dialects. Eleven of them are from Beijing, one from Tianjin, and two from Hebei. Tianjin and Hebei are very close to Beijing, so they are all Beijing Mandarin speakers. One participant grew up in Henan (Zhongyuan Mandarin) and educated in Shandong (Ji Lu and Jiao Liao Mandarin). Another one is from Xi'an (Zhongyuan Mandarin). The other four are from the northeast of China (Northern east Mandarin). That is to say, all participants in our experiments are all Mandarin speakers. As Hou (2002) put it, Mandarin speakers, though living several thousands of *Li* away from each other (one *Li* equals 500 metres), have no problem in communication while non-Mandarin speakers cannot understand each other even if they live only several *Li* away. This traditional idea about intelligibility of Chinese dialects is supported by the quantitative data on mutual intelligibility of Mandarin and non-Mandarin Chinese dialects (Tang, 2009; Tang & van Heuven, 2009). On the other hand, all participants, aged from 17 to 53, are very proficient in Putonghua (self-report and checked by the present author in the interview before experimenting) because they received formal education in schools in Mainland China when they were young.

1.3 ToDI and Standard Dutch

ToDI (Transcription of Dutch Intonation), a phonological system developed for Dutch was used in all reports (Gussenhoven et al. 2005, Gussenhoven, 2005). Unlike MAEToBI (Mainstream American English Tones and Break Indices) (Beckman & Ayers, 1994; Hirschberg & Shattuck-Hufnagel, 2005), which was developed for American English, ToDI uses no break indices, which are indicators of prosodic boundary strength for four levels of phrasing. ToDI only indicates intonational phrases and tones, as other boundaries are assumed to be not relevant for the tonal transcription. Since the intonation system of Dutch is similar to that of other standard West Germanic languages, MAEToBI and ToDI can in principle be used for those languages as well (Gussenhoven, 2005).

In the ToDI transcription system (<http://todi.let.kun.nl/>), an intonational phrase (IP) contour is a melodic pattern which occurs in an Intonational Phrase (IP). Each contour consists of a number of High (H) and Low (L) tones. The symbol T is used to refer to either H or L. The tones occur at the edges of IPs and at accented syllables. IPs are demarcated by %. The first edge has a tone. Tones occurring at IP edges are transcribed as T% (initial boundary tone) or T% (final boundary tone). Every syllable is marked by a tone, or a cluster of tones, called a “pitch accent”. The first tone of a pitch accent is transcribed as T*. A T* is followed by further tones to describe the movement from the accented syllable onward. An example is given in Figure 1.3.

The full set of symbols used in the ToDI system is the following:

H*, L*	high/low accent
H, L	upward/downward movement after L*/H*
H%, L%	rising/low ending of an IP
%H, %L	high/low beginning of an IP
%HL	initial falling pitch
%	half-completed fall/rise at end of an IP
!H*	downstepped H*

The pitch accents in the system are:

H*L	High fall from accented syllable
!H*L	Low fall from accented syllable (downstepped fall)
H*	High level from accented syllable

!H*	Lowered level from accented syllable (downstepped level)
H*LH	Pre-nuclear steep fall followed by a gradual rise towards the next accented syllable (pre-nuclear fall-rise)
L*!HL	Low rise fall from accented syllable (downstepped delayed peak)
L*H	Rise from low from accented syllable
H*!H	Vocative chant

The seven nuclear pitch accents listed above (i.e. all except H*LH) can form 21 nuclear contours in combination with the three final boundary conditions.

Figure 1.3. An example of Dutch sentence *Dat alles heeft ons zo bang gemaakt!* transcribed in ToBI.

The Fall is transcribed as H*L L%, as in an alternative question:

with high pitch. Functionally, the occurrence of H*L H% may signal a question, or a reminder, or a suggestion which may have a ring of self-evidence. It often goes with *toch* 'not' or with modal particles *hè* or *hoor*, as in the following two examples:

4. *Je hoeft niet meer te werken. Je hebt toch al genoeg gedaan deze week?*

$\%L$
 $\begin{array}{c} | \\ H^*L \end{array}$
 $H\%$

You don't have to work anymore. Haven't you done enough this week?

5. *Het wordt laat. Maar je moet wel je eten opeten, hoor!*

$\%L$
 $\begin{array}{c} | \\ H^*L \end{array}$
 $H\%$

It's getting late. But you should finish you meal!

The IP-final high rise auditorily begins at mid pitch, which continues until a rise at the IP-boundary. The mid pitch is usually reached late in the accented syllable while the beginning is low, as is commonly the case for H*. The contour is mostly used in questions or frequently used utterance-internally to indicate that another IP follows. We transcribe it as H* H%.

6. *Zei je nou echt dat je naar buiten wilde? In de regen?*

$\%L$
 $\begin{array}{c} | \\ H^* H\% \end{array}$

Did you really say you were going to go out? In the rain?

The vocative chant consists of a high level and a mid level tone. The H* begins on the accented syllable, and the !H, the mid level, is realized on the last syllable, or on a stressed syllable if there is one between the accented syllable and the last syllable. The accented syllable and the syllable on which the !H begins are often lengthened. When the accented syllable is the last syllable, the two levels are both pronounced on that syllable, which as a result is broken into two sections. The lengthening does not occur when the level pitch of H* is spread over more than two syllables. No lengthening is used when the contour is used to mark continuation, which sometimes occurs in instructions which the speaker wishes to sound unproblematic. The vocative chant is also used on utterances with an early accent in which case each of the following

unaccented words is likely to have a pitch level. These levels of pitch are in the same way that series of downstepped accents descend. Since the right-hand pitch level has mid pitch, rather than low pitch, the right-hand pitch level is transcribed as toneless %. Vocative chants with L% and H% are rare but are rare. The one with L% has a fully low-pitched final pitch and may make the speaker sound exasperated. The vocative with H% is like H*!H % with an added rise in the last part of the pitch level. It may give an impression of wheedling. It is sometimes used to call somebody by name as in the following example.

7. *Schat-je! We hebben weer kaa-aas!*

%L H*!H %
 Honey! We have cheese again!

The above examples are all from Experiment 3, Chapter 4. All examples in the thesis are transcribed in ToDI.

1.4 Relevant issues

In this part, some relevant issues to the present research are discussed. They are the relationship between perception and production on the basis of which I intend to motivate why there are two perception and three production experiments in the study, and will introduce some theories or models in the field of phonological acquisition which are potentially used to explain the results in the experiments.

1.4.1 Perception and production

Phonetic perception is the internal mental process of recognizing phonetic segments as tokens of phonological categories by selecting and integrating multiple acoustic parameters. Infants are sensitive to various aspects of the ambient language before birth and their sensitivity becomes sharper after birth (Ohala, 2008). Prosody stands out as an acoustic cue for infants to distinguish a foreign language from the ambient language or discriminate between two foreign languages. The perception ability develops from language-general to language-specific within the first year of life. Infants are initially able to discriminate

consonant and vowel contrasts that are not present in the ambient languages, but they lose the ability and can only distinguish the contrasts of their native language like adults by the end of the first year when they can produce the first words due to the exposure to the native language (Kuhl & Iverson, 1995). The language-specific phonetic perception is robust and automatic because adults require few cognitive resources to extract the phonetic information from the acoustic signal (Fikkert, 2007; Ohala, 2008; Strange & Shafer, 2008).

As a result, for almost all late L2 learners, their oral production is foreign accented. We do not know whether L2 learners have difficulty in perceiving the phonological features, such resulting in the foreign accents in their production. It is generally thought that a major determinant of the foreign accent in production is the underlying problem in perceiving the L2 phonological structures (Flege, 1995). If learners cannot hear given contrasts the way native speakers do, the perceptual problems will cause problems in pronunciation. They sometimes have more difficulty perceiving the difference in an L2 sound which is relatively close to a sound in L2 than a new sound in L2 which is completely distinct from any sound in the L1 inventory (Best, 1995; Flege, 1995). Native Japanese listeners with different learning experience are found to have extreme difficulty in producing the English consonant contrast /r/~/l/ and to perform significantly poorer than the native English speaker in judging in a variety of stimulus materials and tasks (Bradlow, 2008; Strange & Shafer, 2008). However, not all mispronunciation is caused by erroneous perception. For articulatory reasons, L2 learners may not produce certain contrasts though they perceive accurately their representation in the L2. But in some studies, L2 sound production was found to surpass perception (Bohn & Flege, 1996; Brière, 1966; Gass, 1984; Kluge et al. 2007; Neufeld, 1988; Sheldon & Strange, 1982; Strange, 1995), indicating that production of L2 sounds can be more accurate than perception. For example, the ability for many Japanese learners of English to produce the English /r/~/l/ contrast accurately was stronger than the ability to perceive them, particularly in the early stages of acquisition (Yamada, Strange, Magnuson, Pruitt & Clarke, 1994). Pedagogically, learners' perceptual skills may be as important as their production ability. Studies have shown that perceptual training can improve production (Chun, Hardison & Pennington, 2008). The relation between perception and production is too complex to make a straight-forward conclusion that production precedes perception, or

vice versa. Their relation depends upon the stage of the acquisition of the L2, the sound class, the acoustic properties, the contextual factors, the similarity between L1 and L2 and social factors (Llisterri, 1997).

The observations above are all related to segmentals, but the study of intonation encompasses a wide range of speech phenomena and is more concerned with how to convey the intended meanings in communication than segmentals discussed in 1.1. It is worthwhile investigating whether L2 learners can choose certain pitch accents and intonation contours in sentences in different textual context. Therefore Chapter 2 in the present study focuses on whether Chinese learners of Dutch can judge the correct pitch accents in different types of Dutch sentences and Chapter 3 focuses on whether they can choose the optimal intonation contours according to the textual context. The other chapters focus on the production of intonation by Chinese L2 speakers of Dutch.

1.4.2 Models of phonological acquisition

Transfer is omnipresent in learning (Ausubel, 1963), and is an important issue in the second language acquisition research. The learners' previous knowledge of L1 works like a sieve to filter learners' L2 acquisition. Phonological, morphological, syntactic, semantic and lexical transfer are all influenced by behaviourism and structuralism in the middle of the twentieth century, the research on transfer in second language acquisition focused on Contrastive Analysis (CA), which claimed that transfer could explain and predict all errors (Fries, 1945; Ladinsky, 1961). But not all errors are caused by transfer and the differences in language systems. As Selinker (1972) pointed out, the interlanguage, i.e. a learner's linguistic system in between the learner's L1 and the target language, is the result of many factors and transfer is merely one of them. In addition to transfer errors, learners' errors are also made due to universal developmental factors so that they are similar or identical to errors that are observed in the course of L1 acquisition. Wardhaugh (1986) distinguished a strong and weak version of CA. The strong version predicted errors and the weak version explained the errors after the fact. CA is very easy to be falsified if prediction is defined in the absolute sense that all individual learners would or would not make a certain error. It is alive and well today if prediction is defined in probabilistic terms.

Actually, CA has seen a resurgent interest and importance in second language acquisition research since the 1980s (Major, 2008).

Besides the linguistic transfers, L1 skills can also transfer into L2 learning and proficiency. In a recent study by Sparks, Patton, Ganschow and Humbach (2009), high school students transferred their L1 English skills in reading, spelling, vocabulary, phonological awareness and listening comprehension to L2 Spanish, French or German, and their early L1 skills played an important role in their L2 attainment.

Transfer plays different roles in different theories or models of phonological acquisition, which can be seen from the following theories or models.

1.4.2.1 Best's PAM

The Perceptual Assimilation Model (PAM) (Best, 1993, 1994a, 1994b, 1995; Best, McRoberts & Sithole, 1988) employs the metaphor of a phonological space in which native categories (gestural constellations) are arrayed according to similarities/differences in their articulatory-phonetic structure. PAM was developed primarily to account for patterns of nonnative segmental perception by naïve listeners with no experience with the L2. Best & Tyler (2007) later extended the PAM to predict patterns of speech perception by more advanced L2 learners (PAM-L2). It incorporates a combination of perception and production factors. In the very early stages of language acquisition, an infant establishes categories for native language sounds by learning to articulate them. Once the categories have been established, phonemic categories that are non-native will be assimilated to native categories on the basis of perceived similarities.

There are six possible assimilation scenarios in this model, depending on how each member of a non-native contrast is assimilated into native categories: Two-Category (TC) contrasts, where each member is assimilated into a different native category; Single-Category (SC) contrasts, where both members are assimilated into a single native category (equally well or poorly); Category-Goodness (CG) contrasts, where both members are assimilated into the same native category but with one being a closer match to that category; Uncategorized-

Categorized (UC) contrasts, where one member is identifiable as a native category while the other falls between two (or more) native categories; Uncategorized-Uncategorized (UU) contrasts which consist of two uncategorized sounds; and Non-Assimilable (NA) contrasts, where both non-native phones are perceived as non-speech sounds (e.g. the case of American English listeners perceiving Zulu clicks (Kuhl, 1988)). Importantly, the model makes specific discrimination predictions for each assimilation type. For naïve listeners, L2 phonetic segments are perceptually assimilated to L1 phonological categories on the basis of their gestural similarity to L1 phonetic segments unless they are phonetically disparate that they are heard as uncategorizable sounds or are not perceived as speech at all. Of the six assimilation scenarios, three patterns of perceptual assimilation predict specific discrimination difficulties. SC contrasts are predicted to be more difficult than TC or CG contrasts in which the members of a contrasting pair are assimilated by nonnative listeners into two separate native categories or into a single native category with different degrees of goodness, respectively; therefore a SC should be the most difficult kind of contrast for nonnative listeners to acquire.

1.4.2.2 Kuhl's NLMM

Kuhl's Native Language Magnet Model (NLMM) (Kuhl, 1993a, 1993b, 1994, 2000; Kuhl & Iverson, 1995), is a model of perceptual assimilation. Though it originally intended to explain the process by which infants progress through general-language perception to specific perception by the end of the first year of life, it may be extended to account for the perception in an L2.

Language exposure may cause changes in the phonological space according to the model. Each instance of a phoneme heard is stored as an exemplar and the best exemplar becomes a prototype (an abstract representation of phonetic category) and will act as a phonetic magnet. The prototype, like a magnet, attracts other similar exemplars towards the perceptual space near the category centre. All new instances are classified according to the existing prototype categories. Thus, prototypes shape the mapping between acoustics and perceptual space, reduce perceptual sensitivity near the distributional peak of the category. When the L2 learner encounters a new sound that is similar to

sound, the prototype forces the learner to perceive the new sound as the L1 prototype.

The model also predicts the difficulty in discrimination of L2 sound contrasts. Under the proximity principle (Kuhl, 1991), the accuracy to discriminate more prototypical exemplars of a phonetic category is lower than that to discriminate less prototypical exemplars. The difficulty in discriminating L2 sound contrasts increases as the similarity to L1 sounds increases.

The explanatory power of the model was challenged in some studies (Lacerda, 1995; Lively & Pisoni, 1997), but the influence of early language experience on the L2 sound perception cannot be denied.

1.4.2.3 Flege's SLM

Flege's (1995, 1999, 2002) Speech Learning Model (SLM) consists of four postulates and seven hypotheses to account for age-related pronunciation of vowels and consonants in an L2. The four postulates are: (i) The mechanisms and processes used in learning the L1 sound system, including category formation, remain intact over the life span and can be applied to L2 learning; (ii) Language-specific aspects of speech sounds are specified in long-term memory representations called 'phonetic categories'; (iii) Phonetic categories established in childhood for L1 sounds evolve over the life span reflect the properties of all L1 and L2 phones identified as a realization of each category; (iv) Bilinguals strive to maintain contrast between L1 and L2 phonetic categories, which coexist in a common phonological space. The four postulates mean that speakers use the same cognitive resources in L1 and L2 learning, share and have mental representations of the contrastive sounds of their native language, and can create new categories in L1 and modify them in L2 acquisition though they strive not to mix the categories in L1 and L2. The acquisition of L2 sounds that do not exist in their L1 is to establish new categories and the categories in L1 work as filters in the L2 phonological acquisition.

The seven hypotheses in SLM predict the preconditions and stages of phoneme acquisition. The mechanisms needed to produce new sounds remain intact, but perception changes with development. Language

learners are able to perceive at least some of the phonetic differences between two L1 and L2 sounds. The ability to discern new phonetic categories decreases with age because children do not have the native phonetic categories as firmly fixed in their phonological system as older learners do. As a result, the younger the learner, the greater the likelihood that sounds in the L2 will be perceived on their own merits without reference to the L1. The likelihood of category formation is a function of the learner's age of arrival (AOA). Furthermore, it is predicted that those phones that do not contrast in the L1 will be the ones that are difficult to perceive in the L2, and that the similarity between identical sounds in both languages will be hardest to maintain. The accuracy of L2 perception constrains that of L2 production. For example, for Spanish listeners, both American English /a/ and /ɒ/ are perceptually assimilated to Spanish /a/, resulting in difficulty in discriminating this contrast and in the production of both L1 and L2. This is the process called 'equivalence classification' in which learners cannot form the category for the sounds and end up with a single representation of a single phonetic category for both sounds. Conversely, the greater the difference between the L1 and L2 phones, the more likely the learner will notice the difference and thus not rely on the L1 to produce the L2 phone. French /y/ is a new vowel for American English learners and L2 French learners will produce it accurately and perceptually differentiate it from both back, rounded and front, unrounded vowels and from English vowels (Flege & Hillenbrand, 1998). Sufficient exposure to the L2 sounds (which may take up years)

However, SLM neither tells us what type of linguistic or cognitive change is responsible for the decline in perceptual ability as the learner matures nor does it offer insight into the mechanisms that allow earlier L2 learners to acquire phonology more easily than later L2 learners. SLM does not make any explicit prediction about the acquisition of prosody due to its limited scope on phoneme and allophones.

1.4.2.4 Major's OPM

The Ontogeny Phylogeny Model (OPM) is proposed by Major and his colleagues. "Ontogeny" and "phylogeny" are originally biological terms. "Ontogeny" refers to the life cycle of single organism and "p

means the evolutionary development of groups of organisms. Similarly, when they are borrowed into language, the former means the life cycle of an individual's language and the latter the life cycle of all languages and language types (Major, 1994, 1996, 2001; Major & Faudree, 1996). So OPM deals with both individual and evolutionary development of languages. It incorporates markedness and predicts longitudinal phonological acquisition of L2 or dialects by individuals or groups of speakers over generations. It holds that an interlanguage is composed of elements of L1, the required L2 and universals. If L2 acquisition increases, L1 transfer decreases, and universals increase and then decrease. For similar phenomena in L1 and L2, L2 acquisition proceeds slowly, transfer persists, and consequently the role of universals gets relatively small, compared to the norm which is neither similar nor marked. For marked phenomena, L2 acquisition increases slowly; L1 transfer decreases slowly, while the influence of universals increases rapidly and then decreases slowly. Different from the other models, individuals' difference, social and demographic factors affecting L2 phonology are considered important in this model.

OPM was supported in the studies on the acquisition of phonemes and syllable structure, however, no evidence was found to support the claim L1 transfer decreases with increasing degree of L2 formality of speech style. The model can be applied not only in phonological acquisition but also in non-phonological fields. However, 'universals' are not clearly defined and the interrelation of the three proposed elements in interlanguage remains open to speculation. Nor does OPM offer a psycholinguistic account for how L2 phonological learning takes place over time during which the learning is considered as progressing from non-target to target L2 forms through variable performance by trial and error (Trofimovich, Gatbonton & Segalowitz, 2007). Though non-linguistic factors are considered important in the model, it does not specify how such factors influence learning over time.

1.4.2.5 Eckman's MDH and SCH

The difference between L1 and L2 is insufficient to explain the learner error, and should be supplemented by the explanatory principle of typological markedness. Eckman's (1977, 1984, 1985, 2008) Markedness Differential Hypothesis (MDH) states that a structure A is more marked

than B if the existence of A in a language necessitates the existence of B but not vice versa. For example, final voiced obstruents imply final obstruents in initial and medial position but not vice versa; a greater number of the segments in the onset and coda clusters implies a greater number in medial position. Markedness also refers to the relative frequencies. Pharyngeal fricatives are more marked than /p/, and the rhotic of American English is more marked than /l/. It is predicted that a marked rule is more difficult to learn than an unmarked one, L2 acquisition and that in L2 acquisition marked L2 patterns that are more marked than in L1 should not be difficult, unmarked patterns that are more likely to be transferred to L2 than the marked ones. These predictions have found support in numerous studies on segmental acquisition, including voicing contrasts, epenthesis in consonant clusters, and consonant deletion (Major, 2008). It was difficult for German learners of English to acquire the word final voiced consonant in English while Chinese learners of German had no difficulty in producing the word final voiceless consonant in German. Because Chinese does not have complex codas, Chinese-speaking subjects were less native-like in pronouncing English coda clusters than Arabic-speaking subjects. The difficulty they experienced correlated with degree of markedness, with the amount of difference between the native language and the target language (Anderson, 1987).

However, MDH cannot explain L2 patterns which are more marked than in the area of a difference between L1 and L2. It developed from the Structural Conformity Hypothesis (SCH), which states "the degree of conformity to universal generalizations that hold for primary languages holds for the interlanguage" (Eckman, 1991: 24). An interlanguage, a stage in the second language acquisition process that is located along the continuum between the native language and a target language, obeys certain patterns in some of the features of the target languages. The studies on consonant clusters in onsets or codas that allow both a greater number of clusters and thus more marked patterns in an L2 than in an L1, showed that the cluster types were more complex in the interlanguage grammars than those allowed in the L1, but not more complex as those required in the L2. So the findings of these studies support SCH (Eckman, 2008). SCH predicts the nature of interlanguage grammars rather than learning difficulty and expands the domain of the markedness hypothesis beyond the difference between L1 and L2; therefore, it overcomes the shortcomings of MDH.

Both MDH and SCH claim that learners have fewer difficulties and proceed faster in acquisition of unmarked patterns than in the acquisition of marked ones. Due to their scope and explanatory power, the limitation of both hypotheses can be seen. Relying on the concept of linguistic universals, their scope is restricted to linguistic areas such as syllable structures or the frequency of segmental speech sounds for which linguistic universals have been proposed. Other phonological features, phonological process and the prosodic phenomena have not been classified in term of typological markedness, so the two hypotheses cannot predict acquisition phenomena in those fields. Non-linguistic factors influencing phonological acquisition are not put into consideration.

1.4.2.6 Optimality Theory

Since Prince and Smolensky's seminal manuscript on Optimality Theory (OT) was introduced in 1993, numerous efforts have been made to test and develop the theory in the areas of phonology, syntax and discourse studies. Phonology is greatly impacted by the theory and applied linguists have begun to adopt an OT approach to understand observed phenomena in L2 phonological acquisition, though most of the studies focus on L2 syllable structure (Hancin-Bhatt, 2008).

OT grammars consist of a universal set of constraints divided into two subgroups: Markedness and Faithfulness. The Markedness constraints are generalizations on the marked and unmarked patterns in a language. Linguistic patterns that commonly occur in natural languages are unmarked and those that do not are marked. Faithfulness constraints ensure the congruence between patterns in the input and those in the output. The two types of inherently conflicting constraints can be violable, and ranked relatively to each other. The higher the ranking of a constraint is, the more serious its violation. The candidate in the outputs which has the least serious constraint violations is the most optimal and wins. The constraint rankings are language-specific, so acquisition is to learn the constraint rankings that hold for the target language (Boersma, 1998; Hancin-Bhatt, 2008). In the OT framework, L2 acquisition starts from the existing L1 constraint ranking and then proceeds from the least marked to the most marked rankings. Transfer takes place from L1 ranking, but patterns that are like neither L1 nor L2 are the result of

universals. For example, A and B are the constraint rankings for Mandarin Chinese and in English as in (1), where “>” means higher ranking; MAX I, DEP (V) and IDENT (VOI) are faithfulness constraints; NO OBS CODA, NO VOICED OBS CODA are markedness constraints.

Faithfulness constraints

MAX I: Maximize the consonants in the input (not delete the consonants)

DEP (V): The vowels in the output should depend on the input vowels

IDENT (VOI): An output segment should be identical in voice to the corresponding input segment.

Markness constraints

NO OBS CODA: Syllables may not contain obstruents.

NO VOICED OBS CODA: Syllable codas may not contain voiced obstruents

- (1) A: No coda obstruents allowed (Mandarin): */vig/, */vik/
 NO OBS CODA, NO VOICED OBS CODA >> MAX I, DEP (V), IDENT (VOI)

B: Both voiced and voiceless coda obstruents allowed
 /vig/, /vik/
 MAX I, DEP (V), IDENT (VOI) >> NO OBS CODA, NO VOICED OBS CODA

Chinese learners of English were found to avoid obstruents in coda through either deletion or epenthesis, because the Faithfulness constraints MAX I and DEP (V), re-ranked lower than the Markness constraints (Broselow, Chen & Wang, 1998). But some Chinese learners devoiced the coda, thus producing an unmarked form that is not found in either Chinese nor English because they re-ranked the NO OBS CODA to NO VOICED OBS CODA and IDENT (VOI) was the minimal violation of the Faithfulness constraints (Broselow et al., 1998). The table below shows the representational evaluation of /vig/ by Chinese speakers of English, where the full stop in the third candidate indicates syllable boundary. Asterisks indicate constraint violations and an exclamation mark signifies a fatal violation, as usual.

- (2) Devoicing in Obstruent Codas: NO OBS CODA, NO VOICED OBS CODA >> MAX I, DEP (V), IDENT (VOI)

/vig/	NO VOICED OBS CODA	MAX , DEP	IDENT (VOI)
vig	*!		
vi<g>		*!	
vi.gE		*!	
vik			*

OT takes interlanguage grammars as natural and dynamic systems which can accommodate new inputs and as the consequence of L1 influence and markedness effects. By the re-ranking the constraints, the interlanguage development can be explained without any other extra special rules.

Though the above models or theories are all based upon the studies on segmentals, they can be employed to explain the suprasegmental or prosodic acquisition. Theoretically, both segmental and suprasegmental learning may be driven by similar learning mechanisms (Pierrehumbert, 2003) and may be influenced by common factors (Trofimovich & Baker, 2006; Wang, Spence, Jongman & Sereno, 1999). Since they intend to explain some phenomenon in certain aspects, it would be partial to explain all phenomena by exploiting any of them individually due to their respective limitations. Interlanguage is the interactive result of the linguistic factors (L1, L2, universals and transfer) and non-linguistic factors like the individual differences of learners (linguistic aptitude, age of learning, length of residence, motivation and other social factors).

1.4.3 The age issue

Age is a crucial variable in the second language acquisition, especially in pronunciation (Flege, Yeni-Komshian & Liu, 1999; Ioup 1984). Previous studies confirm that later learners are not likely to achieve native-like pronunciation and show that native-like L2 phonology is normally found only with a very early onset of L2 learning; the likelihood to be native-like diminishes as the onset age increases. As Lenneberg (1967) predicted in his critical period hypothesis (CP), the end of neural plasticity and the completion of hemispheric lateralization of human brain at puberty results in a decline of the ability to pronounce foreign languages in a native-like fashion. Of the early Spanish learners of Swedish in a large-

scale study, only a few were actually native-like in their competitive behaviour under detailed acoustic-phonetic scrutiny measurements, although they were judged by native speakers to be like (Abrahamsson & Hyltenstam, 2009).

Compared to other variables like the quality of the input, residence, the degree of motivation and the amount of the use of L2, the most important variable to predict degree of foreign accent is onset of age of L2 learning (Asher & Garcia, 1969; Flege, Bohannon, 1997; Flege & Fletcher, 1992; Flege, Munro & MacKay, 1999; Yeni-Komshian & Liu, 1999; Munro, Flege & MacKay, 1996; 1976; Patkowski, 1990; Piske, MacKay & Flege, 2001; Thompson, 1996). In these studies, the production of the adult subjects, who were divided into sub-groups according to the age at which they began to study L2, was judged by native speakers using a scale indicating the degree of foreign accent. Tokens by native speakers were interspersed among nonnative speech for control. Other studies on acoustic measurements of speech also showed that age was a determining factor in the ability to produce native-like VOT and vowels. It was found that the VOT values of the English phoneme /t/ produced by early Spanish learners and English were equivalent to those of monolingual English native speakers, while the late learners' VOT values were located midway between monolingual Spanish and English values (Flege, 1991; Thompson & Ryalls, 1998). The accuracy of English vowels by Italian immigrants in Canada was inversely correlated with age of arrival (AOA) (AOA was equivalent with onset age of learning), and only the subgroup of the earliest arrivers produced native-like English vowels (Flege, Munro & Meador, 1999; Flege, Schirru & MacKay, 2003). Kim (1995) studied Korean immigrant learners of English into AOA before and after arrival and compared the English /i/~I/ distinction, which is absent from Korean. She found that early arrivers use both vowel length and VOT differences to distinguish the vowel pairs as the monolingual English native speakers while the late learners only used vowel length.

Some studies, however, conclude that the acquisition of native-like pronunciation was not guaranteed by early onset of learning. In these studies, learners were identified as immigrants since they had a detectable foreign accent in their pronunciation in two large-scale studies of Italian immigrants in Canada (Flege, Frieda & Nozawa, 1997; Flege, MacKay & Piske, 2001). Those who often used their native language were found to be more

to have detectable accents in their L2. Except the continued use of L1, some other individual differences contributed to the learner's foreign accent. These are the amount of L2 use, length of residence, target language input, instruction or training, attitude, the cognitive variables of field independence and right hemispheric specialization, social identity and aptitude (Abrahamsson & Hyltenstam, 2008; Ioup, 2008). Due to such individual differences, some adults may be judged more native-like than others and can even outperform children. Though it is still a hot debate whether biological factors or non age-related individual differences lead to foreign accents, Ioup (2008: 57) concluded that "by and large both the nature of the accent and the degree to which it is manifest is influenced primarily by the age at which language acquisition began".

1.5 Structure of the thesis

The present Chapter 1 has sketched the research background and identified relevant issues to the present research on the phonology. Chapters 2 and 3 will describe two perception tests.

Chapter 2 is on pitch accent location. A set of sentences were presented in two versions, each with a different location of the pitch accent, one correct and one incorrect, as informed by different linguistic generalizations. The purpose of the test is to study how well Chinese learners of Dutch identify the correct accentuation pattern in Dutch sentences in a forced choice decision task.

Chapter 3 deals with melody choice. An 'ideal' reading of the fable *Winterkoninkje* was divided into 26 fragments and produced naturally with a number of alternative 'incorrect' intonations. Each fragment was presented to a group of 20 native Dutch and 20 Chinese-Dutch listeners with four intonation contours. One of these was the intended best intonation contour, and the other three were intended as less felicitous versions with different melodies. Working chronologically through the story, the participants listened to the four versions of each fragment and its preceding context as often as they wished, and then selected the best contour for each fragment. The hypothesis is that Dutch listeners show greater agreement in carrying out this task than Chinese listeners.

Chapter 4 describes an unrestricted read-aloud production test of the melodic choices based on seven sets of sentences, composed to elicit particular pitch accents and intonation patterns. The sentences consist of sentences that typically have a specific nuclear contour recorded by 20 Chinese speakers of Dutch. To establish 'correct' contours (baseline) are, we used readings of the same sentences by a small group of five native speakers of Standard Dutch. The readings show variation; 'errors' by Chinese readers should be counted more heavily as the variation is smaller in the Dutch group. The results to be counted in terms of (a) correct pitch placement and (b) nuclear tune. Phrasing, pitch range, speech rhythm, speech articulation rate will be investigated and compared in this chapter.

Chapters 5 and 6 present two studies on the phonetic features of Mandarin-accented Dutch. Mandarin-accented prosody will be compared to a corpus of read speech by 20 speakers of Dutch with a Chinese background and compared with existing data on Standard Dutch. The sentences are chosen from the Intonation in Vrije Nederland (IVAN) corpus. Chapter 5 studies the impact of time pressure on the production of melodies (H*L L%; L*H H%; H*L H%). Time pressure was created through the use of long and short vowels in the words (/ɔ/ and /o/, spelled as *o* and *oo*, respectively), and the presence of a sonorant in the coda (/f/ versus /m/). The corpus comprised 12 test sentences: four declaratives, four questions, and four rhetorical questions. Chapter 6 targets focus effects in falling intonation (H*L L%). The corpus for this experiment consists of three sentences with target words in three different focus conditions (broad focus, narrow focus, and corrective focus). The rhythmic pattern (alternation of emphasized and non-emphasized syllables) remains the same in these sentences. Chapter 7, the last part, presents the conclusions of my experimental work and identifies topics for further research.

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Chapter 2

Choosing the optimal pitch accent location in Dutch¹

2.1 Introduction

Speakers of non-native languages (L2 speakers) often have difficulties in producing acceptable stress and accentuation patterns, in part depending on the difference between L1 and L2. Incorrect prominence patterns often persist despite long exposure to the L2. It would appear that such ‘stress deafness’ is not merely the result of major stress typology differences. One situation in which it has been observed is that of Chinese learners of English (Gut, Trouvain & Barry, 2007). Germanic languages generally have sentence prosodic patterns that are the result of the inherent stress patterns of words and a rather complex set of rules for the placement of pitch accents on a subset of the stressed syllables. Variation in the distribution of pitch accents is strongly context-dependent, but even in reading tasks with isolated sentences, differences between native speakers and Chinese L2 speakers are striking (Chen Hua, 2008). The question we attempt to address in this investigation is, first, whether the apparent difficulties Chinese learners of Dutch (CSD) have with the correct placement of prominences in Dutch sentences is due to their inability to produce those patterns or rather in their ignorance of what an acceptable pronunciation of an isolated sentence is. The question, therefore, is whether they can recognize the correct location of pitch accents in a listening task. Additionally, given that the explanation for the presence or absence of a pitch accent on a given syllable may vary from morphology to information structure, our interest is in whether the acceptability of some accent placements is easier to establish by Chinese

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learners of Dutch than other accent placements. To this end, we classified the accent placements according to the linguistic generalization that lies at their basis.

Accent is a place marker in the phonological structure which, known as pitch accents, are to be inserted (Goldsmith, 1976; Gussenhoven, 1978). Pitch accents in an English, German or Dutch sentence are determined by lexical, phonological and morphological information, in addition to semantic and pragmatic factors (Gussenhoven, 1999). We chose six categories of accentuation problems in sentence production for the participants to judge in the experiment, henceforth referred to as 'accentuation types' (See Appendix 1).

The first accentuation type concerns primary word stress. In Dutch, stress falls on the antepenult, the penult, or the final syllable of a word, depending on whether the penult is open or closed. If the penult is open, and on the penult or the final syllable if the penult is closed (Booij, 1999; Gussenhoven, 1999). In the word *ooievaar* 'stork', whose penult is open, the antepenult and the last syllable are open syllables and the primary stress falls on the antepenult *oo* and not on the penult *ie*. Because final VVC syllables regularly take the primary stress, e.g. *Spanjaard* 'Spaniard', *olifant* 'elephant' make it a source of difficulties to foreign learners, even though such words are frequent in the case of *ooievaar*, (1a) is the correct reading and (1b) the incorrect one.

- (1) a. *Er staat een OOievaar in de wei.*
 b. *Er staat een ooieVAAR in de wei.*
 'There's a stork in the meadow.'

The second problem category comprises compound nouns. In a compound, the pitch accent on the second constituent loses its pitch accent. For example, the pitch accent in *groentetuin* 'kitchen garden' is on the first component *groente* rather than on the second *tuin*, which means that (2a) is correct and (2b) incorrect.

- (2) a. *Ze hebben een grote GROENTEtuin.*
 b. *Ze hebben een grote groenteTUIN.*
 'They have a large kitchen garden.'

The third problem area is that of phrasal proper names. In the Netherlands and Belgium, people's names generally consist of a given name, a surname and an optional surname prefix. The prefix is a function word (or a combination of function words), which remains unstressed and is part of the surname, even though in alphabetic orderings it is ignored. Some surnames, particularly those that were – apparently reluctantly – adopted as a result of the compulsory registration of the Dutch population during the French occupation of 1806-1813², are etymologically phrases, like *Vroegindewei*, which goes back to *Vroeg in de wei* 'early in the field'. The primary stress of a phrasal surname generally falls on the first syllable, but on the last if the same words are used as a common phrase. That is, (3a) is the correct reading and (3b) the incorrect one.

- (3) a. *Dit is mevrouw VROEGindewei.*
 b. *Dit is mevrouw vroegindeWEI.*
 'This is Mrs Vroegindewei.'

Gussenhoven (1983) made a distinction between eventive and non-eventive sentences, where eventive sentences involve the reporting of a change in the world. Following Schmerling (1976), the Sentence Accent Assignment Rule (SAAR) says that in eventive sentences, predicates lose their pitch accent if they are adjacent to one of their arguments. For instance, if a single accent falls upon *dogs* in the sentence [*DOGS must be carried*]_{EVENTIVE}, all relevant people will have to carry a dog. A non-eventive sentence would retain accents on both the argument *dogs* and the predicate *must be carried*, in which 'contingency' reading only those people who happen to have a dog are obligated to carry it (Gussenhoven, 1983; Ladd, 2008). The fourth and the fifth categories are eventive and non-eventive sentences, respectively. In (4a), the argument of the verb *WERken* 'works' is accented and the verb *aangekocht* 'acquired' is deaccented. This is the reason why (4a), an eventive sentence, is correct. However, despite the identical pitch accent distribution, the (a) version is

² The public registration of births, marriages and deaths became compulsory in 1811. Before that time, any registration was done by the churches. The resistance against the registration of surnames was strongest in the north and east of the country, where people often didn't have one. Later, many regretted their choice of name, and had it changed. For instance, the larger part of the *Aap* 'monkey' family changed their name into *Davids* in 1860 (Hulshof, 2011).

the correct reading in the case of (5), because *schade* 'damage' is potentially, so that the verb *MELden* 'report' is accented.

- (4) a. *Ze hebben een aantal nieuwe WERken aangekocht.*
 b. *Ze hebben een aantal nieuwe WERken AANgekocht.*
 'They've acquired a number of new works of art.'
- (5) a. *U wordt verzocht eventuele SCHAden te MELden.*
 b. *U wordt verzocht eventuele SCHAden te melden.*
 'You are requested to report any damage.'

Deaccenting for 'givenness' and accenting for 'newness' is illustrated in (6), where *jas* 'coat' is given information in the first sentence, 'black' is the new information. That is, (6a) is correct, while (6b) is incorrect.

- (6) a. *Ik heb wel een mooie bruine jas gezien. Maar ik zocht een ZWARTE jas.*
 b. *Ik heb wel een mooie bruine jas gezien. Maar ik zocht eigenlijk JAS.*
 'I did see a nice brown coat. But I was really looking for a black coat'

Mandarin Chinese is traditionally analysed as having two types of accentuation: grammatical and logical (Gao, 1984). Grammatical accents are claimed to be determined by the structure of syntactic phrases, while logical accents depend upon the meanings speakers intend to convey. In Dutch, grammatical accent is not as strong phonetically as a logical accent. Unlike what is the case in languages like English and Dutch, there is found to be no consistent phonetic correlates of what has been characterised as grammatical stress. Possibly, stress differences identified by Liao (1991), among others, may resolve as phrasing differences. For example, the occurrence of neutral tone vs. lexical tone. Be that as it may, the following stress relations have been identified, whereby the phonetic strength for (i) the predicate verb than for the subject in an [NP VP]-phrase; (ii) for the adjective in an [Adj Noun]-phrase, and for the adverb in an [Adv Verb]-phrase as well as in an [Verb-Adv]-phrase; (iii) for the head of a prepositional phrase than for the preposition in an [PP NP]-phrase; (iv) for the object in an [NP Verb]-phrase, and (v) to an interrogative

or demonstrative than to their head (Huang & Liao 1991). These phonetic strength differences are not really comparable to the melodically prominent effect of a pitch accent in Dutch. Moreover, unlike the alternation between short unstressed and long stressed syllables in Dutch, syllable duration in Mandarin remains relatively constant, which is why it has been characterized as 'syllable-timed' (Clark & Yallop, 1995; van Santen & Shih, 2000). The only prominence pattern in the above list that corresponds to a Dutch prominence pattern created by the absence of a pitch accent is that of an object-verb combination, represented by the 'eventive' category exemplified in (4). However, Mandarin speakers may not be sensitive to the meaning distinction in non-eventive and eventive sentences, because that distinction will be expressed in different words or syntactic structures.

The effect of the logical accents in Mandarin sentences is phonetically closer to pitch accent distributions in Dutch sentences. In Mandarin, 'logical accents' are often given to words which are to be emphasized, like the new information, or else serve to express strong emotion (Huang & Liao 1991). In effect, the rule for the realization of post-focal words, the phonetic reduction of the pitch range, is phonetically similar to that of deaccenting in West Germanic languages (Xu & Xu, 2005). This means that the 'focus' category, exemplified in (6), should be the easiest case for Mandarin listeners to deal with.

Chinese speakers of Dutch are inevitably influenced, to greater or lesser extents, by their L1 Chinese when they speak Dutch. We know from the field of second language acquisition that the majority of second-language learners cannot acquire a native-like oral ability, but less is known about the extent to which non-native speakers acquire the prosodic knowledge of the target language even in a situation in which they cannot produce it correctly. The answer to that question is important, because the cause of any mispronunciations will need to be attributed either to a lack of knowledge of the L1 prosodic structure or to an inability to pronounce such structures. The present perception experiment was conducted to study how well Chinese speakers of Dutch identify the correct accentuation pattern in the six categories of Dutch sentences. The first question we addressed is whether Chinese learners of Dutch are less often correct and less confident in their judgment of the appropriateness of accent patterns in Dutch than native Dutch listeners, and if their

performance varies over the six accent placement categories. The question is whether and to what extent Chinese speakers with overall proficiency in Dutch do better on the accent judgment than their counterparts with lower proficiency in Dutch.

2.2 Method

2.2.1 Materials

We composed six sentences in each of the six accentuation categories described in section 1 and recorded these in a sound-treated room at Radboud University Nijmegen with H*L L% pitch accents, and tested the effect of accent to recognize for Chinese listeners in English, which is closely related to Dutch (Rosenberg, Hirschberg & Manis, 2011). Half of the sentences were read with correct accentuation and half with incorrect accentuation by a male speaker of Dutch, while the complement of incorrect and correct sentences was read by a female speaker of Dutch. Seventy-two [6 sentences $\times$ 2 (correct and incorrect accentuation categories)] stimuli with each sentence read with correct and incorrect accentuation by different speakers were divided into two mirrored sets of stimuli. Each set thus contained 36 stimuli, and had the same order of sentences, such that a correct stimulus always occurred in one set where the incorrect version occurred in the other set. We selected the best token of each pair of recordings as stimuli to be presented to the listeners.

2.2.2 Participants

2.2.2.1 General information

A group of 20 native and 20 Chinese speakers of Dutch participated in the perception experiment. All Chinese participants (3 male, 17 female, aged from 17 to 53, were native speakers of Mandarin and came from the northern part of China, where the local dialects have tones very similar to those of Standard Chinese (Yuan, 1983). Their proficiency in Dutch varied greatly, but all of them had had sufficient exposure to the language to be able to do the experiment. At the time of the experiment,

they had lived in the Netherlands for periods between three months and 22 years. The two subjects who had lived in the country for three months had studied Dutch in China for more than two years. The Dutch participants (4 male, 16 female) were self-declared native speakers of standard Dutch, aged between 18 and 54.

2.2.2.2 Proficiency ratings

In order to answer our third research question, which concerned the hypothesis that more proficient speakers would be better judges of what is an appropriate intonation contour, the twenty Chinese subjects were asked to read a text of 42 brief Dutch sentences, which were recorded in a professional studio of the Arts Faculty of Radboud University Nijmegen. From the recordings by each speaker, we selected the readings of seven randomly chosen sentences. Their mean sentence length was 11 words. We presented these 140 utterances to three experts on Dutch phonetics, using a different random order for each expert. We did this twice. The first time, the judges were asked to rate the intonational proficiency of the speaker on a scale from '1' to '10', where '1' is 'extremely bad' and '10' is 'extremely good', with the intermediate boxes representing intermediate judgments. Judgements were given for each utterance. The judges were instructed to take into account whether speakers used a correct melody, produced correct word stresses, accented the words which should be accented in the sentence, and produced prosodic breaks somewhere in the middle of the sentences whenever that seemed appropriate. The second time, we asked the experts to rate the segmental proficiency; they were instructed to pay attention to the articulation of the vowels and consonants, including their duration, together with an estimate of whether the speakers pronounced the words clearly and fluently and use the 10-point scale described above. Mean scores of prosodic and segmental proficiency were obtained for each subject by aggregating the scores over the seven items per judge. Pearson's correlations between segmental proficiency and prosodic proficiency are .81 for Expert 1, .96 for Expert 2 and .87 for Expert 3 (a mean r of .88). This suggests that segmental proficiency and prosodic proficiency are highly correlated. Cronbach's alpha's are very high for both measures (Cronbach_{pro} = .94, Cronbach_{seg} = .92) reflecting high agreement among the judges. Correlations for each of the scores between experts are $r_{\text{pro1, pro2}} = .97$, $r_{\text{pro1, pro3}} = .85$, $r_{\text{pro2, pro3}}$

$= .88$; $r_{\text{seg1, seg2}} = .82$, $r_{\text{seg1, seg3}} = .76$, $r_{\text{seg2, seg3}} = .97$. We divided the Chinese group of speakers into a higher ('Chinese Dutch': CHD) and a lower (CLD) subgroup on the basis of each subject's mean score over their segmental and prosodic performance scores. One subject, who had come to the Netherlands at the age of 15, appeared to be so proficient in Dutch that one of the three judges considered her a native speaker. She had high scores of segmental and prosodic quality (9.6 and 9.1 respectively). Two subjects were placed in tenth/eleventh place with a score of 5.6, who we randomly assigned to one group each.

2.2.3 Procedure

The participants were divided into two groups to do the forced-choice task. Ten Chinese subjects and ten Dutch subjects listened to the stimuli in Set I and the other half in Set II.

Either the stimuli in Set I or those in Set II were presented to the participants in individual sessions on a computer screen. Each participant was asked to listen to the stimuli and judge whether the reading was correct or not. The listener wore a GH632 headphones. Subjects first listened to 8 trial stimuli and then proceeded to the experiment proper. They could replay any stimulus before making a judgment. The correct and incorrect tokens were randomly distributed across participant categories. The listeners first clicked either of two buttons marked 'correct' and 'incorrect', and then indicated their confidence in the judgment on a scale from 1 (poor confidence) to 5 (high confidence).

2.3 Data analysis and discussion

2.3.1 Analysis and discussion of correctness scores

We conducted a repeated measures Analysis of Variance (ANOVA) using accentuation type (WDS: word stress, CMP: compound stress, proper names, EVS: eventive sentences, NES: non-eventive sentences, FOC: focus) as a within-subjects variable and the differences between the two groups as a between-subjects variable.

groups as a between-subjects factor. The results show that correctness scores (Table 2.1) are significantly different ($F[5, 190] = 4.9, p < .05$) across accentuation types. Pairwise comparisons (Bonferroni corrected) reveal that mean differences between WDS and EVS, and between EVS and FOC are significant ($p = .014, p = .002$, respectively). There is no significant interaction between accentuation type and language group ($F[5, 190] = 1.4, p > .05$). The mean correctness scores (Figure 2.1) for each stress type obtained by Chinese learners are significantly lower than those of the native Dutch group ($F[1, 38] = 39.4, p < .05$). This means that the native speakers of Dutch outperformed the Chinese speakers of Dutch. Patterns WDS and FOC are easier to identify, while EVS is the most difficult pattern.

Table 2.1. Mean correctness (Cor) and confidence (Conf) scores of Chinese learners of Dutch (CSD) and Dutch listeners to Dutch (NSD) broken down by accentuation type (WDS: word stress, CMP: compound, PRN: proper names, EVS: eventive sentences, NES: non-eventive sentences, FOC: focus). For explanation of negative confidence scores see text.

Accent. type	Lang. group (N=20)	Mean		Sd		Profic. group (N=10)	Mean		sd	
		Cor	Conf	Cor	Conf		Cor	Conf	Cor	Conf
WDS	CSD	3.95	1.45	1.60	2.17	CLD	3.20	.25	1.69	1.82
	NSD	5.80	4.38	.41	.50	CHD	4.70	2.65	1.16	1.84
CMP	CSD	4.10	1.50	1.25	1.81	CLD	3.70	.70	.95	.94
	NSD	5.15	3.38	.67	.96	CHD	4.50	2.30	1.43	2.14
PRN	CSD	3.90	1.38	1.29	1.79	CLD	3.10	.15	.99	1.03
	NSD	5.25	3.06	.79	1.04	CHD	4.70	2.62	1.06	1.52
EVS	CSD	3.55	.80	1.23	1.76	CLD	3.00	-.05	1.05	1.13
	NSD	4.75	2.73	.85	1.05	CHD	4.10	1.65	1.20	1.91
NES	CSD	3.45	.71	1.23	1.74	CLD	2.90	-.18	1.29	1.53
	NSD	4.90	2.67	1.02	1.36	CHD	4.00	1.60	.94	1.51
FOC	CSD	4.45	1.98	1.05	1.59	CLD	4.20	1.32	1.03	1.17
	NSD	5.30	3.52	.80	1.11	CHD	4.70	2.63	1.06	1.73

Figure 2.1. Overall mean correctness scores of Chinese subjects divided into low-proficiency Chinese learners of Dutch (CLD), high-proficiency Chinese learners of Dutch (CHD) and Dutch subjects.

Figure 2.2. Overall mean confidence scores of Chinese subjects divided into low-proficiency Chinese learners of Dutch (CLD), high-proficiency Chinese learners of Dutch (CHD) and Dutch subjects.

As Table 2.1 shows, native listeners of Dutch obtained an overall mean correctness score above 5 points. Accentuation types EVS and NES were below that value, at 4.8 and 4.9, respectively. The highest mean correctness score is 5.8 (WDS) and the second highest is 5.3 (FOC). In the group of Chinese listeners of Dutch, the mean correctness scores are all below 5 points. The mean correctness scores of types CMP and FOC are higher (4.1 and 4.5, respectively) than other accentuation types; the lowest is 3.5, which goes to type NES. Both the CSD and NSD groups have lower mean correctness scores for types EVS and NES, and higher mean correctness scores for type FOC (the highest for CSD). The NSD group got the highest mean score for type WDS, while this is not the highest for the CSD group. CSD got a higher mean score for type CMP. This means that Chinese speakers of Dutch have the most problems with the identification of correct word stress. But their ability to judge the correctness stresses of compound words and focus information in sentences is higher than that of other types. Both language groups have problems with the accentuation of EVS and NES.

We also conducted an RM-ANOVA using accentuation type as a within-subjects variable and different Chinese proficiency groups as a between-subjects factor. Correctness scores (Table 2.1) are significantly different across accentuation types ($F[5, 90] = 2.3, p = .05$). Pairwise comparisons reveal that types EVS and FOC differ significantly ($p = .004$). There is no significant interaction between accentuation type and proficiency group ($F[5, 90] < 1$). The mean correctness scores (Figure 2.1) for each accentuation type obtained by CLD are significantly lower than those of CHD ($F[1, 18] = 14.6, p < .05$). This means that the CHD group outperformed the CLD group. Type FOC is easiest to identify, while type EVS is generally difficult for Chinese listeners.

From Table 2.1, we also learn that CHD subjects got mean correctness scores above 4 points for all six accentuation types while CLD subjects obtained mean correctness scores around 3 points for all categories except FOC. Both CLD and CHD subjects got the highest mean correctness score for FOC, and lower mean correctness scores for EVS and NES. Not surprisingly, CLD subjects have more problems with the correct identification of word stress than CHD. Like the Dutch native speakers, CLD and CHD have problems with types EVS and NES. All groups have significantly higher mean correctness scores for FOC,

showing that identifying the correct accentuation of sentences information is relatively easy.

2.3.2 Analysis and discussion of confidence scores

For the analysis of confidence scores, each response was weighted positively if the accompanying judgment was correct. Otherwise, it was weighted negatively. We computed mean confidence scores for each accent pattern across accent patterns. We wanted to know how confident the listeners were when they made their judgments.

We again conducted an RM-ANOVA using accentuation type as a within-subjects variable and language group as a between-subjects factor. Confidence scores (Table 2.1) are significantly different across accentuation types ($F[5, 190] = 7.4, p < .05$). Pairwise comparisons reveal that the difference between WDS on the one hand and CLD, FOC and NES on the other are significant ($p < .05$), as is the difference between FOC on the one hand and EVS and NES on the other. There is no significant interaction between accentuation type and language group ($F[5, 190] = 1.8, p > .05$). The mean confidence scores (Figure 2.1) for each accentuation type obtained by the Chinese subjects are significantly lower than those of the Dutch counterparts ($F[1, 38] = 37.4, p < .05$). This means that the native Dutch listeners were more confident in their judgments than Chinese listeners when they made their judgments. Both language groups were more confident when they judged WDS and FOC than when they judged CLD and NES accentuation type.

As Table 2.1 shows, the mean confidence scores for the Dutch listeners are all above 3 points, except for EVS and NES, whose mean confidence scores are 2.73 and 2.67, respectively. NSD are most confident in their judgment of WDS (4.4), followed by their judgment of type 1 (3.8). The mean confidence scores of CLD are above 1 point for all accentuation types except EVS (.8) and NES (.7).

An RM-ANOVA with accentuation type as a within-subjects factor and proficiency as a between-subjects factor shows that confidence scores (Table 2.1) differ significantly across accentuation type ($F[5, 190] = 2.6, p < .05$). Only the difference between FOC and NES is

(pairwise comparison, $p < .05$). There is no interaction between accentuation type and proficiency ($F[5, 90] < 1$). Mean confidence scores (Figure 2.2) for each stress type obtained by the CLD are significantly lower than those of the CHD ($F[1, 18] = 17.4, p < .05$). This means that CHD were more confident in their judgments than CLD. Both language groups were more confident judging type FOC and less so when judging type NES.

Table 2.1 shows that CHD are most confident judging WDS (2.7), CMP (2.6) and FOC (2.3), but less confident with types EVS (1.7) and NES (1.6, lowest). Not surprisingly, CLD are not confident when judging type WDS (.3), and like CHD subjects, they are not confident in their judgment of EVS (-.05) and NES (-.18).

Comparing mean correctness and mean confidence scores for the six accentuation types, we find that the two sets of scores correlate very strongly ($r = .98, p < .01$). For the Dutch group, the mean correctness score of type EVS is the lowest even though the corresponding confidence score is not: the lowest confidence is for type NES. However, the differences are small between these two types, which are both related to the deaccentuation rule applying in Dutch eventive sentences. For the Chinese listeners, whether CLD or CHD, the correctness scores and their confidence scores are in agreement with each other across all types of accentuation. It follows from the above comparisons that all listeners took the experiment seriously and that their knowledge of Dutch accentuation patterns is truly reflected by their judgments.

2.3.3 Other factors correlated with correctness and confidence scores

In this section, we answer the question whether other factors like the age of participants, the length of residence (LOR) in the Netherlands, or the age of arrival in the country (AOA) explains their performance in the perception test. The correctness score has no relation with LOR ($r = .40$, n.s.) or with age ($r = -.43$, n.s.). However, AOA does correlate significantly with the correctness scores ($r = -.72, p < .01$). The confidence score behaves in a similar way, showing no correlation with

LOR ($r = .43$, n.s.) or age ($r = -.42$, n.s), while correlating si with AOA ($r = -.75$, $p < .01$). This suggests that choosing the pitch accent location in Dutch sentences is influenced by which learners are first exposed to realistic language use. exposure to Dutch cannot be said to have a positive effect. The case here looks simple: the younger they were when they came to the Netherlands, the higher their correctness and confidence scores in the perception test, supporting the 'younger-is-better' position in studies which have investigated the effects of age on pronunciation (e.g. Ioup, 1994: 489; Ioup, 2008).

2.4 Conclusions

Native speakers' correctness scores on the location of pitch accent in Dutch sentences were significantly better than the scores by low proficiency Chinese speakers of Dutch, and those of the high proficiency group were significantly higher than those of low proficiency Chinese speakers of Dutch. Clearly, greater proficiency in the language improves the ability to identify correct accent locations. Along with the correctness scores, confidence ratings decreased significantly from the native speakers via the high proficiency Chinese group to the low proficiency Chinese group. Moreover, the earlier learners are exposed to the target language, the more correct and the more confident they are in identifying the correctness of accent location.

There were differences between the linguistic categories, showing that some accent patterns are easier to judge – and thus presumably easier to learn – than others. Native speakers find it easiest to identify primary word stress (5.8 correct, where 6.0 is the highest possible score). Chinese L2 speakers of Dutch find it easiest to judge the correctness of the focus condition (4.5). This reflects the fact that the primary word stress in the words we used is a language specific feature, whereas the focus structure of the sentences we used is given in context. The Chinese learners evidently derived the correct accent pattern in the focus condition from the pragmatics of the minimal sentences that constituted the stimuli. In this, they were helped by the fact that post-focal pitch range reduction is a feature of Mandarin speech which resembles post-focal deaccentuation in Dutch.

Judging accentuation of eventive and non-eventive sentences is the most difficult for both native speakers (4.8) and for Chinese L2 speakers of Dutch (3.5). This is understandable, since both correct and incorrect accentuations in fact constitute natural accentuation patterns, given some adjustments in the context. Our results show that the accentuation patterns of Dutch sentences are language specific and must be learnt. This need is most obvious for the five morpho-syntactically governed accentuation types, but is apparent even for the focus category. Here, Chinese listeners did decidedly better than in the other accentuation types, but the relatively low performance of the Chinese listeners with lower proficiency in Dutch shows that deaccentuation of given information must be learnt.

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Chapter 3

Selection of intonation contours by Chinese L2 speakers of Dutch: orthographic closure vs. prosodic knowledge¹

3.1 Introduction

We report an experiment that explored the question how well Chinese L2 speakers of Dutch select the correct intonation contour for sentences in a reading text, as well as the extent to which their choices reflect their language proficiency. Our motivation for carrying out the experiment was a desire to get a perspective on the extent to which the low quality of Chinese L2 performance in Dutch was due to an inability to produce appropriate pitch contours as opposed to their ignorance of what intonation contour to aim for. A second reason for doing the experiment was to address the issue of melody choice in L2 Dutch in a coherent text, a topic that has not been addressed so far. In section 1, we provide the necessary background information on the intonation of Dutch and discuss the general task we used, while section 2 briefly situates our topic in the context of second language acquisition studies. Section 3 presents our research questions.

3.1.1 Intonation in West Germanic languages and tones in Chinese

Descriptions of West Germanic intonation (Halliday, 1970; Pierrehumbert, 1980; Fox, 1984; 't Hart et al., 1990; Grabe, 1998; Grice & Baumann, 2005; Gussenhoven, 2005; Peters, 2006; Ladd, 2008),

¹ This chapter appeared in *Second Language Research* 28, 283-318 (He, van Heuven & Gussenhoven 2012).

generally distinguish between the location of pitch accents (as 'sentence accents' or 'accented syllables') and the tones or boundary tones that are inserted in the accented syllables and the boundary tones that are inserted at the phrase end, i.e., the tone string that makes up the melody. In addition, descriptions account at least to some extent for the phonetic realization of the intonation contour, given some information about accent locations and melodies. However, native speaker competence goes well beyond what these descriptions have to offer. In order to be successful in a pragmatic context and communicative intention, a competent speaker will not only choose an appropriate syntactic structure and appropriate words, but also insert appropriate pitch accents in appropriately accented syllables and appropriate boundary tones. Moreover, the pronunciation of the linguistic structure that arises will be adequate and conform to the detailed phonological and phonetic standards of the language. For L2 speakers, each of these aspects poses a challenge, since their competence in them is likely to be different from comparable systems in their L1. When the morphosyntactic structure is given, as in a reading task, there remains a challenging task of assigning appropriate intonation contours to the consecutive sentences of the text. The assignment of the intonation contour is not well understood, and the least studied aspect of intonation is the choice of melody. Importantly, even when the distribution of pitch accents is kept constant, considerable melodic variation is found in West-Germanic languages, because of the large number of pitch accents and the relative freedom with which they combine in the same sentence. The aim of the investigation reported here is to investigate the extent to which L2 learners of Dutch cope with melody choice, given a syntactically contextualized sentence. The other two aspects of intonation competence, i.e. pitch accent location and phonetic realization, were already covered for the same group of subjects in research published by He et al. (2011a, 2011b).

Native speaker competence in melodic structure can be expressed by a finite state tone grammar (Pierrehumbert, 1980). Gussenhoven (1996) proposed (1) as the grammar of Dutch. It lists two options for the boundary tone, five options for the prenuclear pitch accent, five options for nuclear pitch accents and three options for the final boundary tone (L%, H% and %, the latter indicating absence of a tone). For each accented syllable in the Intonational Phrase, 5 (pitch accent options) × 3 (boundary tone options) = 15 melodies are allowed. A prenuclear

accent is pronounced over the stretch of speech up to the next accent, by pronouncing its last tone rightmost, i.e. just before the tone of the next pitch accent ('Displacement', to use Grabe's (1998) term). Within pitch accents, tones are connected by linear interpolations. Any remaining longer stretches of speech between the initial boundary tone and the first pitch accent, between a monotonal pitch accent and a following pitch accent, or between the last pitch accent and the final boundary tone, are filled up by a doubling of the target of the tone on the left, which thus has a leftmost and a rightmost target ('Continuation'). This means that H^* and L^* are always realized as level pitch, while prenuclear H^*L and L^*H are realized as slowly falling and rising pitch, respectively, if the next accent is some distance away. In the absence of the final boundary tone, the L of nuclear H^*L is pronounced rightmost, creating a fall from high to mid pitch. The vocative chant, analyzed as H^*+H , is realized as a high pitch followed by a lengthened mid (downstepped) pitch. In (2) we give an example of a sentence which illustrates the Displacement of the L of prenuclear H^*L and Continuation, for the initial $\%L$ as well as for the prenuclear H^* , which is pronounced as high level pitch until just before the target of nuclear L^* . We follow van de Ven & Gussenhoven (2010) representing the rightmost target of a tone with Continuation as an open circle.

$$(1) \quad \left\{ \begin{array}{c} \%H \\ \%L \end{array} \right\} \quad \left(\begin{array}{c} H^* \\ L^* \\ H^*L \\ L^*H \\ H^*LH \end{array} \right)^n \quad \left\{ \begin{array}{c} H^* \\ L^* \\ H^*L \\ L^*H \\ H^*+H \end{array} \right\} \quad \left\{ \begin{array}{c} H\% \\ L\% \\ \% \end{array} \right\}$$

In addition, H^* -tones may be downstepped (indicated by $!H^*$) after an initial $\%H$ or an H -tone in a prenuclear pitch accent, adding 3 (pitch accents) $\times 3$ (boundary tone options) = 9 contours to the set of 15 possible nuclear contours. Finally, a H^*L or H^*+H pitch accent may be

prefixed with an L^* , causing a delayed peak. When L^* is prefixed over the role of H^* , giving L^*HL instead of unprefixed prefixation adds a further 4 (downstepped or non-downstepped H^*+H) $\times$ 3 (boundary tone options) = 12 contours, giving 3 ways of saying any expression containing a single pitch accent. Evidence for the reality of this grammar was collected by Gunlogson & Rietveld (1991).

In addition to this competence concerning possible forms, a speaker is capable of choosing an appropriate form for a given context. Even though there have been proposals as to the semantics of pitch contours (Lieberman & Sag, 1974; Ladd, 1980; Gussenhoven, 1990; Pierrehumbert & Hirschberg, 1991; Gunlogson, 2003), none are able of accounting for these choices in any comprehensive sense. We give four possible ways of saying a Dutch two-accent sentence: 'And we were so frightened by all that!', as spoken by a child to his father after explaining how he and the other children had been frightened by the look and comportment of a passing lion during their father's hunt. Each of them has an initial ring of plausibility. Example (3a) has a fall, indicating the firmness of the statement, and a final rise, appealing to the father's understanding of the seriousness of the threat; example (3b) lacks that final rise; example (3c) had two rising pitch accents, the first a boundary rise, indicating a stronger appeal to the father, which would appear to emphasize the desperation of the speaking child. The tracks and speech waveforms of the stimuli corresponding to (3a) and (3d) are shown in panels a, b, c and d of Figure 3.1, respectively. It is not clear from any theory on the market why 19 out of 20 speakers chose (3a) as the most appropriate contour in a forced choice task in which the other three contours were the competitors. It is beyond the scope of this paper to summarize the semantic literature, but some indication of the limited understanding that has been reached can be given, whereby we concentrate on West Germanic languages.

(3)

While generally the focus in a sentence should be accented while the background information after the focus is not, pitch accents have been claimed to signal different degrees or types of focus. Chen (2007) shows that both H*L and H* are used in Dutch to realize the sentence-initial focus, but with a preference for H*L. Pierrehumbert & Hirschberg (1990) propose that new information in English sentences is marked by H* or L+H* (often equivalent to H*L in Gussenhoven's analysis), while L* (often equivalent to L*H or L*HL in Gussenhoven's analysis) marks given information. Some support for this position is given by Chen et al. (2007), even though L*HL in that experiment sides semantically with H*L, not with L*H. High ending utterances often signal continuations or questions, while low ending utterances signal finality or assertions (Bolinger, 1978; Pierrehumbert & Hirschberg, 1991; Haan, 2002) in the standard varieties of English and Dutch. High endings can be used to mark a statement in English dialects (Grabe, 2004; van Leyden & van Heuven, 2006), and yes/no questions Dutch dialects may end in falls

(Gussenhoven, 2000). Baumann (2006) shows that downstep pitch accents are functionally intermediate between non-do H*-pitch accent and deaccentuation. The gist of this work is that shape can signal shades of information novelty, but it does not. The native speaker responses to data like those in (3). If we assume nevertheless that these choices are based on linguistic knowledge, however elusive, the prediction is that L2 speakers of the language fail to produce the same degree of agreement in their preferences.

Figure 3.1. f0 tracks and speech wave forms of the stimuli corresponding to (3c) and (3d), respectively, representing the sentence *Dat alles heeft om zo bang gemaakt!*

The questions we wanted investigated then are, first, the extent to which native speakers agree on the optimal intonation contour for the sentence.

contextualized morphosyntactic expression, and second, to what extent L2 speakers whose L1 has a different prosodic organization deviate from the native speaker behavior, and if so, what generalizations can be made about the differences between the two language groups.

It is, of course, impractical to test all 36 nuclear contours of Dutch for acceptability for any one sentence. For one thing, a large number of these contours would probably strike native speakers as wildly inappropriate for the sentence concerned, something which might jeopardize their motivation to do the test. Quite apart from the arduousness of the task, the time it would take would seriously restrict the number of sentences that could be investigated. We decided to strike a balance between these two factors, and selected 26 contiguous fragments from a story entitled *Het Winterkoninkje* 'The willow wren', testing a varying set of four contours for each of them. For each fragment, the second author and another trained native Dutch intonologist (Judith Hanssen) selected the most plausible intonation contour, henceforth the 'optimal contour'. In this contour, we then judiciously replaced a boundary tone and/or a nuclear pitch accent, so as to arrive at three competing contours that seemed less optimal, yet not obviously implausible. Our assumption was that if the optimal contour is chosen as the 'best' contour out of the four by a majority of the 20 native listeners, we would have reasonable ground for assuming that the optimal contour is in fact maximally appropriate for the sentence concerned.

In order to see how L2 speakers with a prosodically different L1 perform the same task, we recruited 20 Chinese speakers of Dutch. Mandarin Chinese has four lexical tones, with some words being toneless ('neutral tone'), providing a sharp typological contrast with Dutch. Intonationally, there are some broad similarities. Traditionally, Mandarin is analysed as having two types of accentuation: 'grammatical' and 'logical' (Gao, 1984). Grammatical accents are determined by the structure of syntactic phrases, while logical accents depend upon the information structure speakers intend to express. The effect of logical accent placement is phonetically close to the pitch accent distributions of Dutch sentences. Logical accent is given to words which are selectively focused or else serve to express strong emotion (Huang & Liao, 1991). Since the pitch range of words is drastically reduced after the focus, the post-focal words are phonetically similar to deaccented words in West Germanic

languages (Xu & Xu, 2005). As for melodic intonation, two tones, H and L, corresponding to Chao's Rising and Falling tones, have been identified for *Putonghua* (Standard Mandarin in China), *Guoyu* (Standard Mandarin in Taiwan), and in the *Beijing dialect*, which is very close to Standard Mandarin (Peng et al., 2005; Peng & Ní Chiosáin, 2004), where H is for questions and L for statements. However, previous studies of pronunciations of the four lexical tones in questions and statements reveal a consistent upward shift in the register of the tones in questions (cf. Shen, 1990), as shown in Figure 3.2. It shows the F0 contours of utterance-final tokens of the words for 'mother', 'hemp', 'horse', 'scold', all of which consist of the syllable [ma], spliced off from the end of short Chinese sentences with interrogative and declarative intonation. The left panel shows four Chinese sentences with interrogative intonation: (1) *Ta shi nide ma?* (She is your mother?); (2) *Ta shi nide hemp?* (It is your hemp?); (3) *Ta shi nide ma?* (It is your horse?); (4) *Ni shi nide ma?* (You are scolded by her?). The right panel illustrates the same four sentences but with declarative intonation. The time scales and Hz-scales of the two panels are identical. At the level of the syllable, the prosodic differences are substantial. Unlike what is the case in languages like English and Dutch, metrical strength differences are not really comparable to the melodically prominent effect of a pitch accent in Dutch. For example, the syllable duration in Mandarin remains relatively constant across different intonations, which is why it has been characterized as a 'syllable-timed' language (Yallop, 1995; van Santen & Shih, 2000). Clearly, other than pitch range compression, there is little if anything in their native intonation that Chinese listeners of Dutch can use in their choice of pitch

Figure 3.2. f0 tracks of four standard Chinese lexical tones with interrogative (top) and declarative intonation (bottom) on the syllable [ma] spliced from the four Chinese sentences: (1) *Ta shi nide ma* 'She is your mother?'; (2) *Ta shi nide ma* 'It is your hemp?'; (3) *Ta shi nide ma* 'It is your horse?'; (4) *Ni bei ta ma* 'You are scolded by her?'

3.1.2 Research on prosodic production and perception

There is abundant evidence that L2 speakers retain a foreign accent in their L1 prosody (e.g., Banjo, 1979; Willems, 1982; van Els & de Bot, 1987; Cruz-Ferreira, 1989; Grosser, 1989; Ellis, 1994; Wennerstrom, 1994; Jilka, 2000; Trouvain & Gut, 2007; Gut, 2009; Hincks et al., 2009). L2 learners have been shown to perform suboptimally in tasks in which

have been found to transfer their prosodic knowledge from L1 to L2 when intonational meaning was processed in a way that depended on the L1 prosodic system (Braun, 2010). Prosodic transfer can be both phonological and phonetic. The phonological transfer results from differences in the inventory of phonological tones, their forms and the meanings assigned to them (Mennen, 2007), and phonetic transfer from a difference in the phonetic realisation of an equivalent phonological tone or tone complex (Mennen, 2007; Gut, 2009; O'Brien & Gut, 2010).

3.1.3 Research questions

Our first concern was to study intonation contour choice in context. Native speakers vary greatly in their choice of intonation contour (van Bezooijen, 1989; Haan, 2002; Wells, 2006). In a discussion of the intonation of isolated written Dutch sentences closed by the question mark, Haan (2002: 36) observes that "any intonation that can occur with a statement, in a command, or an exclamation can also occur with a question" and that "questions may be found with all intonation curves." That is, there appears to be no such thing as a specific intonation for questions. Similarly, van Bezooijen (1989) reports individual differences in accentuation preferences in an accent assignment production task. This means that there may well be no single intonation melody and no single accent structure which can be considered uniquely adequate and is preferred by all subjects. While these findings were made with the help of production experiments, there is no reason for believing that the variability is principally different in perception. Crystal (1969) selected twenty utterances from a corpus of British English speech and asked six subjects to read three sentences with intonation contours that matched each of twenty attitudinal labels. Quite apart from the degree of variation among the subjects, it was striking that when they were asked to assign those labels to the utterances in a perception test, little between-listener agreement was found. When they repeated the labeling task several weeks later, there was even little within-listener agreement between the two tests. Results like these suggest that intonation contour choice is profoundly contextual and cannot fruitfully be studied on the basis of isolated sentences. Studies that have counted the distribution of rises and falls on yes-no questions in English have in fact found that the occurrence of one or the other is heavily dependent on the type of situation involved (Chun, 2002). We expect to find far greater agreement

among native speakers in contextualized sentences, but the research we know of that bears on this issue.

Second, we decided to study intonation contour choice and interpretation of intonation contours, as in Crystal (1969). Learners can exploit semantic context and their knowledge of the target language to comprehend the L2 in the absence of any accurate perceptual or phonological information in foreign utterances, so that the intonation contours that might show up in isolated stimuli may not be easily recognized (Crystal 1991). Third, we decided to provide the textual and situational context for the judges by simulating a reading task on the basis of a story that required no speech production. By asking subjects to choose from a set of possible contours instead of having them read the sentences for themselves, we tapped more directly into their 'linguistic competence' as opposed to their perhaps inadequate phonetic execution of the intonation contours or expressions they would have wanted to use. While it is clear that the majority of second language learners cannot acquire native-like intonation ability, less is known about the extent to which non-native learners can acquire the prosodic knowledge of the target language even in contexts in which they cannot produce it correctly. If Chinese learners were to demonstrate an ability to pick the 'best' intonation contour from a set of four, any failure on their part to produce adequate intonation contours must be sought in the way they produce speech, rather than in a principled inability to select an adequate intonation contour. Conversely, if they appear to be unable to select an appropriate contour in any given context, their inability to produce correct prosody must be sought and foremost be sought in their lack of knowledge of the semantic and pragmatic of the intonation system. Accordingly, in the test, subjects were given some time to read each sentence in silence, enabling them to form a mental representation of the intonation contour, and were then given an opportunity to listen to the four options. By pacing the task in this way, subjects were provided a fair opportunity to demonstrate their linguistic competence.

In sum, there are three questions we wanted to address. We will address them with our hypotheses.

- I. To what extent do native speakers of Dutch agree on the 'best' intonation choices in Dutch sentences in context? Operationalizing the question as it is in a forced four-choice task, we hypothesize that native ju

high agreement on which is the best choice out of the four, provided that an adequate choice is available among the set of four options. Additionally, it should be the case that they show a high level of agreement on the extent to which each of the three less adequate choices is to be rejected.

- II. To what extent do Chinese L2 speakers of Dutch approach the behavior of the native speakers? Given the near-absence of non-lexical melodic variation in Mandarin and given the evident difficulty of identifying the regularities in the relation between pragmatics and melodic shape as outlined in section 1.1, we hypothesize that their choices only very partly reflect the judgements by the native speakers and are otherwise random.
- III. Is there any difference between a more advanced group and a less advanced group of Chinese L2 speakers Dutch? Assuming that despite the absence of formal instruction, L2 speakers of Dutch increase their knowledge of the morphology and phonology of the intonation of Dutch along with increases in the proficiency in Dutch, we hypothesize that the performance of the advanced group falls between that of the native speakers and the less advanced group.

3.2 Method

3.2.1 Material

We chose a text of 366 words, *'t Winterkoninkje*, which was translated and edited by Jörg Peters from an original Low Saxon story.² Carlos Gussenhoven (CG) and Judith Hanssen (JH), both native Dutch intonation experts, transcribed the whole text on the basis of a reading by JH as well as their own judgement of what was the most appropriate way of reading that text. This transcription will be referred to as the

² The original version of the story, *De Tunkrüper*, was taken from *Plattdeutsche Volksmärchen* by Wilhelm Wisser. It was rewritten by Jörg Peters with the aim of eliciting a large variety of intonation contours from native speakers of different varieties of Dutch.

'consensus transcription'. Subsequently, the text was divided into fragments, 26 of which were used as test items. Within each of the test items, we selected a brief experimental fragment from one of the intonational phrases, ranging from one to ten words. In fifteen cases, these contained one pitch accent, in ten cases two, and in one case three. Starting from the consensus transcription (the A-version), we freely produced three variations on it by changing the last pitch accent, the boundary tone or both of these, so as to produce three new versions whose phonology did not deviate greatly from the A-version. The A-version was thus always included among the contours that judges could choose from. In no case did we find one of the competing intonation contours was wildly implausible, for example in (3); the full set of test items and the four transcriptions are given in an appendix). Subsequently, JH recorded the text of the model transcription as well as with each of the rival contours. The task in the studio in the Arts Faculty of Radboud University Nijmegen. Read the same sentence with four pre-determined intonation contours. This was a task that not even an intonation specialist will find easy. The production of each version of each sentence was monitored by CO. CO repeated any item for which either of them was not entirely satisfied. In all items were produced naturally and smoothly; in the case of contour 3, the suspended fall or half-completed fall, which occurred only in the A-versions, we decided to have JH read them in a block. JH found it hard to 'get into' the contour on a number of occasions. CO gave us four speech wave files with a reading of each of the four fragments.

In order to produce four stimuli for each text fragment, we extracted the sections of the four speech wave forms which corresponded to the variable parts, the experimental sections, in the case of 15 text fragments and pasted these onto the non-variable section of one of the four files for each item. This was done in order to avoid any variation in the non-experimental sections of the text fragments from biasing the results. In 11 cases, of which (3) is an example, the text of the fragment

³ We have found on more than one occasion that speakers can generally enter a rut, finding it hard to abandon a particular intonation contour in a reading task, conversely fail to produce a particular contour. Often, the next day, contours that were hard are easy, while contours that kept coming back may be hard to produce. In the case of the half-completed fall, there may also be regional variation. S. is a bilingual with Dutch and Sittard Limburgish.

short that splicing was felt to be uncalled for. In one case, item 19, we edited the variable sections in order to remove pauses. We took care to select the non-variable sections randomly from the four readings, thereby avoiding an overrepresentation of non-variable sections taken from the model version, which would have introduced a possible artifact in the stimuli.

3.2.2 Participants

The same participants as in Chapter 2 participated in the perception experiment (Section 2.2.2 for detailed information). The 20 native speakers of Standard Dutch served as the control group. It was used in two ways. First, a validation of the consensus transcription was to be based on the judgments of the control group: if the native listeners failed to choose the consensus version as the most acceptable intonation contour, that fragment should not be taken into account when establishing the performance of the Chinese group, and must therefore be removed from the experiment. Second, the control group served as the baseline against which the performance of the Chinese subjects was to be assessed.

3.2.3 Procedure

All 104 stimuli were presented to subjects together with their texts on a computer screen. Before the experiment proper, participants saw a text screen on which they were instructed to silently read the text of the entire story, presented to them on four successive screens, in order to familiarize them with its contents. One of the four screens contained a part of the story which was not used for segmentation into experimental fragments. On this screen they were instructed to listen to a reading of that passage by the same speaker who had pronounced the stimuli. This was done to enable judges to familiarize themselves with her voice and reading style. The subjects then did four trial items, which were identical to the first experimental fragments. Subsequently, they were presented with the written fragments chronologically through the story. They were instructed to read the fragment, and then to play each of the four versions by clicking one of four buttons numbered 1, 2, 3 and 4. The position of the consensus version was randomly located in the row for

each fragment and for each subject. Subjects were allowed to listen to each of the four stimuli for each fragment as often as they wished, and to correct their choice before moving on to the next fragment.

3.3 Data analysis

We report 'correct' votes, defined as votes for the consensus vote, as well as agreement and entropy scores in section 1, so as to answer our three research questions. Moreover, in sections 2, 3, and 4, we will discuss other factors that are correlated with performance. We will also discuss the performance of the Chinese subjects.

Figure 3.3. Correct scores by the Dutch and Chinese listeners.

Figure 3.4. Correct scores by CLD (Chinese speakers with lower proficiency in Dutch, and CHD (Chinese speakers with higher proficiency in Dutch).

3.3.1 Overall analysis

Nineteen or more out of 20 Dutch listeners chose the consensus version, the A-version, in 14 out of 26 items. Stimulus A for an additional four items was selected by 17 or more judges, and for another four items by 14 or more judges. The A-version of items 0 and 16 were selected by 13 and 12 judges, respectively. In the case of two items, 6 and 17, the A-versions attracted less than 60% of the scores. We felt that an A-score of less than 60% disqualified the consensus version as a standard for the Chinese listeners; the scores for these two items will therefore not be used to assess their performance. However, they will be retained in the calculation of the entropy and agreement measures. This means that overall, the consensus version was chosen as the best version by the Dutch judges in 83.3% of the cases. Without items 6 and 17, this percentage rises to 88.8. We conclude that with the exception of items 6 and 17, the test provides a viable instrument for assessing a listener's ability to select an appropriate contour for a contextualized Dutch sentence. Of the Chinese participants, 80% chose the A-version as the best version for six items, and 70% did so in three further items. Overall, the consensus version was selected by the Chinese participants in 53.3% of the cases, and 56.5% without items 6 and 17. A univariate Analysis of

Variance shows that the difference with the control group is ($F[1, 958] = 144.5, p < .001, \eta^2 = .13$). Within the Chinese subjects with higher proficiency in Dutch had higher correct scores than those with lower proficiency (52%) ($F[1, 478] = 4.5, p = .01$), not counting items 6 and 17. This means that native speakers performed better than Chinese speakers of Dutch, and that Chinese speakers of Dutch with high proficiency (CHD) did better than the one with low proficiency (CLD) (see Figures 3.3 and 3.4).

Because the total correct score by the Chinese participants was above the chance level (25%) and Chinese participants with higher proficiency in Dutch performed better than those with less proficiency, the high correct score must be due to their knowledge of Dutch. Knowledge of the language, as revealed by the subjects' evaluation of the appropriateness of intonation contours, will also be reflected in the extent to which inappropriate choices are rejected. Therefore, we expect the control group to show high agreement in their selection or rejection of the B-, C- and D-versions, but expect the Chinese groups to show less agreement on the B, C and D versions. Moreover, the Chinese groups are expected to show less agreement than the CHD. Putting this in another way, the distribution of responses over the 'inappropriate' stimuli should be more even in the groups with less knowledge than in the groups with more knowledge. The evenness of the distribution of responses is expressed by an entropy measure, essentially an uncertainty measure (Shannon, 1948; Attneave, 1959). We computed the entropy for each item, and then took the mean entropy across all items per list as the overall measure of agreement. Entropy, expressed as H , has its maximum value if all options are equally probable. If $H = 0$, the subjects are in complete agreement that just one specific option is the correct choice. We used the formula in (4) to compute H . For a given alternative in a binary choice situation is chosen in 50% of the responses then the entropy in the responses to the item equals $.50 * \log_2 2$ bit.

$$(4) H = -\sum_{i=1}^n p_i \log_2(p_i),$$

where p_i is the probability of each alternative i and n is the number of response categories.

We arranged the H-values for the 26 items for Chinese and Dutch listeners side by side. When an item was missing (which occurs when the item got 100% A responses), its contribution to overall entropy is zero. We then ran a paired t-test on the items and found that the Dutch H-values are much smaller ($H = .25$ bit) than the Chinese counterparts ($H = .79$ bit) ($t[25] = 4.01$; $p < .001$). This shows that the scores of the Chinese listeners are more evenly distributed over the incorrect alternatives than those of the Dutch listeners. Similarly, we calculated the entropies of CLD and CHD, which were .74 and .50, respectively. There is a significant difference between Dutch group and CHD ($t[25] = -2.46$, $p = .011$, one-tailed) as well as between CHD and CLD ($t[25] = -2.04$, $p = .026$, one-tailed). This means that native listeners show fairly high agreement over what are the best and the worst choices as compared to CHD, and that the CHD show higher agreement than the CLD.

3.3.2 An orthographic strategy

An investigation of the choices by the Chinese subjects brought one further factor to light which must have played a role in their choices. Table 3.1 gives the percentage of choices for contours ending in a fall (H^*L L%) or half-fall (H^*L %) by the Dutch listeners, the high performing Chinese subjects and low performing Chinese subjects as a function of the punctuation used to mark the closure of the orthographic sentence fragment, '?' on the one hand, versus '!', ':', ';' or no closure punctuation on the other. The Dutch responses are close to the frequency of occurrence of those contours in the A-versions, as given in the first data column, which indicates that the native speakers agreed to a high degree with the assignment of falling intonation contours over sentences closed by the question mark and other sentences. The Chinese choices for falling contours are more strongly biased towards sentence fragments *not* closed by '?', with the CHD falling between the CLD and the native speakers. This strongly suggests that the less the Chinese subjects know about Dutch, the more they rely on a spelling-based strategy with rises for fragments ending in '?' and falls for fragments with other closure punctuations. Since questions do not necessarily end in a rise and statements do not necessarily end in a fall, the Chinese group must have relied on cross-linguistic tendencies to associate questions

with rising intonation and non-questions with falling intonation (2005).

Table 3.1. Percentage of choices for contours ending in H*L L% or function of closure punctuation for native Dutch, high-performing Chinese low-performing Chinese (CLD) listeners, together with the percentage frequency of occurrence of those contours in the A-versions, for all items 17.

Closure punctuation	Consensus version	Dutch	CHD
‘?’	50.0	47.1	40.0
‘?’/ ‘.’/ ‘,’	65.0	67.3	76.5

Orthography was claimed earlier to influence L2 listeners’ behaviour (van Heuven (1986) and Escudero et al. (2009). They found that Dutch and Spanish listeners, respectively, attributed greater weight to duration than native Dutch listeners and suggested that an effect might be provided by the spelling of long vowels in Dutch. In Dutch, monosyllabic words are written with two graphemes to distinguish them from their short counterparts, which are written with one grapheme.

3.3.3 Overall contour preferences

Finally, we consider the question whether the Dutch and Chinese subjects showed different preferences for nuclear contours regardless of whether their choices were for the A-version or for a competing B-version. The group selected 480 contours. Overall, 46% were for falling nuclear contours, 18% for downstepped tunes, 20% for the fall-rise, and 16% for level tunes. However, the two groups do not share the same distribution. Figure 3.5 gives the total number of choices broken down by contour type (N = 480). We merged the data for H*L % and H*L % L, which constitute the class of non-downstepped falls, and those for H*L % and H* H%, which constitute the rises. Both of these have higher frequencies in the Chinese group, while the downstepped falls and the fall-rise were chosen less frequently. A Chi-square test shows that the Chinese and the native groups differ significantly in their choice of contours ($\chi^2 = 30.9$, $p < .01$). The post-hoc comparisons reveal that the t

make significantly different choices for the non-downstepped falls ($\chi^2[1] = 8.2, p < .01$), the downstepped fall ($\chi^2[1] = 7.3, p < .01$), the fall-rise ($\chi^2[1] = 4.7, p < .05$), and the rises ($\chi^2[1] = 6.9, p < .01$). However CHD and CLD's choices of the contours are not significantly different ($\chi^2[4] = 1.5, n.s.$). These results arguably support the Markedness Differential Hypothesis of Eckman (2008), which predicts that while a marked rule or element is more difficult to learn than an unmarked one in L1 acquisition, in L2 acquisition patterns that are less marked in L2 than in L1 should not be difficult, while more marked patterns in L2 are hard to learn, and the more so the more marked they are. Since rises and falls are present in Mandarin as the usual realizations of Tone 2 and Tone 4, respectively, there is no equivalent to the Dutch fall-rise. (Mandarin Tone 3 lacks the substantial fall-part of the Dutch fall-rise, and has the rise-part only phrase-finally.) Although Post-Focus Compression may produce contours that are broadly similar to downstepped falls, there is no equivalent to the downstepped fall in focused pronunciations. Thus, these data can be understood on the basis of the familiarity of the Chinese subjects with the general shapes of the non-downstepped falls and rising contours in Mandarin and their relative unfamiliarity with downstepped falls and falling-rising contours.

Figure 3.5. Distribution of preferences for six classes of contours over all test items except fragments 6 and 17 by 20 Chinese (CSD) and 20 native Dutch (NSD) listeners ($N = 20 \times 24 = 480$).

3.3.4 Correlations with speaker variables

In this section, we address the question whether the performance of Chinese subjects is explained by their proficiency in Dutch, as the basis of their performance in a production task by three experimental variables: whether the age of the subjects, the length of residence (LOR) in the Netherlands, or the age of the arrival in country (AOA) explains their performance in the acceptability test. The correctness scores of Chinese subjects are significantly correlated with the segmental test scores ($r = .69, p < .05$) and the prosody scores ($r = .75, p < .001$), which indicates that the extent to which they chose the A-version is to a large extent explained by their proficiency in Dutch, supporting the interpretation that the differences in correctness and entropy scores between the two groups are due to differences in proficiency. Their correctness scores have no relation with LOR ($r = .33, n.s.$) or age ($r = -.40, n.s.$). However, AOA correlates significantly with correctness scores ($r = -.64, p < .01$), suggesting that proficiency is influenced by the age at which learners are first exposed to realistic language use. Length of exposure to Dutch cannot be expected to have a positive effect, however. Negative correlations were found between AOA and the proficiency scores on the segmental test ($r = -.75$) and the prosodic test ($r = -.76$, respectively, both $p < .001$). The younger they were when they came to the Netherlands, the higher the scores they obtained in the experiment as well as in the proficiency test, supporting the 'younger-is-better' position held by studies which have investigated the effects of age on pronunciation (Ellis, 1994: 1988; Flege et al., 1995).

3.4 Conclusions

Our Contour Acceptability Experiment has shown that native speakers of Dutch obtained higher correctness scores than the Chinese subjects, and that within the Chinese group, the high-proficiency subgroup had higher correctness scores than the low-proficiency subgroup, where 'correctness' is defined as the choice that was earlier identified as the most appropriate contour (the 'consensus contour' or 'A-version') for a sentence in a short story. Second, it was shown that higher scoring groups showed more agreement in their selection of less adequate contours than lower scoring groups, as measured by an entropy measure. This suggests that

who are better at identifying the most appropriate contour are also better at judging the relative appropriateness of the less appropriate contours. Chinese participants' choices of intonation contours in context are in part explained by their proficiency in Dutch, as established by an independent measure of their segmental and prosodic proficiency. Their performance has no relation with their length of residence in the Netherlands, nor is it related to their age. However, it does correlate with AOA, meaning that the earlier they came to the country, the higher is their segmental proficiency, the higher is their prosodic proficiency and the higher are their scores on the intonation acceptability test reported here. This is in accordance with early studies of second language acquisition (e.g. Ellis, 1994; Ioup, 2008).

An analysis of the Chinese preferences revealed that the lower-scoring subjects relied to a greater extent on closure punctuation than did higher-scoring subjects. Where knowledge of Dutch was lacking, the strategy used was to choose contours with rises or level pitch whenever there was a question mark at the end of the sentence and contours with falls (H*L% or H*L L%) whenever this was not the case. A further analysis of the overall preferences for particular nuclear contours revealed that the Chinese subjects were biased towards non-downstepped falls and H%-rises at the expense of fall-rises and downstepped falls. We explained these data as resulting from the unfamiliarity with the phonetic shapes of these contours in their native language.

In earlier research (He et al., 2011a), we demonstrated that Chinese learners of Dutch are relatively successful in selecting a correctly accented word if the accent expresses the information structure of the sentence, but are poor at doing so if the accented word is accented for morphosyntactic reasons, like compound formation or predicate accentuation in non-eventive sentences. While information structure has comparable effects in Mandarin in triggering Post-Focus Compression, there is no equivalent in Mandarin to compound deaccentuation, or the deaccentuation of predicates in eventive sentences. Our experiment provides further support for the position that the acquisition of the intonation system of Dutch is a gradual process. An important part of the intonational competence that is required is the ability to choose an appropriate melody for sentences that form part of a coherent text. Breaking down the notion 'intonational competence' through tests or experiments that focus on specific aspect of that competence will help us

understand the acquisition process. It is clear that the majority of language learners cannot produce the native-like pronunciation or prosody, but little is known about the deep nature of these difficulties, which could lie in their ignorance of what intonation patterns to select or in their inability to produce the phonetic realizations that native speakers would use in the same situation. In this study, we have shown that Chinese second language speakers of Dutch, in this sense, do not know what to say. We should bear in mind that the situation for other language groups may be very different, depending on the degree of genetic affiliation between, in this case, Dutch and Chinese, and the subjects. German and English have been described as having essentially the same intonation system as Dutch (Bolinger, 1959; Bolinger, 1998; Gussenhoven, 2005). The Romance languages are more similar, but not as different as is Chinese. Further research with learners from other backgrounds should establish to what extent this is the case. Evidently, the question of how to teach and how to practise intonation patterns still leaves ample room for further research, but our findings suggest that instead of imitating intonation contours from source texts, it may initially be more fruitful to expose learners to competent speakers of texts in order to increase their chances of learning when they hear the contour.

3.5 References

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Chapter 4

A prosodic analysis of Mandarin-accented Dutch

4.1 Introduction

Despite the great liberty that speakers of Dutch have in choosing an intonation contour for a given sentence, in many cases this liberty is constrained to the extent that we may speak of 'intonational idioms'. For instance, an alternative question like *Wil je koffie of thee?* 'Would you like coffee or tea?' is typically pronounced with a Fall (H*L) on the final word, indicating that the list of options is complete at that point. In the experiment reported here, we explored the ability of a group of twenty Mandarin-accented speakers of Dutch to read out sentences that were taken to have 'idiomatic intonation'. We defined seven such intonational idioms, each represented by six syntactically similar sentences, resulting in 42 sentences altogether. To place the experimental sentences in some realistic context, they formed part of mini-dialogues. Each of the seven intonational idioms is illustrated in section 4.2.1. The purpose of this approach was not only to see how well the L2 learners were able to produce the right intonation contour with the accented syllable in the right location, but also to collect reasonably controlled free speech. By eliciting intonational idioms, we hoped to ensure that a usable quantity of similar and thus comparable data could be obtained. Such data can be used to study phonetic measures in similar speech conditions. This approach was successful.

The same group of twenty Mandarin-accented participants that was used in Chapter 2 and 3 took part in the experiment. Again, they were further divided into two subgroups: ten with higher proficiency and ten with lower proficiency in Dutch. The twenty Chinese speakers of Dutch were compared with the performances of five native speakers of Standard

Dutch, who served as a control group. One aim of the experiment was to see if the Chinese subjects were able to choose the correct intonational melody (pitch accent plus boundary tone) on the basis of the (pitch accent location) in these seven types of sentences. The second aim was to be able to investigate their phonetic realization of the intonational contours, since in this experiment they were left free to say the sentences as they wished. Therefore, we not only report on the success of the L2 subjects used the correct intonation contour with the correct location of the nuclear pitch accent, but also report on the phrasing they used, on the pitch range and on speech rhythm. These concepts are briefly explained.

4.2 Phrasing

Phonological phrasing involves the division of an utterance into one or more phonological units. As Figure 4.1 shows an utterance (U) consists of one or more international phrases (IP), and an IP is composed of one or more phonological phrases (ϕ), which dominate one or more words (ω). An utterance is produced so as to reflect its syntactic structure. The division of IPs in an utterance is not totally syntactically driven. There may be some hesitations and fillers 'err', 'erm', etc. in utterances at largely unpredictable points. Intonation phrasing is influenced by many other factors, such as speaking styles, information structure, discourse structure and speakers' awareness of listeners' needs (Watson 2004; Gussenhoven & Jacobs, 2008). Due to their limited syntactic knowledge and their proficiency in the L2, second language learners would divide sentences into different IPs from native speakers, thus causing disfluency in their speech. The representation in Figure 4.1 can be appropriate for a sentence like *Often, John seemed sad.*

Figure 4.1. Prosodic hierarchical structure of an utterance (after Gussenhoven 2008)

IP boundaries can be identified phonetically by pausing, final syllable lengthening, anacrusis and f_0 resetting (Cruttenden, 1997). Pauses are longer after larger phonological units than those after minor ones in read speech. Pauses between utterances are longer than the ones after IPs, and pauses between IPs are longer than the ones after phonological phrases if there are any. The length of pauses also depends upon the speaking styles (Keseling, 1992). But pausing is not sufficient to indicate an IP boundary because it can occur in the hesitations. The lengthening of accented final syllables can also help listeners to find the IP boundary (Gussenhoven & Rietveld, 1992). The final syllable lengthening was found longer at an intonation boundary than at an 'intermediate phrase' boundary (Chavarría, Yoon, Cole & Hasegawa-Johnson, 2004; Yang, 2004). The f_0 resetting is visible in instrumental pitch tracking though it is not sensitive to listeners. Pitch is the lowest at an L% boundary in an IP, and will be raised up higher for the next IP. The pitch of an initial unstressed syllable in the IP which follows an L boundary tone of the preceding IP will be higher than that of the L%. Declination, the downward trend of f_0 over the course of an utterance (Cohen, Collier & 't Hart, 1982; Ladd, 1984) is common phenomenon in speech. The last IP indicator, anacrusis, is also concerned with the unstressed syllable in the next IP. Compared with other unstressed syllable in an IP, the unstressed ones before the first pitch accent are often produced more quickly. We annotated all the IPs in the speeches based upon our hearing and the phrasing features shown in the spectrograms.

Earlier research has shown that non-native speakers of English not only produced significantly more and shorter intonation phrases in read speech than native speakers, but also put phrase boundaries in different places (Chen, 2008; Grosser, 1982; Gut, 2000, 2009; Hewings, 1995b). In her corpus-based study of phonological acquisition, Gut (2009) found that non-native speakers of English produced significantly more phrases than native speakers in the read speech, resulting in fewer words in the IPs, while the native speakers of English produced no interrupted phrases in their read speech. Although there were some interrupted phrases in the retellings by the native speakers, the percentage of interrupted phrases was lower and the length of the IP longer than in the case of the non-native speakers. Similar differences were found between native speakers and non-native speakers of German. Although the average number of IP phrases produced by the two groups in the read speech did not differ significantly, the differences in the mean length of

phrases was significant. The mean length of IP phrases by speakers in retellings is longer than that by non-native speakers of German; however, no significant difference was found in the length of interrupted phrases by the two groups.

Chen (2008) found that the number of pauses and IP length in speech by Chinese learners of English were significantly different from the native speakers, who had fewer pauses and thus longer IP lengths. Considering the information status in an utterance, the learners tend to employ their L1 Chinese syntactic knowledge in deciding where to place IP boundaries, more specifically using punctuation. For example, they took some adverbials like 'especially', reporting clauses and attributive relative clauses as separate IPs. Conversely, in list structures, they did not treat each item as a separate IP, and they had considerably more pauses in reading longer sentences with no punctuation. Advanced learners performed more like the native speakers than the learners with lower proficiency in English.

The first aim in this study is to find out how Mandarin Chinese speakers and speakers of Dutch divide an utterance into IPs in read speech and whether there are differences in phrasing between Chinese speakers with higher proficiency in Dutch (CHD) and the ones with lower proficiency. The second aim is such that makes the CHD group perform closer to the native speakers, i.e. fewer pauses in the internal-IPs and at the boundaries in the read speech. Three groups of speakers were also compared.

4.3 Pitch range

Pitch range is the difference between the maximum and minimum F0 values across an utterance. Patterson (2000) proposed two measures to measure pitch range. The wide pitch range is the difference between the average of a speaker's utterance-final lows and the average of a speaker's utterance-initial highs. The small pitch range is the difference between the non-initial pitch peak and the non-final valley. The wide pitch range measurement was adopted in the present study.

In her corpus study, Gut (2009) found the pitch range of native speakers of German and English to be greater than that of their counterparts. The pitch range of native Chinese speakers in the read speech and retellings

research, the pitch range in read speech by Chinese learners of English was also found significantly narrower than that by the native speakers, while the advanced learners' pitch range was more similar to that of the native speakers than that of the learners with lower proficiency in English (Chen, 2008). Chinese speakers adapt their pitch range to convey pragmatic meanings. Expansion of the pitch range typically codes referents that are in focus, while a reduced pitch range is found for non-focused materials after the focus. Acoustic and auditory studies similarly showed that f_0 variation of L2 learners was different from that of native speakers in research with Chinese speakers of French, who are claimed to have wider pitch span and higher overall pitch level than native speakers (1990).

The second research question is to see what the differences are in pitch range between native speakers and Chinese speakers of Dutch, and between the Chinese subgroups (CHDs and CLDs).

4.4 Speech rhythm

Speech rhythm concerns the temporal distribution of speech events. Languages were claimed to be stress-timed or syllable-timed in earlier research (Abercrombie, 1967; Pike, 1945). Stress-timed languages like English and Dutch have been said to have a rhythm defined by approximately equal intervals of stress, called feet, each of which begins with a stressed syllable. In syllable-timed languages like French and Chinese, the length of each syllable has been claimed to remain approximately the same. No acoustic correlation with this classification was found in later empirical investigations, however. The feet in presumed stress-time languages like English not only have different durations, but their durations also increase linearly with the number of syllables they contain (Dauer, 1983; Fauré, Hirst & Chafcouloff, 1980; Roach, 1982). Further, Barry (2007) claimed there is in fact no such thing as isochrony. Speech rhythm is a cover term which reflects the variety of syllable structures, phonological vowel length, vowel reduction and lexical stress (Barry, 2007; Dauer, 1983). The presumed stress-timed and syllable-timed languages in fact have different types of syllable structures, resulting in different syllable durations. For instance, English has CV (30%), CVC (34%), VC (15%), V (8%) and CVCC (6%) while Spanish has majority of CV (58%) syllables. Also, stress-timed languages usually

have vowel reduction, lexical stress or sentential accents realized by length, pitch and spectral features, while syllable-timed languages have no lexical stresses or sentential accents, and the realization of stress depends on the pitch contour (Barry, 2007).

In an attempt to provide phonetic meaning to the distinction between stress-timed and syllable-timed languages, Ramus, Nespor and Trovati (1999) classified some languages into categories similar to stress-timed and syllable-timed languages by comparing the percentage of variation in the duration of adjacent syllables (V) and the standard deviation of the consonantal intervals (C). They claimed that most languages of the world fall somewhere in between on a continuum of the two categories at polar ends. Other approaches to measure speech rhythm are the Pairwise Variability Index (PVI) proposed by Francis Nolan (Low & Grabe, 1995), the Rhythm Ratio (RR) (Ramus & Gut, 2001), the Variability Index (VI) (Deterding, 2006) and the Syllable Ratio (SR) (Gut, 2003). These are given here in (1) respectively.

$$\begin{aligned}
 (1) \quad & \text{a. } n\text{PVI} = 100 \times \left[\sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{d_k + d_{k+1}} \right| / (m-1) \right] \\
 & \text{b. } \text{RR} = 100 \cdot \sum_{k=1}^{m-1} \frac{d_k}{d_{k+1}} / (m-1) \\
 & \text{c. } \text{VI} = \frac{1}{n-2} \sum_{k=1}^{n-2} |d_{k+1} - d_k| \\
 & \text{d. } \text{SR} = \frac{1}{n} \sum_{k=1}^n \frac{d_{k+1} + R_k}{d_k + R_k}
 \end{aligned}$$

PVI calculates the mean sum of the quotients of the duration of adjacent syllables or vowels in their mean duration, and will be an integral number by multiplying the result by 100. The hundred times of the mean sum of the quotients of adjacent syllables or vowels in their mean duration. The quotient in the pair is obtained by dividing the shorter duration of the syllable or vowel by the longer one. The higher the value is, the more different the duration of adjacent pairs is. VI measures the variability of the duration of adjacent syllables without final syllables, due to the final syllable lengthening. SR is to measure the average sum of quotients of the duration of adjacent syllables with a full vowel and its immediate adjacent syllable with a full vowel, and it is obtained by dividing the sum of all quotients by the number of syllables. Also the final syllable and the pre-pause syllables are included in SR.

The finding that Thai, Dutch, German, British English, Tamil and Malay had higher vowel PVI while Mandarin and Spanish had lower vowel PVI means that the former group showed more variation in vowel duration and the latter less variation in vowel duration (Grabe & Low, 2002). The consonant PVI in Estonian, Romanian, French, Welsh and Luxemburgish was found lower than that in Polish, Catalan, Tamil, Malay and British English. The vowels that should be reduced in British English were pronounced as full vowels in Hong Kong English, and also the weak and unstressed syllables were significantly longer in Hong Kong English than in British English (Setter, 2003). The vowel PVI was significantly lower in the read speech in Taiwan English than in American English. The length of the reduced vowels in Taiwan English was exactly the same length of full vowels (Jian, 2004).

Speech rhythm is a principal factor contributing to 'foreign accent' (Anderson-Hsieh et al., 1992; van Els & de Bot, 1987) and is difficult for learners to acquire (Adams, 1979; Bond & Fokes, 1985; Faber 1986; Wennerstrom, 2001). The non-native speech rhythm in English by the syllable-timed L1 language learners was found due to factors like durations of stressed and unstressed syllables, liaison, inappropriate pauses and stress (Adams, 1979).

Numerous studies showed that L2 learners of English whose L1 was syllable-timed language could not reduce durations of English vowels like the native speakers, resulting in non-native speech rhythm (Bond & Fokes, 1985; Chen, 2008; Flege & Bohn, 1989; Ghazali & Bouchhioua, 2003; Lee, Guion & Harada, 2006; Mairs, 1989; Wenk, 1985) and the non-native speech rhythm correlated positively with the proficiency in the second language (Chen, 2008; Wenk, 1985; Zborowska; 2000). The more advanced the learners in these investigations were, the more their speech rhythm was native-like. Similar findings are also true for learners of other language. For example, English learners of German mostly reduced the vowels in word-initial unstressed syllables and function words in reading word or phrase lists, while native Russian learners of German only reduced the vowels in word-final syllables, but Japanese learners of German could not reduce the vowels in unstressed syllables (Kaltenbacher, 1998). The SR in the read speech by all Polish, Italian and Chinese learners of German was significantly lower than that by the native speaker of German, and the SR in the retellings by Chinese

learners was significantly lower than that by the native speakers (Gut, 2003). In the corpus driven studies by Gut (2009), the syllable durations of native speakers' speech were found to be longer and slower than those of non-native speakers, although the non-native speakers of German could produce native-like vowels like the native German speakers. Non-native speakers of English could not sufficiently reduce or delete the unstressed syllables.

The differences in speech rhythm by non-native speakers and native speakers were attributed so far to the influence of the speakers' L1 (Adams, 1979; Chen, 2008; Gut, 2003, 2009; Kaltenbacher, 1998; Lee, Guion & Harada, 2006; Setter, 2000; Yallop, 1985). Chinese has been characterized as a 'syllable-timed' language due to its relatively constant syllable duration (Clark & Yallop, 1985; Santen & Shih, 2000), while Dutch is a stressed-timed language like English, German and other Germanic languages.

In the investigation by Chen (2008) the %V was higher and ΔC was smaller in the read speech by Chinese learners of English than by the English speakers. It meant that there was less reduction of vowels and less variation of consonants in Chinese-accented English than in native English. This resulted from their L1 Chinese (Chen, 2008). And %V and ΔC in advanced learners' read speech were close to those of the native speakers.

The third research question in the present study is to compare speech rhythm in the read speech by Mandarin Chinese speakers and Dutch and the native speakers, and to find the nPVI difference between speech rhythm by CHDs and CLDs.

4.5 Speech rate and articulation rate

Speech rate is often defined as the average number of syllables per second in a whole sentence (Pereira & Watson, 1998). Articulation rate refers to the average number of syllables per second excluding pauses. The difference between speech rate and articulation rate is the inclusion of the duration of pauses in the former and their exclusion in the latter. Native speakers of Dutch spoke faster and paused less in speech than a heterogeneous group of non-native speakers.

Cucchiarini, Strik & Boves, 2000). The SR (syllable ratio) discussed in above section, was found to correlate with speech rate in both native German and native English, while in non-native speech there was no such correlation (Barry, Andreeva, Russo, Dimitrova & Kostadinova, 2003; Ramus, 2002; White & Mattys, 2007)

The fourth research question in the present investigation is to compare the speech rate and the articulation rate in the read speech by the native speakers with those by the CHDs and CLDs.

4.6 Pitch accents

Germanic languages, like English, German or Dutch, generally have sentence prosodic patterns that are the result of the inherent stress patterns of words and a rather complex set of rules for the placement of pitch accents on a subset of these stressed syllables. Their placements in sentences are determined by lexical, phonological and morphological information, in addition to semantic and pragmatic factors (Gussenhoven, 2011).

Mandarin Chinese is traditionally analysed as having two types of accentuation: grammatical and logical (Gao, 1984). Grammatical accents are claimed to be determined by the structure of syntactic phrases, while logical accents depend upon the meanings speakers intend to express. A grammatical accent is not as strong phonetically as a logical accent. Unlike what is the case in languages like English and Dutch, there appear to be no consistent phonetic correlates of what has been characterized as grammatical stress. Possibly, stress differences identified by Huang & Liao (1991), among others, may resolve as phrasing differences and the occurrence of neutral tone vs. lexical tone. Be that as it may, the following stress relations have been identified, whereby there is more phonetic strength for (i) the predicate verb than for the subject in an [NP VP]-phrase; (ii) for the adjective in an [Adj Noun]-phrase, and for the adverb in an [Adv Verb]-phrase as well as in an [Verb-Adv]-phrase; (iii) for the head of a prepositional phrase than for the preposition; (iv) for the object in an [NP Verb]-phrase, and (v) to an interrogative pronoun or demonstrative than to their head (Huang & Liao, 1991). Although there are similarities between the Chinese prominence differences and

those of Dutch, these phonetic strength differences are not comparable to the melodically prominent effect of a pitch accent in Dutch. Moreover, unlike the alternation between short unstressed and long stressed syllables in Dutch, syllable duration in Mandarin is relatively constant, which is in fact why it has been characterized as 'syllable-timed' (Clark & Yallop, 1995; van Santen & Shih, 2000).

The effect of the logical accents in Mandarin sentences is probably closer to pitch accent distributions in Dutch sentences. In Mandarin, 'logical accents' are often given to words which are to be emphasized because they express new information or strong emotion (Hu, 1991). In effect, the rule for the realization of post-focal pitch accent and phonetic reduction of the pitch range, is phonetically similar to deaccentuation in West Germanic languages (Xu & Xu, 2002). This means that Chinese learners of Dutch could in principle acquire the 'focus' in the read speech if they transfer their L1 knowledge of pitch production or perception.

Chapter 2 reported on the perception experiment conducted with well Chinese learners of Dutch identify the correct accentuation in six categories of Dutch sentences characterized by some generalization about the distribution of pitch accents. Native Dutch correctness scores were significantly higher than those by the Chinese learners with high proficiency in Dutch, and the correctness scores of the latter were also significantly higher than those obtained from the low proficiency learners. Accentuation for new information was more difficult to evaluate than accentuations due to morphological rules. In particular, more syllables are generally found to be accented in non-native speech than in native speech, or to be accented inappropriately. Chinese learners of English produced too many pitch accents in read speech (Giles & Juffs, 1990). One reason is the transfer of word tone from L1 to L2, the other is the fact the learners ignored the context of the sentence and accented the given information in the reading (Chen, 2008). Chinese learners had a tendency to accent content words and their accentuation patterns were found similar to those by the native speakers, so that their speech, though foreign-accented, was generally intelligible. But learners with lower proficiency in English accented the functional words and their speech sometimes was not intelligible due to the wrong information being expressed by inappropriate accents. This means

interaction between their knowledge of the L1 and L2 resulted in the incorrect accent patterns.

Incorrect accent placements in L2 speech are often reported in the literature (e.g. Adams, 1979; Beckman, 1979; Chen, 2008; Grosser, 1997; Gut, 2009; Juffs, 1990). Spanish speakers of English were found to place the nucleus on the given information and the pitch movement on the nucleus was smaller than the native speakers (Ramirez Verdugo, 2002). Mandarin Chinese speakers could not produce the pitch accents in delivering lectures, ignoring the difference between the given and new information (Wennerstrom, 1998). Nearly half of the cases of given or accessible information were accented in a corpus driven study (Gut, 2009). In pre-nuclear position, more falling contours occur on content words than do rising contours, but falls and rises are equally frequent on function words, which are accented less often.

The fifth research question is to investigate where the Mandarin speakers of Dutch put pitch accents in the sentences and to find the differences in pitch accent placement between CLDs and CHDs.

4.7 Intonation contours

Dutch is an intonation-only language in which there are Fall, Rise, Fall-rise contours and 21 other nuclear (accent-lending) f0 contours (Gussenhoven, 2005), while Mandarin Chinese is a tone language in which there is no such rich contour inventory. At least two boundary tones have been identified for *Guoyu* (Standard Mandarin in *Taiwan*) and *Putonghua* (Standard Mandarin in mainland China), which have been claimed to correspond with *Yuanren Chao's* Rising and Falling endings respectively in the *Beijing* dialect, a dialect very close to Standard Mandarin (Lin, 2006; Peng et al., 2005). As Figure 3.2 shows, the lexical tones are kept intact when the syllable [ma] was uttered with four tones in Mandarin interrogatives and declaratives. We find that the pitch was raised in interrogatives compared to declaratives. That is to say, a falling tone remains a falling tone and a rising tone remains a rising tone when pronounced with either intonation.

Warren (2004) found that Hong Kong English speakers used more Rises in different types of conversations when they communicated with native

speakers than other contours. No significant difference between the French native speakers and the Chinese learners when 25 native French listeners were asked to judge whether questions sounded like questions (Shen, 1990). The striking differences in the pronunciation of rises for questions lie in the realization of the final syllable. The learners either raised the pitch higher than the native speakers did or lowered it first and then rose late in the syllable, forming a falling-rising terminal contour rather than a Rise. Wennerstrom (1994) found that Thai speakers of English did not use a high ending rise for questions the way the native speakers of English do in speech, while the Japanese and Spanish speakers of English did not show differences in the frequency of use or the realization of rises for questions compared to the native speakers. Japanese and Thai speakers of English produced low or falling pitch in the middle of the utterances, while the native speakers were more low or falling pitch in their picture description than the native speakers' description. But the low or falling pitch was produced by the Spanish speakers and the native English speakers only at the end of the text or before topic shifts and parentheticals. According to Shen (1995a), Falls were produced by Greek, Korean and Indonesian speakers of English at connective junctures where the native speakers produced Rises instead. Spanish learners were also found to use more Falls in statements and more Rises in tag questions than the native speakers, though they showed no differences in the use of Falls and Rises in yes-no questions and yes-no questions (Ramirez Verdugo, 2002). The native speakers of English or German used a reduced tone inventory, and complex tones on nuclei occurred much less frequently than in the native speakers' speech. Level tones or simple pitch movements were mostly produced on nuclei in non-native speech. And the realization of Falls or Rises were phonetically different from the native speakers (Shen, 2009). For example, some Falls by the non-native speakers did not drop their pitch bottom to signal the finality of the utterances.

By studying the intonation contours used in listing, statement, question, clause in coordinate sentences, imperatives, wh-questions, yes-no questions in the reading of a story, Chen (2008) found Chinese learners of English could produce the Fall and the Rise according to the native patterns generally, but they could not choose different Rises to express different emotion and pragmatic meanings in the utterances. And sometimes they substituted the Fall and Rise for the native patterns, especially the subjects with lower English proficiency.

The longitudinal study led Grosser (1997) to propose that simple tones should be acquired before complex tones (Gut, 2009). If this hypothesis is correct, a complex tone like the Fall-rise in English and Dutch would be difficult for Chinese learners of the two languages. The Dutch intonation contours appear on single syllables and the nuclear accent occurs on the last syllable of the intonational phrase (IP). The Fall-Rise, which is carried out entirely in the syllable rime, does not have a Mandarin counterpart. The intonation contours of Fall and Rise are similar to those of Tone 4 and Tone 2, respectively. The Chinese speakers of Dutch may have no problem with the Fall and Rise, therefore, as they can transfer Tone 4 and Tone 2 to Dutch. Mandarin tone 3, which is low and begins any pitch fall earlier and lower than the Fall-rise, cannot be transferred easily into Dutch and the Fall-Rise will therefore be more difficult than the Fall and Rise.

4.2 Method

4.2.1 Materials

The subjects were asked to read 42 Dutch sentences (seven types $\times$ six sentences = 42, cf. Appendix 4) in the way they thought was correct.

The first type is the alternative question as (1) shows, which is transcribed as H*L L%.

(1) *Je moet kiezen: wil je liever fruitsalade of wil je liever ijs?*

|
%H H*L L%

You have to choose: would you rather have fruit salad or ice cream?

The second type is the yes-no question with *toch* 'not' as in (2), transcribed as H*L H%.

(2) *Je hoeft niet meer te werken. Je hebt toch al genoeg gedaan deze week?*

|
%L H*L H%

You don't have to work anymore. Haven't you done enough for the week?

The third type with *echt* 'really' in the stimulus sentence is transcribed as H* H%, as shown in (3).

- (3) *Zei je nou echt dat je naar buiten wilde? In de regen?*

|
%L H* H%

Did you really say you wanted to go out? In the rain?

The fourth type is the sentence-initial reporting sentence. Standard Dutch is often read with half-fall, transcribed as H* shows.

- (4) *Hij keek ons de hele tijd strak aan. Toen zei-die: Dat nooit!*

|
%L H*L %

He looked hard at us for the whole time. Then he said: That's never!

The fifth type, shown in (5), is the vocative chant, transcribed as H*!

- (5) *Schat-je! We hebben weer kaa-aas!*

|
%L H*!H %

Honey! We have cheese again!

The sixth, as in (6), contains a modal particle *bè* or *boor* to trigger a half-fall, which has H*L on a preceding word, followed by H%.

- (6) *Het wordt laat. Maar je moet wel je eten opeten, boor!*

|
%L H*L H%

It's getting late. But you should finish your meal!

The seventh and last type (7) is the exclamation with *wat* 'what', which has a half-fall or half fall, transcribed as H*L L% or H*L %, respectively.

- (7) *Kijk daar 's! Wat is dat een rare fiets!*

|
%L H*L %

Look over there! What a funny bike!

4.2.2 Procedure

4.2.2.1 Subjects

The five female speakers of Standard Dutch were all from Radboud University Nijmegen, aged from 27 to 51 years. They were recorded in the studio in the university.

Twenty Mandarin Chinese speakers of Dutch (3 male, 17 female) in the experiment are the same participants as in Chapter 2 and 3. They were recorded with the help of a Zoom H4 Handy Recorder in different places: in the house, in classrooms, or in libraries; one was recorded in the studio in the Arts Faculty of Radboud University Nijmegen and three in a studio at Gronigen University. The 42 test sentences together with their corresponding stimulus sentences were put into a Powerpoint file in a random order and printed in a booklet in the same order with the context and target sentence printed on the same page. To the participants' preference, they could read aloud the sentences page by page from the booklet or from the screen displayed by the Powerpoint file, which they went through by clicking the 'Next' button. They were allowed to repeat sentences whenever they thought were not their best reading.

The Mandarin speakers of Dutch were divided into a higher ('Chinese Higher Dutch': CHD) and a lower (CLD) subgroup on the basis of each subject's mean score over their segmental and prosodic proficiency scores, as explained in Chapter 2.

4.2.2.2 Labellings

We annotated each target utterance with *Praat* (Boersma & 2009), as Figure 4.2 shows.

Figure 4.2. An annotation example of the utterance *Wil je liever fruitsalade of ijs?* 'Would you rather have fruit salad or ice cream?' spoken by a native speaker. The tiers are Pitch tier, Word tier, Syllable tier, Phrase tier, Tone tier and the Miscellaneous tier.

- (1) Pitch tier. In order to calculate pitch range, two pitch heights (the first peak of an intonation phrase) and L (final low of the phrase) were marked on the first tier.
- (2) Word tier. The beginning and the end of each word were annotated.
- (3) Syllable tier. The beginning and the end of each syllable were annotated.
- (4) Tone tier. Pitch accents and boundary tones were annotated.
- (5) Phrase tier. Intonational phrases (ph) and pauses (p) were annotated.
- (6) Miscellaneous tier. The file names were shown and some other information were made on this tier.

4.2.2.3 Variables

- (1) Numbers of intonation phrases
- (2) Pitch range. Pitch range = H minus L in semitones (ST)
- (3) Nuclear accent placement
- (4) Accent placement
- (5) Intonation.
- (6) nPVI
- (7) Speech rate and articulation rate
 - Speech rate = the numbers syllables/the duration of utterance with pauses
 - Articulation rate = the numbers of syllables/the duration of utterance without pauses

4.3 Results

As there are 20 Chinese subjects which are divided into two subgroups with 10 in each group and only five subjects of the Standard Dutch in the present study, the Gabriel value is referred to if homogeneity of variances is not violated in the following One-way ANOVAs. Otherwise, the Games-Howell value will be used.

4.3.1 Phrasing

As Figure 4.3 shows, CLDs have more IPs than CHDs and NSDs, and NSDs have the fewest. A One-way ANOVA test shows that the differences between the three groups in phrases are significant. ($F[2,22] = 6.9, p = .005$). The post hoc comparison indicates that native speakers of Dutch have significantly ($p < .05$) fewer IPs than the Chinese speakers of Dutch, regardless of whether they are proficient or less proficient in Dutch. And there is no significant difference in phrasing between the Chinese subgroups.

Figure 4.3. Mean number of phrases by CLDs (Chinese speakers of Dutch with low proficiency), CHDs (Chinese speakers of Dutch with high proficiency), and NSDs (native speakers of Standard Dutch). The error bars enclose ± 1 standard error.

The number of pauses inside IPs between the three groups was significantly different ($F[2,22] = 4.3$, $p = .026$). CLDs and CHDs were found to pause within IPs more frequently than NSDs ($p < .05$ respectively), and no significant differences are found for pause durations between CHDs and CLDs, which are shown in Figure 4.4. While pause durations inside IPs decrease and pause durations at IP boundaries increase from CLDs via CHDs to NSDs, as shown in Figures 4.5 and 4.6, these differences fail to reach significance.

Figure 4.4. Mean number of pauses inside IP's by CLDs (Chinese speakers of Dutch with low proficiency), CHDs (Chinese speakers of Dutch with high proficiency) and NSDs (native speakers of Standard Dutch). The error bars enclose ± 1 standard error.

Figure 4.5. Mean duration (ms) of pauses inside IP's by CLDs (Chinese speakers of Dutch with low proficiency), CHDs (Chinese speakers of Dutch with high proficiency) and NSDs (native speakers of Standard Dutch). The error bars enclose ± 1 standard error.

Figure 4.6. Mean duration (ms) of IP boundary pauses by CLDs (Chinese Dutch with low proficiency), CHDs (Chinese speakers of Dutch with high proficiency) and NSDs (native speakers of Standard Dutch).

The finding that Chinese speakers of Dutch produced more read speech than the native speakers is in accordance with the studies by Chen (2008), Grosser (1982), Gut (2000, 2009) and (1995b). In Chen's (2008) study, the subjects were asked to read a story, and Chinese learners of English were found to have significantly more pauses and shorter IP lengths than the native speakers. In this study, the Chinese speakers of Dutch pause within IPs more frequently than the native speakers. Their pause duration within IPs is significantly longer than the native speakers. However, the pause duration at IP boundaries is shorter than those by native speakers, but these differences are not significant. Therefore, the frequency of IP-internal pauses is one of factors that contribute to the Mandarin accent of the non-native speakers.

4.3.2 Pitch range

From Figure 4.7, we know that pitch range increases from CLDs to CHDs to NSDs (10.8 st, 11.0 st & 13.0 st respectively). An ANOVA test was conducted, but no significant difference was found between the three groups ($F[2, 22] = 3.0, p = .088$). This finding

from Chen's (2008) and Gut's (2009). The pitch range of native speakers of German and English were found to be significantly greater than that of the non-native speakers in the read speech and retellings (Gut, 2009). The pitch range in the read speech by Chinese learners of English was significantly narrower than by the native speakers and the advanced learners' pitch range was more similar to native speakers' than that of the learners with lower proficiency in English in research by Chen (2008). In Chapter 6, the subjects were asked to read sentences with test words in broad, narrow and corrective focus conditions. The same results were obtained: the pitch range of the test words in the three focus conditions by the native Dutch speakers was wider than that of CHDs, while that of CHDs was wider than that of CLDs although again without reaching significance (He, van Heuven & Gussenhoven, 2011b). We attribute the fact that the pitch range in the speech of the Chinese subjects is not significantly narrower than that of the native speakers to the fairly narrow pitch range of Dutch (Willems, 1983).

Figure 4.7. Mean pitch range in semi-tones of the three groups across all utterances: CLDs (Chinese speakers of Dutch with low proficiency), CHDs (Chinese speakers of Dutch with high proficiency) and NSDs (native speakers of Standard Dutch). The error bars enclose ± 1 standard error.

4.3.3 Speech rate and articulation rate

As Figure 4.8 shows, both speech rate and the articulation rate increase from CLDs via CHDs to NSDs.

Figure 4.8. Mean speech rate and articulation rate by the three groups: CLDs (Chinese speakers of Dutch with low proficiency), CHDs (Chinese speakers of Dutch with high proficiency) and NSDs (native speakers of Standard Dutch). The error bars represent standard error.

One-way ANOVA tests show that both speech rate ($F[2, 22] = 10.9, p = .001$) and articulation rate ($F[2, 22] = 10.9, p = .001$) are significantly different between groups. The speech rate of the native speakers and CHDs are significantly higher than of the CLDs ($p < .01$), but there is no difference between native speakers and CHDs. Similar to speech rate, the articulation rate of the native speakers and CHDs is significantly higher than CLDs ($p < .01$), while no difference between native speakers and CHDs was found. Cucchiarini et al. (2002) found that native speakers of Dutch spoke faster than the non-native speakers of Dutch in the read speech task. In present study, native speakers with higher proficiency are found to speak faster than those with lower proficiency.

4.3.4 Speech rhythm

A One-way ANOVA shows that the three groups differ significantly on the nPVI (see section 4.4) ($F[2, 22] = 12.5$, $p < .001$). The post hoc comparisons indicate that the native speakers' nPVI is significantly larger than that of CHDs ($p < .05$) and CLDs ($p < .01$), and that CHDs' nPVI is significantly larger than CLDs' ($p < .05$), (see Figure 4.9).

The speech rhythm in the utterances by the Mandarin speakers of Dutch is significantly different from that of the native speakers, while CHDs again stand between the native speakers and CLDs. Clearly, when their Dutch proficiency improved, subjects' speech rhythm became more native-like as well. Previous studies showed that speech rhythm was difficult to acquire (Adams, 1979; Anderson-Hsieh, Bond & Fokes, 1985; Faber 1986; Johnson & Koehler, 1992; van Els & de Bot, 1987; Wennerstrom, 2001). When Chinese speakers speak a second language, their L1 Chinese syllabic rhythm ('syllable-timed') is transferred to their L2 (stressed-timed), and apparently they are incapable of reducing the duration of the unstressed syllables like other L2 learners, resulting in a non-native speech rhythm (Chen, 2008; Bond & Fokes, 1985; Flege & Bohn, 1989; Ghazali & Bouchhioua, 2003; Gut, 2003, 2009; Jian, 2004; Kaltenbacher, 1998; Lee et al., 2006; Mairs, 1989; Wenk, 1985). And the more proficient they are in the second language, the more native-like their speech rhythm is (Chen, 2008; Wenk, 1985; Zborowska, 2000). The results of the present study are in line with the previous studies.

Figure 4.9. Mean nPVI by the three groups: CLDs (Chinese speakers of Dutch with low proficiency), CHDs (Chinese speakers of Dutch with high proficiency), and NSDs (native speakers of Standard Dutch). The error bars enclose ± 1 standard error.

4.3.5 Pitch accents

A One-way ANOVA of the pitch accent frequencies in our three groups of speakers reveals that the Chinese speakers of Dutch have significantly more pitch accents in their utterances generally than the native speakers ($F[2, 22] = 6.9$, $p = .005$). The number of pre-nominal pitch accents in the utterances produced by the native speakers is significantly less than that produced by the CHDs ($p < .05$), while no significant difference was found between the native speakers and the CLDs. Figure 4.10 shows that more pitch accents can be found in the utterances of subjects with lower proficiency in Dutch.

Figure 4.10. Mean prenuclear accents by CLDs (Chinese speakers of Dutch with low proficiency), CHDs (Chinese speakers of Dutch with high proficiency) and NSDs (native speakers of Standard Dutch). The error bars enclose ± 1 standard error.

This finding is in line with previous studies (e.g. Adams, 1979; Beckman, 1979; Chen, 2008; Grosser, 1997; Gut, 2009; Juffs, 1990; Ramirez Verdugo, 2002). More pitch accents were found in Chinese non-native speech than in native speech. Chinese speakers of Dutch transfer their L1 Chinese phonological patterns, which have a tonal specification on the majority of the syllables, to a language with pitch accents only on some words, and as a result accent every word when they speak Dutch. On the other hand, Chinese speakers of English ignored the prosodic effects of information status and accented the given information in a reading task (Gut, 2009; Wennerstrom, 1998). The CHDs in the present experiment accented some content words which the native speakers of Dutch did not accent at all 67 times, while CLDs did so 95 times. Generally, these superfluously accented words provided old information, and thus no pitch accents should have been assigned to them. Additionally, both CHDs accented 24 and CLDs 34 function words which were not accented by the Dutch subjects. The function words and modal words like *liever* 'rather', *toch* 'yet', *het* 'the', *hè* 'hey', *hebt* 'have', etc. often are not accented in Dutch, but the Chinese subjects typically accented them in their reading task.

We also found that some Chinese speakers of Dutch in both groups could not properly accent some compound words ‘pencil’, *handdoeken* ‘towel’ and *uitverkoop* ‘sale’, *zwaailichten* ‘flashlight’ and accented the second component in them. They even did so where the word stress is in words like *elektrisch* ‘electricity’, disyllabic words like *daarom* ‘therefore’ *jarig* ‘birthday’, *regen* ‘rain’. They made 14 such errors and CLDs 19.

In Chapter 2, an experiment was described testing the ability of Mandarin Chinese speakers of Dutch to choose the optimal pitch location (He et al. 2011a). It showed that native speakers performed significantly better than the CHDs, and the latter performed worse than the CLDs. The confidence ratings similarly decreased from CHDs to CLD. In the present production test, CLDs have more pitch accents than and the CHDs, and the CHDs have more pitch errors than the native speakers. This may mean that their uncertainty about which words are to be accented is solved by over-accentuation. The listening data and the production data show that the location of pitch accents in Dutch needs to be learnt.

4.3.6 Intonation contours

4.3.6.1 Analyses of nuclear contours

We define a correct pitch contour as a correct nuclear placement, a correct pitch accent and final boundary tone, separately for each sentence. The ‘correctness’ was predetermined by a set of ‘intonational idioms’ made by an intonation expert. We collected the correct nuclear tunes produced for each type of sentence for each group of subjects, and calculated their percentages of correct pronunciations (Figure 4.11).

Figure 4.11. Percentages of correct contours by CLDs (Chinese speakers of Dutch with low proficiency), CHDs (Chinese speakers of Dutch with high proficiency) and NSDs (native speakers of Standard Dutch).

In general, correct scores of correct nuclear tunes for each type of sentence by the native speakers are higher than those by the CHDs and CLDs, and those by the CHDs are higher than those by the CLDs. More specifically, the native speaker used H*L H% unanimously for the 2nd and 6th sentence types. A Chi-square test shows that the percentages of correct pronunciations for CLDs, CHDs and NSDs are significantly different across the sentence types ($\chi^2[12] = 63.4, p < .001$). For each type of sentences, we conducted a separate Chi-square test to check whether the three groups are significantly different. The test results are shown in Table 4.1. As three comparisons were made, the p -value was adjusted by using the formula $p' = \frac{CCF}{K(K-1)/(2+1)}$, where k is the number of comparison, and .05 is the original significance level. So the adjusted significance level in Table 4.1 is .013.

Table 4.1. Results of Chi-square tests for the comparisons of each type of contours (CLDs (the Chinese speakers of Dutch with low proficiency), CHDs (the speakers of Dutch with high proficiency) and NSDs (the native speakers of Dutch)).

contours	three groups		CLD vs CHD		CLD vs NSD		CHD vs NSD
	$\chi^2[2]$	p	$\chi^2[1]$	p	$\chi^2[1]$	p	
H*L L%	6.2	.045	1.6	.023	6.2	.013	1.5
H*L H%	74.8	<.001	44.5	<.001	78.4	<.001	7.4
H* H%	45.2	<.001	.3	.602	29.5	<.001	2.5
H*L %	21.3	<.001	2.3	.131	18	<.001	8.3
H*!H	34.0	<.001	10.0	.002	33.0	<.001	8
H*L H%	18.2	<.001	5.9	.015	18.3	<.001	3.6
H*L (L%)	5.8	.054	3.6	.057	5.4	.020	.2

For the first type, H*L L% is the optimal contour for the questions. Actually, all the native speakers read them with this contour except for two accent placement errors. As Table 4.1 shows, the percentage of correct pronunciations is significantly lower than that of the NSDs, but the differences with the CHDs are not significant. This means that CLDs cannot use Falls to conclude the alternative questions like the native speakers. Of 60 alternative questions, 15% have rising tones, as shown in Table 4.2.

Table 4.2. The distribution percentage of erroneous contours in 60 alternative questions by CLDs and CHDs.

Contour chosen	CLD	CHD
L*H H%	15.0	3.3
H*L H%	3.3	1.7
L* H%	1.7	1.7
H*L %	1.7	5.0
H* H%	5.0	0.0
L*H %	0.0	1.7

H*L H% is the predetermined optimal contour for the second type of yes-no questions with *toch* 'not' (rhetorical modal particle, equivalent to 'or not' tag question in English). All NSDs read the question with this predetermined contour, while very few CLDs used this contour. The NSDs' percentage of correct pronunciations is significantly higher than that of CHDs and CLDs, and that of the CHDs is higher than that of CLDs.

the CLDs. Neither CHDs nor CLDs could use the Fall-rises to read the yes-no questions with *toch* like the native speakers. As Table 4.3 shows, most cases by CLDs were Low rises, High rises and Falls rather than the Fall-rise while most errors made by CHDs were Low rises.

Table 4.3. The distribution percentage of erroneous contours over yes-no questions with *toch* by CLDs and CHDs.

Contours chosen		CLD	CHD
L*H	H%	26.7	13.3
H*	H%	20.0	3.3
H*L	L%	30.0	5.0
H*L	%	0.0	3.3
H*	%	0.0	3.3

The third type are questions with *echt* 'really', which are optimally read with H* H%. The NSDs read them with H* H% in 63% of the cases, while both CHDs and CLDs read them with the correct contour in less than 20% cases. Like NSDs, both CLDs and CHDs substituted H*L H% and L*H H% for it in most cases, as Table 4.4 shows. The differences in correctness percentages are significant between CLDs and NSDs, between CHDs and NSDs, but insignificant between CHDs and CLDs. Neither CLDs nor CHDs could properly use High rises for the sentence type quite like the native speakers.

Table 4.4. The distribution percentage of erroneous contours in yes-no questions with *echt* by CLDs, CHDs and NSDs.

Contours chosen		CLD	CHD	NSD
H*L	H%	45.0	50.0	26.7
L*H	H%	31.7	18.3	10.0
H*L	L%	3.3	0.0	0.0
L*H	%	1.7	0.0	0.0
L*	H%	0.0	3.3	0.0
H*L	L%	0.0	3.3	0.0
H*L	%	0.0	1.7	0.0
H*LH	H%	0.0	1.7	0.0

The fourth type is the reporting clauses and optimal nuclear the Standard Dutch is the Half-fall, transcribed as H*L %. As shows, only 40% of the utterances were read by NSDs with H CHDs and CLDs used this nuclear contour in less than 20% of (with correct nuclear accent and correct contours). Table 4.5 shows three groups predominantly used H*L H% to replace the contour. NSDs also used H* %, but no CHDs or CLDs did. H*L L% only in few cases (3.3%), but CLDs and CHDs used cases (56.7%, 33.3% respectively).

NSDs' percentage of correct pronunciations of the nuclear is significantly higher than that CLDs' and CHDs' as Table 4.1 shows the difference between CLDs and CHDs is insignificant.

Table 4.5. The distribution percentage of erroneous contours in reporting CLDs, CHDs and NSDs.

Contours chosen	CLD	CHD	NSD
H*L L%	56.7	33.3	3.3
H*L H%	8.3	28.3	26.7
L*H H%	3.3	3.3	3.3
L*H L%	1.7	0.0	0.0
L*H %	0.0	0.0	6.7
H* H%	0.0	0.0	3.3
H* %	0.0	0.0	16.7

The fifth type is the vocative chant, transcribed as H*+!H. 60 utterances for this sentence type produced by NSDs were the chant as shown in Figure 4.11, but less than 40% and less than the utterances were produced with the vocative chant by CLDs respectively. The differences between the three groups percentage of correct pronunciation are significant (Table 4.1) utterances with erroneous nuclear contours shown in Table 4.1 the NSDs were largely Half falls (H*L %), and next they were L%). However, CHDs and CLDs produced largely Falls, in some half falls.

Table 4.6. The distribution percentage of erroneous contours for vocative chants by CLDs, CHDs and NSDs.

Contours chosen		CLD	CHD	NSD
H*L	L%	70.0	45.0	10.0
H*L	%	10.0	11.7	20.0
H*L	H%	3.3	3.3	0.0
L*H	H%	1.7	0.0	0.0
H*!H	H%	0.0	0.0	3.3

The sixth sentence type comprises sentences which contain one of the modal particles *bè*, and *hoor* to trigger a Fall-rise on the preceding accented word, and the optimal nuclear contour for them is therefore H*L H%. All the utterances by the NSDs had this contour, as shown in Figure 4.11. It was used in 75% of the utterances by the CHDs and in 48% of the utterances by the CLDs. The NSDs' percentage of correct pronunciation was significantly higher than that by the CLDs, as shown in Table 4.1. However, the differences with the CHDs were insignificant. As shown in Table 4.7, 1.7% utterances with the erroneous contours by the CHDs were Low rises and 1.7% of them were Half falls while the erroneous utterances by the CLDs were either Low rises (6.7%) or the full Falls (10%).

Table 4.7. The distribution percentage of erroneous contours for the sentence type with *bè* and *hoor* by CLDs and CHDs.

Contours chosen		CLD	CHD
L*H	H%	6.7	1.7
H*L	L%	10.0	0.0
H*L	%	0.0	1.7

The seventh sentence type is the exclamation with *wat* 'what' which is intended to elicit the Fall (H*L L%) or Half fall (H*L %). 70% of the utterances of this type by NSDs in fact were the optimal contours, Full fall or Half fall, as shown in Figure 4.11, but 45% by CLDs and 65% by CHDs were optimal contours. However, Table 4.1 shows that the

differences between the three groups were insignificant. All of the Full fall or Half falls for this types of sentence but with a lot of wrong accents. The alternative used by NSDs and CLDs can be found in Table 4.8. Most utterances by NSDs were H* % or H* %, the erroneous ones by the CLDs are Low rises, Fall-rises and Rise-falls.

Table 4.8. The distribution percentage of erroneous contours in *wat-ex* sentences by CLDs and NSDs.

Contours chosen	CLD	NSD
L*H H%	8.3	0.0
L*H %	1.7	3.3
H*L H%	3.3	0.0
H* H%	0.0	3.3
H*!H %	0.0	3.3
H* %	0.0	6.7

4.3.6.2 Nuclear accent errors and boundary tone errors

The Chinese speakers of Dutch cannot use the correct intonational contours in those intonational idioms like the native speakers of Dutch. Figure 4.11 shows. They either put the nuclear accent in a wrong place or used an incorrect tone at the right-hand boundary of the IP. This section focuses on the nuclear accent errors and the final boundary tone errors made by the Chinese speakers of Dutch compared with the native speakers of the Standard of Dutch.

A One-way ANOVA performed on the data of the nuclear accent errors and boundary tone errors showed that significant differences exist between the three groups for the number of nuclear accent errors ($F[2, 22] = 15.5, p < .001$) and final boundary tone errors ($F[2, 22] = 15.5, p < .001$), as shown in Figure 4.12. The CLDs made significantly more nuclear accent errors than the CHDs ($p < .01$) and the NSDs ($p < .01$). The difference between CHDs and NSDs is not significant. Moreover, the CLDs made significantly more final boundary tone errors than the CHDs and the NSDs (both $p < .01$), and the CHDs made significantly more such errors than the NSDs ($p < .05$). The CLDs made significantly more errors in nuclear pitch accent and the final boundary tone than the NSDs. The CHDs made significantly more final boundary

than NSDs, but their nuclear pitch accent errors are insignificantly more than NSDs. Therefore it seems that the final boundary tones are more difficult for Chinese speakers of Dutch than the pitch nuclear tones.

Figure 4.12. The mean number of errors of nuclear pitch accents and final boundary tones made by CLDs (Chinese speakers of Dutch with high proficiency), CHDs (Chinese speakers of Dutch with low proficiency) and NSDs (native speakers of Dutch).

In sum, the percentages of the correct pronunciations of the seven types of Dutch sentences generally decrease from NSD via CHDs to CLDs, but there are some noteworthy differences along this continuum. The NSDs' percentages of the correct pronunciations are significantly higher than the CLDs', except for the *wat*-exclamations, whose optimal nuclear contour is a Full fall (H*L L%) or Half fall (H*L %). The NSDs' percentages of the correct pronunciations for *wat*-exclamations and alternative questions are not significantly higher than those of the CHDs. The exclamations and alternative questions are like statements for which the Fall contour is used in Chinese, therefore the Chinese subjects' percentages of the correct pronunciations for the two types of sentences are higher than other sentence types. The difficult sentence types for the Chinese subjects are the rhetorical questions with *toch*, the surprised questions with *echt*, the reporting clauses and the vocative chants. For these four types of sentences, the percentages of the correct pronunciations by the NSDs are significantly higher than those of the

CLDs and CHDs. For the rhetorical questions with *toch* and vocative chants, CHDs performed significantly better than CLDs. CHDs significantly outperform CLDs for the type of questions with the reporting clauses. Apparently, H* H% for questions with H*L % for reporting clauses are more difficult for Chinese speakers. H*L H% for questions with *toch* and H*!H for vocative chants.

The optimal nuclear contour is H*L H% for sentences ending with particles *hoor* and *hè* as well as the questions with *toch*. The percentage of correct contours by the NSDs for the first type is significantly higher than that of the CLDs, but no significant difference with the CHDs was found. In the second type, NSDs significantly outperformed CLDs and CHDs. Interestingly then, H*L H% sentences ending with particles *hoor* or *hè* are less difficult than the ones with *toch* located in the middle of the sentence rather than at the end.

As Eckman (2008) predicted, patterns that are less marked in L1 should not be difficult in L2 acquisition, but more marked patterns in L2 are hard to acquire. The marked tones (the Fall-rise, the Half rise, the Half fall and the Vocative chant in Dutch) are difficult for Chinese learners, because in the Chinese tone inventory there are not the same pitch contours. The Chinese speakers of Dutch have more problems with Falls and Rises because there are such lexical items in Mandarin. These findings on the 'intonational idioms' are in line with previous intonation studies of Germanic languages as second languages (e.g. Chen, 2008; Grosser, 1997; Gut, 2009). Non-native speakers of English and German used a reduced tone inventory, and complex tones occurred less frequently than in the native speech (Gut, 2009). In the read speech task, Chinese learners could not choose appropriate intonation to express their pragmatic meanings (Chen, 2008).

The CLDs made significantly more nuclear pitch accent errors than CHDs and NSDs. CHDs made more final boundary tone errors than the NSDs, but their nuclear pitch accent errors were not significantly greater.

4.4 Conclusions

The investigation reported here allows a number of generalizations to be made. First, Chinese learners of Dutch produce more IPs than the native speakers. Moreover, they pause within IPs more often than the native speakers, but the durations of the pauses are not significantly different.

Second, while the pitch range in L2 speech by Chinese learners of Germanic languages has generally been found to be narrower and lower than that of the native speakers (Chen, 2008; Gut, 2009), it was found that their pitch range in L2 Dutch is not significantly different from native Dutch. In fact, it is narrower than that of the native speakers. Even if this difference is insignificant, as it was in the study by He et al. (2011b) (Chapter 6), we may conclude that this finding is related to the low and narrow pitch range of Dutch.

Third, the speech rate and articulation rate of the Chinese speakers with lower proficiency in Dutch are significantly slower than those of their counterparts with higher proficiency and the native speakers. The native speakers' normalized Pairwise Variability Index (nPVI) is significantly larger than that of the Chinese participants, while the nPVI of the Chinese speakers with higher proficiency in Dutch is significantly larger than that of the Chinese speakers of Dutch with lower proficiency. This means that the more proficient they are, the more differentiated syllable durations become, which indicates that advanced speakers are gradually moving away from the 'syllable-timed' rhythm of their mother tongue. Most probably, such factors as speech rate, articulation rate and nPVI contribute to the foreign accent.

Fourth, due to the influence of their mother tongue and their lack of proficiency in the second language, the Chinese speakers with lower proficiency in Dutch have significantly more prenuclear pitch accents than their counterparts with higher proficiency and the native speakers. The Chinese speakers of Dutch with high proficiency can accent words in the sentences in a similar way to the native speakers, even though they sometimes accent function words and words with given information. Our results suggest that with increasing proficiency learners can reduce the influence of their mother tongue here. On the other hand, some Chinese speakers of Dutch, whether they are proficient or less proficient in Dutch, wrongly put pitch accents on the second component in

compound words, as in *potlood* 'pencil', *handdoeken* 'towel' and *verkoop* 'sale'. Some even miss-stressed quite frequent Dutch words, like *elektrisch* 'electric', *daarom* 'therefore' *jarig* 'birthday', *regen* 'rain'. As was shown in Chapter 2, Chinese speakers of Dutch have problems with the morphological rules and often do not know the morphologically determined pitch accent locations in the sentences.

Lastly, Chinese speakers of Dutch can in some cases choose the wrong intonation contours in intonational idioms. They had fewer correct reading *wat*-exclamations and alternative questions in which *Falls* should be used, than with other sentence types. The most frequent sentence types for the Chinese subjects are questions with *toch*, questions with *echt*, reporting clauses and vocative chants. Questions with *toch* and reporting clauses are the most difficult for Chinese subjects. The percentages of correct pronunciations were less than 20%. Chinese speakers performed better on sentences with *hoor* and *bè* than on sentences with *toch*, even though the same intonation contour, *Rise*, is the optimal contour for both sentence categories. This is because sentences with the particles *hoor* and *bè*, which are in the final positions in the sentences, are less marked than sentences with *toch*, which locates in the middle of the sentences. And Chinese speakers of Dutch with lower proficiency made significantly more *no* pitch accent errors and final boundary tone errors than the Chinese speakers with higher proficiency, and the Chinese subjects with higher proficiency made significantly more final boundary tone errors than the Chinese speakers.

Chinese speakers of Dutch thus have some knowledge of 'intonational idioms' in the reading task as we report here. In Chapter 4 we will examine how Chinese speakers of Dutch realize *Falls*, *Rise* and *Rise* in final syllables of the IPs.

4.5 References

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Chapter 5

Mandarin-accented Fall, Rise and Fall-Rise f₀ contours in Dutch¹

5.1 Introduction

Dutch has a large number of nuclear intonation contours, including the Fall, Rise and Fall-rise (Gussenhoven, 2005), while Mandarin Chinese is a tone language with four lexical monosyllabic pitch contours. It therefore lacks the rich inventory of contours of Dutch. This chapter investigates the question how well Chinese learners of Dutch pronounce the Fall, the Rise and the Fall-rise in positions in which they are comparable with the Mandarin lexical tones, i.e. when occurring on the final syllable of the intonational phrase, when the entire contour is realized on one syllable. In this position, variation in the shape of these contours is likely to occur as a function of the availability of voiced, sonorant segmental material. Languages appear to have different strategies to deal with such time-pressure (Grabe, 1998a 1998b; Hanssen, Peters & Gussenhoven, 2007).

The Dutch intonation contours will be elicited in different types of sentences, like questions and statements. Mandarin, too, makes intonational differences between pragmatically different sentences. Two boundary tones have been identified at least for *Guoyu* (Standard Mandarin in *Taiwan*) and *Putonghua* (Standard Mandarin in mainland China), which were claimed to correspond with Y. R. Chao's Rising and Falling endings respectively in Beijing dialect, a dialect very close to Standard Mandarin (Lin, 2006; Peng et al., 2005). The Rising ending was claimed to be used for asking yes-no questions, and the Falling ending for making statements. More recent descriptions show that Chinese

¹ An earlier and shorter version of this chapter appeared as He, van Heuven & Gussenhoven (2012) in the *Proceedings of the 6th International Conference on Speech Prosody*.

speakers adapt their pitch range to convey pragmatic meaning. The difference between declarative and interrogative intonation patterns. The pitch contours of the four lexical tones of *Putonghua* are given in 3.2 in Section 3.1.1, Chapter 3 of this dissertation (p. 63). The difference between declarative intonation and interrogative intonation cannot obviously be described as due to a low and high tone, respectively, given that Tone 2 is a rise and Tone 4 is a fall in both intonations. Expansion of the pitch range typically codes information that are in focus, while a reduced pitch range is found for non-focus materials. Beijing Mandarin has comparable Post-Focus C intonation (Xu, 1999).

There are hardly any studies on how Chinese learners use intonation contours in Germanic languages. Warren (2004) found that Hong Kong English speakers used more rises in different intonation contours when they communicated with native speakers of English. In the intonation perception test by Shen (1990) in which the stimuli were the laryngeal voice output of utterances, native Chinese speakers listening to French, who had never learned French language before the perception test, were able to differentiate falling intonation contours extracted from French native speakers' conversations as well as French native speakers could. Shen (1990) found that Chinese speakers of French who had more training in French pronunciation were judged as more native-like in pronunciation of intonations for unmarked questions and statements than those with less training. The stimuli were the laryngeal voice output of 34 unmarked interrogatives and 30 statements produced by Chinese learners of French and a four native speakers of French. In a test of the degree of nativeness of the questions by the best Chinese speakers and the French speakers, no significance difference was found in the responses by 25 native French listeners who were asked to judge whether the questions sounded like questions. The striking difference between the Chinese and French participants for the question was the realization of the final syllable. The learners either raised its pitch more than the native speakers, over-correctly so to speak, or lowered it first and then raised it finally, forming a falling-rising terminal contour rather than a Rise terminal. Acoustical and auditory studies show that the f_0 of L2 learners was different from that of native speakers. For example, Chinese speakers of French are said to have wider pitch range and higher overall pitch level than native speakers (Shen, 1990).

Chen (2008) found that the Chinese learners of English could produce Falls and Rises according to the syntactic pattern of the sentences, but they could not choose between different kinds of rises in English to express different emotions and pragmatic meanings in a reading task. Sometimes they substituted Falls and Rises for the level tone, especially the subjects with lower English proficiency. The pitch span produced by Chinese learners of English was narrower than that produced by native speakers (Chen, 2008). The pitch spans used by the subjects with higher proficiency were more similar to those used by the native speakers than to those used by the subjects with lower proficiency.

A longitudinal study by Grosser (1997) led to “a tentative proposal of a sequence in the acquisition of tones: simple tones are acquired before complex tones, and falls are produced before rises” (Gut, 2009). If this hypothesis is correct, the Fall-rise in English and Dutch would be difficult for Chinese learners to acquire, because it is the most complex of the three. In addition, it is different from any Mandarin tone. It is carried out entirely in the syllable rime, and as such does not have a direct Mandarin counterpart. Figure 5.1, adapted from Xu (1997), shows that the intonation contours of the Fall, Rise and Fall-rise in Figure 5.2 are broadly similar to those of Tone 4, Tone 2 and Tone 3, respectively. The Chinese speakers of Dutch will have no problem with the Fall and Rise, because there are no major differences between these intonation contours when used in final position in the intonational phrase and Tone 4 and Tone 2, respectively. In that position, they can transfer Chinese Tone 4 and Tone 2 to Dutch when acquiring the intonation of Dutch. Mandarin Tone 3, however, begins any pitch fall earlier and is lower than the Dutch Fall-rise. Tone 3, therefore, cannot successfully be used as a Dutch Fall-rise.

Figure 5.1. Mean f_0 contours of four Mandarin tones of monosyllable /ma/ in isolation, adapted from Xu (1997).

Figure 5.2. Mean f_0 contours of the proper name *Lof* read by the native Dutch in Fall, Rise and Fall-rise. *Lof* is accented and located in the IP-final position.

The availability of phonetic space for the realization of an intonation contour is a factor which contributes to phonetic variation. Speakers can adjust the phonetic shape of a nuclear pitch accent either by

reduced contour trajectory or by increasing the speed of the pitch movement in order to produce the full contour. The first is known as 'truncation', and the latter as 'rate adjustment' (Erikson & Alstermark, 1972), and renamed 'compression' by Bannert and Bredvad (1975).

Investigations of the realization of Fall and Rise contours on phrase-final test words with successively less scope for voicing as manipulated by the phonological vowel length of the nucleus (long and short) and the length of the test words (monosyllabic and disyllabic) showed that the adjustment strategies to the reduction in availability of phonetic space were cross-linguistically different and depended upon the contours in the language (Grabe, 1998a, b). Research by Grabe, Post, Nolan & Farrar (2000) showed that adjustment strategies also differed in varieties of the same language.

In Dutch, Caspers & van Heuven (1993) found the effects of three types of time pressure on the shape and alignment of the accent-lending rise and fall movement in six intonation contours. The pitch of the accent-lending rise and fall were time-compressed rather than frequency-compressed under the time pressure created by increased speech rate. The slope of the pitch fall and the pitch rise were steeper in shorter vowels than in longer vowels. The time pressure for the pitch contours greatly compressed the accent-lending rise, but not the fall in the pitch movements. Under the three types of time pressure, the onset of the rise was likely to be aligned with the onset of the syllable, but the alignment of its end varied due to the presence of a rival fall in the contours. Neither the beginning nor the end of the fall could find anchor points.

Hanssen et al. (2007) investigated the effect of the availability of voiced material on the realization of three nuclear contours in Standard Dutch with three types of Dutch sentences. They used four monosyllabic proper names *Loom*, *Lom*, *Loof* and *Lof* as test words to elicit three nuclear contours, the Fall, the Rise and the Fall-rise ($H^*L\ L\%$, $L^*H\ H\%$ and $H^*L\ H\%$). The test words were phonologically different in the length of the nucleus and did or did not have a sonorant consonant coda. This research suggested that the choice of contour had different effects on the test words. First, the rate of f_0 change was higher in Falls and Rises than in Fall-rises, except for *Loom*. Second, the rate of f_0 change tended to increase when the sonorant portion of the accented word was

shortened in Falls and Rises; for the Fall-rise contour, *Loom* had a slightly increased rate of f0 change, whereas the rate of f0 change for *Lof* and *Lof* was smaller than in *Loom*. The effect of the vowel difference was less clear cut. In Rises, words with a short vowel tended to have a higher rate of f0 change. In Falls, this tendency was reversed. In Fall-rises, there was the opposite tendency. In this contour, the falling and the rising movements were shortened. This meant a compression of the pitch range. The Fall and the Rise were compressed as well as somewhat truncated, since the overall duration was reduced as sonorant portions were shorter.

According to Ladd (2008), the high Fall-rise intonation occurs most often in Dutch on the penultimate or antepenultimate accented syllable rather than on the final accented syllable. On final stressed syllables, the Fall is either avoided (replaced by Rises) or, on Ladd's interpretation, it is realized as Falls (p. 184) by native speakers in a corpus-based study.

Our general research question is how Mandarin speakers whose native language is a tone language, produce the three intonation contours of Dutch H*L L%, L*H H% and H*L H% on IP-final monosyllabic words and whether the systematic variation due to reduced sonorant material that native speakers display is also present in the L2 production of the Mandarin subjects. In the experiment, we thus studied the effect of time pressure on the production of the three contours by the Mandarin speakers following methodology in the research by Hanssen et al. (2008) and Hanssen (forthcoming), so that we can compare the production of the Mandarin speakers of Standard Dutch (NSD). Specifically, the questions addressed were the following:

- (1) Can Mandarin Chinese speakers of Dutch produce the three intonation contours on IP-final monosyllabic words after practicing the three examples given before they are recorded and to what extent do their realizations differ from those by native speakers of Dutch?
- (2) Do adjustment strategies to diminished availability of phonetic space adopted by the NSD differ from those used by Mandarin speakers of Dutch with higher proficiency (CHD) and lower proficiency (CLD)?

5.2 Method

5.2.1 Materials

Time pressure was created by the four Dutch monosyllabic proper names *Loom*, *Lom*, *Loof* and *Lof* with phonologically different length of the nucleus (/o:/ and /ɔ/) and the contrast of obstruent versus coda consonants /f, m/ in the test words. The test words were put into short carrier sentences to elicit three different nuclear contours, the Fall, the Rise and the Fall-rise (or H*L L%, L*H H% and H*L H%, following Gussenhoven, 2005). In the corpus, we included three types of sentences: a statement with narrow information focus, a yes-no question, and a rhetorical question with corrective focus as exemplified by (1) to (3) below. They were intended to elicit the Fall, Rise and Fall-rise respectively. The rhythmic structure and the number of syllables before the test word in the carrier sentences were held constant. In order to minimize the speakers' chance to produce prenuclear accents which would result in downsteps (Pierrehumbert, 1980; van den Berg, Gussenhoven & Rietveld, 1992) and other possible effects on the nuclear contours, the carrier sentences were short and the new information was located in the final target word. All carrier sentences were preceded by a context sentence, with which they formed mini-dialogues. Before the recording, two example mini-dialogues, which were different from the test materials, were provided to the subjects to practise the intonation contour to be elicited in each of three blocks of mini-dialogues. Each block contained two examples plus four test mini-dialogues with the same test contour in the response sentence (see Appendix 5).

(1) Statements

A: *Met wie gaat je baas morgen trouwen?*

'Who is your boss going to marry tomorrow?'

B: *Hij trouwt met mevrouw de Loom.*

'He is going to marry Mrs. de Loom.'

(2) Yes/No questions

A: *Ik moet straks naar de baas komen, omdat ik weer te laat was vanmorgen.*

'I'll have to see the boss in a minute, because I was late again this morning'.

B: *Moet je naar dokter Loom? Oei, maak je borst dan maar nat!*

'Do you have to go see doctor Loom? Goodness, then you can expect the worst!'

(3) Rhetorical questions

A: *Dit antieke horloge is nog van opa Thijssen geweest.*

'This antique wristwatch belonged to grandfather Thijssen

B: *Het was toch van opa Loom?*

'Wasn't it grandfather Loom's?'

5.2.2 Subjects

Twenty (3 male, 17 female) Mandarin Chinese speakers of Dutch from 17 to 53, in the experiment are the same participants as in the experiments reported in this dissertation. They were divided into a higher (Chinese Higher Dutch: CHD) and a lower (CLD) group on the basis of each subject's mean score over their segmental and suprasegmental proficiency scores as in previous chapters.

The native subjects (14 female, 9 male) of Standard Dutch were from 14 to 49. The data of the native speakers were all obtained from the Standard Dutch corpus in the NWO project *Intonation in Dutch*.

5.2.3 Recordings of Chinese subjects

The example dialogues and the context sentences were all recorded by different native speakers in the studio of the Arts Faculty of the University of Nijmegen. The two examples and the four random dialogues for each type of intonation contour were all included in a Powerpoint file with the examples at the beginning of each list of dialogues. In order to maximize the chances that participants would produce the test words and produced the target contours, they were asked to practice the response sentence in the example dialogues in each list before listening to the sound files played from a laptop before recording. If they could reproduce the contour fluently, the recording began. During the recording, the experimenter played the example dialogues and the context sentences in the test dialogues. The subjects read aloud the response sentence from a page in the list in which only one dialogue was printed on each page. Subjects were recorded with the help of a Handy Recorder Zoom H4, with a 48 kHz sampling rate and 16 bit stereo format in different places: in the

classrooms, or in libraries; one and three subjects were respectively recorded in sound-treated booths at Radboud University Nijmegen and Groningen University. All response sentences including those in the examples were recorded and the subjects were allowed to repeat any reading which they thought was not their best reading of the response sentence. The sound files were saved in the computer for analysis.

5.2.4 Acoustic measurements

5.2.4.1 Labelling

We used the labels in Table 5.1 to annotate our data as Figure 5.3 shows, following Hanssen's (forthcoming) method.

Figure 5.3. An illustration of how tonal and segmental labels on a target word are placed on the basis of the auditory information and visual inspection of the waveform, pitch signal and spectrogram. The panel shows an utterance of the rhetorical question *We gaan toch naar bakker Lof?* 'Aren't we going to baker Lof?' read by a Chinese speaker of Dutch.

The tonal labels of the f_0 minima and maxima of the three nuclear contours were placed on the first tier. The segmental boundaries of the test words were labelled on the second. Since the boundaries between segments are rarely clear-cut, the point where phonemes least affected each other was chosen as the location of the boundary and were placed at positive zero-crossings. The name of the test sentence, the nuclear

contour transcribed with ToDI and comments made if necessary provided on the third.

Table 5.1. Overview of tonal and segmental labels

Labels	Fall	Rise	Fall-rise
L1	f0 elbow preceding nuclear peak	f0 elbow at beginning of nuclear rise	f0 elbow preceding nuclear peak
H1	nuclear f0 peak	end of nuclear rise	nuclear f0 peak
L2	end of nuclear fall	-	elbow between maxima
H2	-	-	end of nuclear rise
O	beginning of onset of accented word (/l/ for all test words)		
V	beginning of vowel of accented word (/ɔ/ for <i>Lof</i> and <i>Lom</i> , /o:/ for <i>Loof</i> and <i>Loom</i>)		
C	beginning of coda of accented word (/f/ for <i>Lof</i> and <i>Loof</i> , /m/ for <i>Lom</i> and <i>Loom</i>)		
E	end of coda of accented word		

The labels for the f0 maxima (H1 and H2) in the contours were determined automatically; we used a *Praat* function that gives the location of the highest pitch in a selected interval. Similarly, the location of the turning point in Fall-rises (L2) was determined automatically. The labels for the f0 minima at the beginning of all contours (L1) and the end of the nuclear Fall (L2) was less straightforward. Considering that rate of f0 change (which is calculated by f0 excursion by f0 duration) is an important variable in the analysis, it is essential that the labels should not be placed too early or too late. Figure 5.4 shows, the two falling contours (a & b) differ in the high and low f0 turning points in contour (a) correspond to the maximum and minimum, they can be automatically labeled with *Praat* functions, and the average speed of movement closely reflects the actual movement in the speech. However, if the position of the target of contour (b) is labeled with the *Praat* function to find the minimum automatically, the rate of f0 change will fluctuate considerably. So the elbow is defined as a point in the pitch movement where

a sudden change in the f_0 slope. Some interruptions and non-tonal signals caused by microprosodic perturbation were ignored in the labelling. As example (c) indicates, the low turning point is therefore labeled manually as the elbow of the f_0 contour. The elbow at the start of the rise was determined similarly.

Figure 5.4. Representations of a falling contour, with (a) and without (b, c) a clear elbow. The dotted line represents the average movement between two f_0 labels (from Hanssen, forthcoming).

5.2.4.2 Variables

We measured the following properties and used them as variables to analyze the data:

- a. duration of the sonorant rime
 $t(E) - t(V)$ for *Lom*, *Loom*; $t(C) - t(V)$ for *Lof*, *Loof*
- b. duration in ms of the Fall, Rise and Fall-rise
 Fall: $t(L2) - t(H1)$
 Rise: $t(H1) - t(L1)$
 Fall-rise: $t(L2) - t(H1)$ and $t(H2) - t(L2)$
- c. distance in ms of f_0 maximum to beginning of vowel
- d. location (in %) of f_0 maximum relative to duration of vowel
- e. excursion in semitones of the Fall, Rise and Fall-rise
 Fall: $f_0(L2) - f_0(H1)$
 Rise: $f_0(H1) - f_0(L1)$
 Fall-rise: $f_0(L2) - f_0(H1)$ for the first part (falling movement)
 $f_0(H2) - f_0(L2)$ for second part (rising movement)
- f. speed of movement of Fall, Rise and Fall-rise (f_0Exc/f_0Dur)
- g. f_0 of H1, L2 (Fall), L1, H1 (Rise), and H1, L2, H2 (Fall-rise)

5.3 Results

5.3.1 Prosodic results

The percentages of the 80 utterances per contour (4 sentences per subject) that were pronounced with correct intonation and a correct pitch contour of the target words are shown in Figure 5.5. As for the 80 utterances, 77 utterances were produced with a correct (falling) intonation contour; three incorrect utterances had a Rise, all by the CHDs; however, 77 correct utterances, 32 were downstepped falls (47% for the CHDs, 53% for the CLDs), whose occurrence is related to the accents on the words prior to the target word. In addition, five target words were deaccented (20% by the CHDs, 80% by the CLDs). As for the 80 utterances, 77 utterances were correctly pronounced as Rises and had accents on the target words. As for the Fall-rise, 58 utterances (73%) were pronounced as rises and with accents on the target words. Twenty-one utterances (26%) by the CHDs, 12 by the CLDs) were produced as Rises and one by the CHDs as a CLD; one CHD pronounced the Fall-rise as a Rise and also as a CLD; three downsteps by two CLDs were found in the Fall-rise.

From Figure 5.5, we know that the Fall-rise was the most difficult intonation configuration for Chinese learners of Dutch, who had few examples in Mandarin with the Fall and Rise, for which they can transfer Tone 4 and Tone 2, respectively. Tone 3 in Mandarin, which is a low tone, was transferred to Dutch as a pronunciation of the Fall-rise, and its realization to be difficult for Chinese learners to acquire.

Figure 5.5. Percentage of correct contours produced by Chinese group (Fall, Rise and Fall-rise)

5.3.2 Sonorant rime comparisons

The duration of the sonorant rime consists of the duration of vowel and the nasal consonant in our four test words. Since it is an important factor for speakers to realize an intonation contour, we compared the durations of the sonorant rimes produced by different groups or subgroups of subjects in different sentence conditions.

CLDs could not pronounce the short vowel /ɔ/ and the long vowel /o:/ correctly, as Figure 5.6 shows. For the Fall, the mean duration of /o:/ in *Loom* was only 4 ms longer than /ɔ/ in *Lom*. In the Rise, /ɔ/ (194 ms) of *Lof* was hardly shorter than /o:/ (200 ms) of *Loof*, and /ɔ/ (155 ms) in *Lom* is in fact longer than /o:/ (153 ms) of *Loom*. In the Fall-rise, both /ɔ/ in *Lof* (292 ms) and *Lom* (268 ms) were longer than their counterparts (/o:/ in *Loof* (286 ms) and *Loom* (242 ms). By contrast, all CHDs pronounced the short and the long vowels correctly in the three sentence types, quite like the native group. Since Chinese does not exploit length as a vowel feature at the phonological level (Wang & van Heuven, 2006), it is not surprising that CLDs could not pronounce the vowel quantity contrast correctly.

The sonorant rime of *Loom* as produced by CLDs was longer in the Fall and Rise, so they lengthened the coda /m/ to compensate the insufficient duration of the long vowel; but in the Fall-rises of *Lof* and *Lom* were longer than those of *Loof* and *Loom* respectively. The codas of *Lom* and *Loom* were longer than those produced by CHDs and those by CHDs were longer than those by native speakers, except in the case of the Fall-rise, in which the duration of /m/ in *Lom* by CHDs was shortest in the three groups and the duration of /m/ in *Loom* by CLDs was the longest. The durations of the sonorant rimes produced by the CLDs were all longer than those by the native speakers and those by the CHDs with the exception *Loof* in the case of the Fall and Rise.

In the Fall, the sonorant rimes between the three groups are significantly different ($F[2, 35] = 6.6, p < .05, \eta^2 = .27$). Multiple comparisons show that CLDs' sonorant rime durations are significantly longer than those by CHDs ($p < .05$), though the difference with the NSDs is not significant ($p > .05$). Sonorant rimes are also significantly shorter than CHDs' ($p < .05$).

In the Rise, sonorant rime durations differ significantly between the three groups ($F[2, 38] = 6.6, p < .05, \eta^2 = .26$). The differences in sonorant rimes between CLDs and CHDs and between CLDs and NSDs are not significant, but CLDs' sonorant rimes are longer than those by NSDs ($p < .05$).

In the Fall-rise, the sonorant rimes between the three groups are significantly different ($F[2, 38] = 34.2, p < .05, \eta^2 = .64$). The durations of sonorant rimes by CLDs are significantly longer than those by CHDs ($p < .05$), and those by CHDs are significantly longer than those by NSDs ($p < .05$). In short, the lower the proficiency in Dutch, the longer the sonorant rimes in target words are, regardless of contour.

Figure 5.6. The sonorant rime duration of the four target words (*Lof*, *Loof*, *Lom* and *Loom*) in the three contours (Fall, Rise and Fall-rise), L: Chinese speakers with lower proficiency in Dutch; H: Chinese speakers with higher proficiency in Dutch; D: native speakers of Dutch. The error bars enclose ± 1 standard error.

5.3.3 Analysis of f_0

The positions of L1, H1, L2, H2 and onset of the vowels are indicated by marks in the following figures for the relevant contours by the native speakers of Standard Dutch and the Chinese subjects. The pitch in semitone (ST) and the timing in millisecond (ms) are mean values of the target words. The timings of H1, H2, L2 and the onset of the vowel were obtained with reference to the timing of L1, which was set to zero. L1 is also the zero alignment point for the f_0 . Figure 5.7 to 5.15 were drawn from averaged data based on the correctly pronounced accents and nuclear pitch contours.

Figure 5.7. The Fall contours with the four target words (*Lof*, *Lom*, *Lof*, *Loom*) produced by the native speakers of Dutch. The landmarks are the positions of L1 (the f_0 elbow preceding nuclear peak), the onsets of the vowels in the words, H1 (the nuclear f_0 peak) and L2 (the end of nuclear Fall), respectively. Both the timing and pitch of L1 have been set to zero.

Figure 5.8. The Fall contours with the four target words (*Lof*, *Lom*, *Lof*, *Loom*) produced by CHDs (Chinese speakers with higher proficiency in Dutch). The landmarks are the positions of L1 (f_0 elbow preceding nuclear peak), the onsets of the vowels in the words, H1 (the nuclear f_0 peak) and L2 (the end of nuclear Fall), respectively. Both the timing and pitch of L1 have been set to zero.

Figure 5.9. The Fall contours with the four target words (*Lof*, *Lom*, *Loof* and *Loom*) produced by CLDs (Chinese speakers with lower proficiency in Dutch). The landmarks are the positions of L1 (f0 elbow preceding nuclear peak), the onsets of the vowels in the words, H1 (the nuclear f0 peak) and L2 (the end of nuclear Fall), respectively. Both the timing and pitch of L1 have been set to zero.

Figure 5.10. The Rise contours with the four target words (*Lof*, *Lom*, *Loof* and *Loom*) produced by the native speakers of Dutch. The landmarks are the positions of the onsets of vowels in the words, L1 (f0 elbow at the beginning of the nuclear Rises) and H1 (the end of nuclear Rise), respectively. Both the timing and pitch of L1 have been set to zero.

Figure 5.11. The Rise contours with the four target words (*Lof*, *Lom*, *loof*, *loom*) produced by CHDs (Chinese speakers with higher proficiency in Dutch). The marks are the positions of the onsets of vowels in the words, L1 (f_0 elbow at the beginning of the nuclear Rises) and H1 (the end of nuclear Rise), respectively. Both timing and pitch of L1 have been set to zero.

Figure 5.12. The Rise contours with the four target words (*Lof*, *Lom*, *loof*, *loom*) produced by CLDs (Chinese speakers with lower proficiency in Dutch). The marks are the positions of the onsets of vowels in the words, L1 (f_0 elbow at the beginning of the nuclear Rises) and H1 (the end of nuclear Rise), respectively. Both timing and pitch of L1 have been set to zero.

Figure 5.13. The Fall-rise contours with the four target words (*Lof*, *Lom*, *Loof* and *Loom*) produced by the native speakers of Dutch. The landmarks are the positions of L1 (the f_0 elbow preceding nuclear peak), the onset of the vowels in the words, H1 (the nuclear f_0 peak), L2 (the elbow between two f_0 maxima) and H2 (the end of nuclear contour), respectively. Both the timing and pitch of L1 have been set to zero.

Figure 5.14. The Fall-rise contours with the four target words (*Lof*, *Lom*, *Loof* and *Loom*) produced by CHDs (Chinese speakers with higher proficiency in Dutch). The landmarks are the positions of L1 (the f_0 elbow preceding nuclear peak), the onset of the vowels in the words, H1 (the nuclear f_0 peak), L2 (the elbow between two f_0 maxima) and H2 (the end of nuclear contour), respectively. Both the timing and pitch of L1 have been set to zero.

Figure 5.15. The Fall-rise contours with the four target words (*Lof*, *Lom*, *Loof*, *Loom*) produced by CLDs (Chinese speakers with lower proficiency in Dutch). The graph shows the positions of L1 (the f0 elbow preceding nuclear peak), the onset in the words, H1 (the nuclear f0 peak), L2 (the elbow between two f0 maxima) and the end of nuclear contour, respectively. Both the timing and pitch of the contours are set to zero.

In the following statistical analyses, we excluded the subjects who could not produce any one of the four target words correctly. We excluded 8, 8 and 22 subjects for the Falls in the CLD, CHD and MLD, respectively, 10, 10 and 21 subjects for the Rises, and 8, 8 and 21 subjects for the Fall-rises. In addition, there were missing data for some subjects for one reason or another. In order to get values for the missing data, we averaged the values of a variable in which all subjects had full data in the four words and used the average as a reference. The missing data in any empty cell was obtained by subtracting the corresponding reference average to the difference between the reference data of a speaker with missing data and the corresponding reference average. To get x in Table 5.2, for example, we first selected those parts of the table that have a full data specification (see the shaded cells). We calculated the column means for that selection only, took the mean of the values in that column (6.73) and added it to the mean difference between the non-empty cells of Speaker 1 from the corresponding reference values. That is, the mean of (13.88, 12.00, 11.02) = 12.30. The mean of (7.90, 6.53, 6.40) = 6.94. So, Speaker 1 is 12.30 - 6.94 = 5.36 semitones higher pitched than the reference speakers. Then the x in the cell gets the value 6.73 + 5.36 = 12.09. Repeating this procedure for all cells in the table gives the final values.

procedure for all other empty cells of the same variable, for all other variables in the dataset and for all other datasets (Rise, Fall, Rise-fall), but doing it separately for native speakers and Chinese speakers of Dutch, we obtained substitute values for all the missing data. Percentages of missing data were sometimes high. For the Fall, 37.3% of the cells were missing in the data for the Chinese subjects and 19% for the native speaker group. For the Rise, there were no empty cells in the Chinese group, but 33.9% in the native group. For the Fall-rise, 23.6% were missing for the Chinese group and 7.6% for the native group.

Table 5.2. The data points of L1's f0 (the f0 elbow preceding nuclear peak) in the four target words (*Lof*, *Lom*, *Loof* and *Loom*) produced by the NSDs for the Fall. Means in shaded cells are based on actual data, means in non-shaded cells were computed through imputation (see text).

speaker	L1f0_lof_f	L1f0_lom_f	L1f0_loof_f	L1f0_loom_f
1	13.88	X	12.00	11.02
2	13.33		12.51	
3	14.87	10.27	12.68	11.56
5	4.27	5.07	0.84	2.72
6	5.83	3.01	1.33	3.44
7	0.00	7.59	7.59	9.69
8			10.56	
9	6.90	0.68	2.12	0.84
11	11.38	10.74	9.98	9.19
12	12.93	11.11	10.56	9.39
13	13.25	11.20	11.83	11.02
15	10.27	11.83	12.00	10.56
16	11.20	11.91	11.20	10.46
17		-0.71	-1.07	-0.53
21	1.33	-1.07	V0.17	0.00
23	9.88			8.14
24	5.45	3.16		3.16
26	2.57	-1.63	-1.63	-2.02
31		8.98	9.49	9.39
32		8.98	9.79	9.79
33	15.86			6.55
36			3.30	
mean	7.90	6.73	6.53	6.40

5.3.3.1 Peak alignments in the Fall, Rise and Fall-rise

Peak alignment, a measure indicating the location of an f_0 peak relative to the onset or offset of a syllable or rime, depends on many prosodic factors (Xu, 2001). The peak moves away from the syllable rime onset along with the syllable offset, if factors like speech rate and vowel length cause the sonorant part of a syllable to lengthen. The peak moves in the opposite direction, closer to the syllable onset or offset, if the lengthening of the syllable is caused by prosodic factors like an upcoming stress, pitch accent or phrase boundary (Cassidy & Heuven, 1993; Ladd, Mennen & Schepman, 2000; Prieto, van der Lely & Hirschberg, 1995; Xu, 2001).

Studies have shown that peak alignment can disambiguate sentence types. It plays a role in disambiguating Hungarian statements and questions with a phonetically rising-falling pitch contour, where an early pitch peak (early in the accented vowel) was associated with declaratives and a late peak (in the second half of the accented vowel) with interrogatives (Gósy & Terken, 1994). Studies of question statement disambiguation in other languages, like Neapolitan (D'Imperio & House, 1997) and Swedish (House, 2004), also showed the same pattern.

A study by Prieto (1995) showed that onset duration correlated with peak delay. The conclusion was in accordance with the findings for English nuclear peak location was influenced by onset and offset durations and by their durations, but it went against Silverman and Pierrehumbert's proposal that the peak placement should not be affected by the duration of the onset. Rietveld & Gussenhoven (1995) found in their research that peak location in Dutch moves left when the preceding consonant is sonorant as compared to voiceless.

Since our Chinese speakers of Dutch produced longer vowel durations than native speakers and the onset of the four target words were relatively late, we located the peak position relative to the beginning of the vowel (thereafter called 'peak delay'), but we also expressed this as a percentage of the peak delay ('proportional peak delay') to control for the duration of the vowel, partly because Chinese speakers produced longer vowels.

As for the Fall, the peak occurred later for the three groups of speakers if the sonorant rime was longer. However, the peak of *Loom* was earlier than that of *Lom* for all three groups and the peak of CHDs' *Loof* was later than that of their *Loom*. Overall, peak delay was significantly different ($F [1.7, 58.5] = 3.57, p < .05, \eta^2 = .092$), but there is no interaction between the groups. Differences in peak delay between the three groups were not significant ($F [2, 35] = .19, p > .05, \eta^2 = .01$). Similarly, the proportional peak delay was significantly different within the groups ($F [2.4, 82.9] = 8.3, p < .001, \eta^2 = .191$), but there was no interaction with the groups. Though the percentages by NSDs were higher than those by CHDs and those by CHDs were higher than those by CLDs, the differences between the three groups were not significant ($F[2, 35] = .37, p > .05, \eta^2 = .021$). We checked a third alternative measure, the proportions of the peak delay in the rime, only to find the same result.

Because peaks appear at the end of the sonorant rime in the Rise and sonorant rimes vary in duration, it is not surprising that words with longer sonorant rimes had greater peak delays for the Rise in all three groups. An exception was the peak of *Loom*, which was earlier than that of *Lom* for the CLDs. The peak delays of the four words by CLDs were larger than those by CHDs and those by CHDs were larger than those by NSDs. Overall, differences between targets words were significant ($F[2.7, 101.9] = 58.47, p < .001, \eta^2 = .606$), and there was a significant interaction with the groups ($F[5.4, 101.9] = 4.8, p < .001, \eta^2 = .202$). The differences in peak delay between the three groups were just significant ($F[2, 38] = 3.2, p = .05, \eta^2 = .15$), with CLDs having longer peak delays in the four words ($p = .055$). There is no consistent effect of vowel quantity on proportional peak delay: while *Loof* has a greater proportional peak delay than *Lof*, in the case of *Loom* the proportional peak delay is less than in *Lom*. NSDs had the latest proportional peak delays, while CLDs had the lowest in *Lof* and *Loof*. The NSD value in *Lom* was between CLDs, the lowest, and CHDs, the highest, and their value in *Loom* was the earliest, before the CHD and the CLD values, respectively. Overall, proportional peak delay was significant across the words ($F[2.6, 98.1] = 142.36, p < .001, \eta^2 = .789$), and there was no interaction with the groups ($F[5.2, 98.1] = 1.33, p > .05, \eta^2 = .065$). Differences between the three groups were insignificant ($F[2, 38] = .13, p > .05, \eta^2 = .007$). We checked the third alternative measure, peak delay as a proportion of the rime, only to find the same result.

In the Fall-rise, the words with longer sonorant rimes had later peak positions in the utterances by the NSDs. For the CLDs, the peaks in the words with coda /m/ were located later than those in the words with no coda. The peaks in *Lom* and *Lof* were later than those in *Loom* and *Loof*. For the CHDs, the peak of *Lof* was earlier than that of *Loof*, but the peak of *Loom* was earlier than that of *Lom* and *Loof*. Within the group, peak positions were significantly different ($F[3, 114] = 8.30, p < .001, \eta^2 = .179$). The interaction with groups ($F[6, 114] = 5.67, p < .001, \eta^2 = .23$) was significant. Peak positions were not significantly different among the three groups ($F[2, 38] = 1.6, p > .05, \eta^2 = .076$). As for the proportional peak delay, the words with longer sonorant rimes had greater peak delay. The analysis shows that /m/ causes f0 peaks to move right. The percentage of peak delay was lower than that of *Lom* for both NSDs and CHDs, meaning that coda /m/ pulls the peak rightwards more in short vowels than in long vowels. The percentage in *Loof* was lower than that of *Lof* for NSDs. The difference in the percentages were significant ($F[2.4, 90.6] = 4.74, p < .001, \eta^2 = .376$), and the interaction with the group was also significant ($F[4.8, 90.6] = 4.74, p < .005, \eta^2 = .200$), but between NSDs and CHDs the differences were insignificant ($F(2, 38) = 1.7, p > .05, \eta^2 = .08$). The proportional peak delay in the rime was not significantly different ($F[2, 38] < 1$).

In sum, the proportional peak delays, whether measured relative to the vowel or the rime, were not significantly different between the two groups. This means Chinese speaker of Dutch located the peak like the native speakers did, even though overall the CHDs behaved differently from the native speakers.

5.3.3.2 Comparison of excursions of the Fall, Rise and Fall-Rise

In this analysis, f0 excursion refers to f0 differences in the Fall, between H1 and L2 in the Fall, between L1 and H1 in the Rise, and between H1 and L2 in the falling movement of the Fall-Rise. The f0 duration is the distance in ms from H1 to L2 in the Fall, from L1 to H1 in Rise, from H1 to L2 in the falling movement of the Fall-Rise, and from L2 to H2 in the rising movement of that contour. By comparing the excursions by their corresponding f0 durations, the rate of

obtained. This can be used to compare how f0 falls or rises between the various conditions. A stable f0 excursion and an increasing rate of change on shorter words can be interpreted as compression, while a decreasing f0 excursion on shorter words and a stable rate of f0 change can be taken as evidence of truncation.

The Fall

The f0 excursions (H1-L2) in the four target words produced by the Standard Dutch group were ranked $Lom_{H1-L2} > Loom_{H1-L2} > Loof_{H1-L2} > Lof_{H1-L2}$, where the largest difference is between the words ending in /m/ and those ending in /f/. The rate f0 change (RC) was ordered $Lof_{RC} > Loof_{RC} > Lom_{RC} > Loom_{RC}$, as shown in Figure 5.7. This means that native speakers speeded up the rate of f0 change as the sonorant rime got shorter, while their excursions diminished as the sonorant rime got shorter. Concomitantly, NSDs reduced the distance over which the f0 movement was carried out.

As can be perhaps be discerned in Figures 5.8 and 5.9, CHDs ordered f0 excursion and rate of f0 change as $Loof_{H1-L2} > Lom_{H1-L2} > Loom_{H1-L2} > Lof_{H1-L2}$ and $Loof_{RC} > Lom_{RC} > Loom_{RC} > Lof_{RC}$; CLDs ordered them $Loom_{H1-L2} > Lom_{H1-L2} > Loof_{H1-L2} > Lof_{H1-L2}$ and $Loof_{RC} > Lom_{RC} > Loom_{RC} > Lof_{RC}$. However, no significant differences were found in the f0 excursion ($F[2, 35] = .43, p > .05, \eta^2 = .024$) or rate of f0 change ($F[2, 35] = 1.82, p > .05, \eta^2 = .094$) between the three groups. Within groups, it was found that NSDs truncated *Lof* and *Loof*; CHDs truncated *Lof*; CLDs did not truncate any words. The lack of significant differences in f0 excursion (H1 to L2) means that the pitch spans of the three groups were not significantly different.

The relevant peaks to L1s (Figures 5.7, 5.8 and 5.9) within group were significantly different ($F[3, 105] = 8.0, p < .001, \eta^2 = .187$). No significant interaction between groups and target words was found ($F[6, 105] = 2.1, p = .065, \eta^2 = .105$). The differences in peaks between group were not significant either ($F[2, 35] = 2.93, p > .05, \eta^2 = .143$). The four target words had effects on the peaks, but there were no significant differences among the groups. Peaks produced by the Mandarin speakers of Dutch were similar to those by the native speakers.

The Rise

As shown in Figure 5.10, the f0 excursion was ranked $Lom_{L1-H1} > Loom_{L1-H1} > Lof_{L1-H1}$ for the native speakers, while the change was ranked $Lof_{RC} > Loof_{RC} > Lom_{RC} > Loom_{RC}$. NSDs distance over which the f0 movement was carried out as the portion was shorter. CHDs increased the rate of change in rimes much like the native speakers and f0 excursions vary way. The f0 excursions by the CHDs (Figures 5.11) were ranked $Loom_{L1-H1} > Lof_{L1-H1} > Loof_{L1-H1}$ and f0 durations were ranked $Loof_{RC} > Lom_{RC} > Loom_{RC}$. For the CLDs, f0 excursions were ranked $Loom_{L1-H1} > Lom_{L1-H1} > Lof_{L1-H1} > Loof_{L1-H1}$ and f0 durations were ranked $Loom_{RC} > Loof_{RC} > Lom_{RC}$ (Figure 5.12). But really, CLDs differentiate the Rises at all much across the four words.

No significant differences were found in f0 excursion between groups ($F[2, 38] = 1.1, p > .05, \eta^2 = .052$), but the differences in f0 change were significant ($F[2, 38] = 3.8, p < .05, \eta^2 = .16$). Comparisons showed that differences in the rate of f0 change between NSDs and CLDs were significant ($p < .05$), but not between CHDs or between CHDs and NSDs. Again, this shows that CHDs increased the rate of f0 change when the sonorant rime was shorter, while CLDs failed to adopt such a strategy in response to reduction in phonetic space. Within groups, NSDs truncated words ending in /f/ relative to those ending in /m/, and compressed words ending in /f/; CHDs didn't truncate any words, but compressed words ending in /f/; CLDs truncated the words ending in /f/, but did not truncate any words.

The fact that there are no significant differences in f0 excursion between groups (the relevant peaks) means that the pitch spans of the target words were not significantly different. Within the entire group, the f0 peaks were significantly different ($F[3, 114] = 11.5, p < .001$), while the interaction between groups and target words was not significant ($F[6, 114] = 4.0, p = .001, \eta^2 = .174$). Target words had different f0 peaks, and different groups produced different the peaks in the target words.

The Fall-rise

In the falling part of the Fall-rise, shown in Figures 5.13 to 5.15, the three groups had longer f_0 durations in the target words with longer sonorant rimes, except that both CHDs and NSDs had a longer f_0 fall in *Loof* than in *Lom*, whose sonorant portion is longer than that of *Loof* (Figure 5.6). The difference in fall duration was significant between the three groups ($F[2, 38] = 6.4, p < .05, \eta^2 = .251$). CLDs' were the longest and NSDs' were the shortest. No significant differences were found by multiple comparisons between CLDs and CHDs or between CHDs and NSD, but the difference between CLDs and NSDs was significant.

Again in the falling movement of the contour, the rate f_0 change was faster for *Lof* than for *Loof*, and that for *Lom* was faster than that for *Loom* for all three groups. This means that target words with long vowels had lower rates of change than those with short vowels, as is to be expected. However, although the differences in the rate of f_0 change for these three groups failed to reach significance, target words with different codas showed different patterns in the three groups. For the NSDs, it was slower in *Loom* than in *Loof*, but unexpectedly it was faster in *Lom* than in *Lof*; for the CHDs, oddly, the target words with /m/ had faster rates than those with /f/; for CLDs, the tendency was the opposite of that for NSDs, that is, the rate of change was faster in *Loom* than in *Loof*, but in *Lom* it was slower than in *Lof*.

In the rising movement of the contour, the NSDs had wider f_0 excursions in the target words with longer sonorant rimes. The CHDs had the same tendency, but the f_0 excursion in *Loof* was wider than that in *Lom* and in *Loom*. However, the f_0 excursion in the pronunciation of *Loom* by the CLDs was narrower than that in their *Lom*. As in the falling movement of the contour, CLDs had the widest f_0 excursions, while the NSDs had the narrowest. The differences in f_0 excursion between the three groups were significant ($F[2, 38] = 6.4, p < .05, \eta^2 = .25$). Multiple comparisons showed that differences were significant between CLDs and NSDs, between CLDs and CHDs and between CHDs and NSDs.

The rate of f_0 change in the rising movement of the Fall-rise was found to be slower, overall, in *Lof* than in *Lom*, while in *Loof* it was the fastest. In *Lom*, it was faster than *Loom* for CLDs and CHDs, but not for NSDs. The differences between the three groups were not significant ($F[2, 38]$

= .93, $p > .05$, $\eta^2 = .047$). Unlike what we found for the rising movements, the Fall and the Rise, speakers tended to increase f_0 change in the Fall-rise in longer sonorant rimes.

In both the falling and rising movements of the Fall-rise, the excursions by NSDs were significantly narrower than those by CHDs, but no significant differences were found between NSDs and CLDs, and between CLDs and CHDs. The rates of f_0 change between the two groups were not significantly different. Looking at the two movements within the groups, NSDs truncated *Lof*, *Loof* and *Lom*, and CHDs truncated *Lof* and *Lom*, and compressed *Loof*. CLDs truncated *Lof* and *Loof*, and compressed *Lof*. In this analysis, we learn again that CHDs pronounced the Fall-rises more like the CLDs.

In the Fall-rises, the relevant peaks to L1 were significant within group ($F[3, 114] = 13.04$, $p < .001$, $\eta^2 = .255$), and the differences between target words and group were not significant ($F[6, 114] > .05$, $\eta^2 = .078$). Between groups, The differences in the peak height were not significant ($F[2, 38] < 1$). This shows that target words were pronounced on the peaks, but different groups behaved similarly in terms of peak height.

Neither the f_0 of H1 and of H2 (relative to L1) in the Fall-rise were significantly different between the three groups ($F[2, 35] < 1$, $p > .05$, $\eta^2 = .052$; $F[2, 38] < 1$; $F[2, 38] < 1$, respectively). No significant differences were found in the case of the Fall and the Rise, either, no difference in pitch span was found between the two groups of speakers. This result is not in line with Chen's findings (2004) that the pitch span by Chinese learners of English was narrower than that by native speakers and that the pitch spans by subjects with higher proficiency were more similar to those by the native speakers than those by subjects with lower proficiency.

5.4 Conclusions

As in the other experiments reported in this dissertation, subjects with higher proficiency performed more like native speakers.

than those with lower proficiency in the experiment reported in this chapter. This is true for a large number of measures. First, the more advanced group (CHD) was more successful in producing recognizable versions of the IP-final nuclear Fall, Rise and Fall-rise. Second, the CHDs could pronounce the short and the long vowels correctly in the three sentence types, in fact much like the native speakers, but Chinese speakers with lower proficiency (CLDs) did not differentiate properly between the short vowel /ɔ/ and the long vowel /o:/. The durations of the sonorant rimes by CLDs were all longer than the corresponding ones by the native speakers and also longer than the corresponding ones by CHDs, except for *Loof* when pronounced with the Fall and the Rise. With Falls, CLDs' sonorant rime durations were significantly longer than those of the NSDs, but not significantly longer than those by the CHDs. NSDs' sonorant rimes were also significantly shorter than those by the CHDs. With Rises, CLD sonorant rimes were significantly longer than those by NSDs. In the Fall-rises, the sonorant rimes by CLDs were significantly longer than those by CHDs and NSDs, and those by CHDs significantly longer than those by NSDs.

The pitch spans and the peaks relative to the valleys in the three contours were not found to be significantly different between the native speakers and the Chinese speakers of Dutch. This contradicts Chen's findings (2008) that the pitch span by Chinese learners of English was narrower than that by native speakers. We provisionally attribute this discrepancy to the fact that the pitch span of Dutch is narrower than that of English (Willems, Collier & 't Hart, 1988).

The monosyllabic (phrase-final) Fall-rise is the most difficult contour for the Chinese speakers of Dutch. They could not produce it correctly even after training, and some subjects replaced it with a Rise. In the Fall-rises, CLDs' f₀ excursions were the longest, while those by the NSDs were the shortest, a significant difference. The differences in the rate of f₀ change for the three groups, however, were not significant. Speakers tended to increase the rates of f₀ change in Fall-rises when sonorant rimes got longer. Overall, CHDs pronounced the target words in Fall-rises better than did CLDs.

Neither subgroup managed to reproduce the behaviour of NSDs in the realization of the Fall-rise, which reflects the fact this pattern does not

occur in their L1. While phrase-final Tone 3 has a general f contour, in terms of Dutch phonology it is equivalent to a low fall, since the fall begins outside the rime instead of well within it (see F3). For this reason, the Fall-rise is more appropriately labeled 'rise'.

The three groups adopted different strategies to the experimental time pressure. In the Falls, the native speakers truncated *L*. The Mandarin speakers of Dutch with high proficiency truncated *L*, but the ones with low proficiency didn't adopt such a strategy. In the Rises, the native speakers of Dutch truncated *Lof* and compressed *Lof*, *Loof* and *Lom*. The Mandarin speakers of Dutch with high proficiency truncated no words, but compressed *Lof* and *Loof*. The ones with low proficiency truncated *Lof* and *Loof*, but did not compress any words. In the Fall-rises, the native speakers of Dutch truncated *Loof* and *Lom* and compressed *Lof* and *Loof*. The Mandarin speakers of Dutch with high proficiency truncated *Lof* and *Lom*, and compressed *Loof* and *Lom*. The ones with low proficiency truncated *Lof* and compressed *Lof*. Chinese learners of Dutch approach native speakers more in the execution of three intonation contours on IP-final words when their general proficiency is higher.

5.5 References

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Chapter 6

Prosodic effects of focus in Dutch declaratives by L1 Chinese speakers¹

6.1 Introduction

Focus is the informative part of an utterance which is marked by relative prominence. It can be 'broad' or 'narrow' in size (Ladd, 2008). In Dutch as shown in (1a) and (1b, c), the whole response *Ik zou wel naar Momberen willen fietsen* to the question *Wat zijn de plannen voor morgen?* in (1a) is the focus constituent, while the focus constituent is restricted to the word *Momberen* in the response sentences to their respective questions in (1b, c). In all three cases, the new information is given by the focus constituent. A distinction between 'information focus' and 'corrective focus' can additionally be made (Gussenhoven, 2007), as shown in (1b) and (1c). Although the word *Momberen* is the focus constituent in both (1b) and (1c), the information status is different. *Momberen* in (1b) provides the requested information ('where'), but *Momberen* in (1c) is the correction to old information *Zaltbommel* in the addressee's preceding statement.

- (1a) A: *Wat zijn de plannen voor morgen?*
'What are your plans for tomorrow?'
B: [*Ik zou wel naar Momberen willen fietsen*]
'I would like to cycle to Momberen'
- (1b) A: *Waar zou Karel je heen willen brengen?*
'Where would Karel like to take you?'
B: *Hij zou me naar Momberen willen brengen.*
'He would like to take me to Momberen'
- (1c) A: *Had je moeder je naar Zaltbommel willen sturen?*
'Did your mother want to send you to Zaltbommel?'

¹ An earlier and shorter version of this chapter appeared as He, van Heuven & Gussenhoven (2011) in the *Proceedings of the 17th International Congress of Phonetic Sciences* (Hong Kong).

B: *Nee, ze had me naar [Momberen] willen sturen.*
 'No, she wanted to send me to Momberen.'

Speakers of different languages can adopt phonetically and logically different strategies to express the meanings in different conditions. These strategies include pitch accent distribution, boundary, pitch range and duration.

In English, focus is marked by pitch accents. Additionally, British English increase the duration of the accented syllable under narrow and corrective focus as compared with broad focus. Significant differences were found in peak height and peak time in the three focus conditions by Sityaev (2003). However, American English did not realize narrow focus in short English sentences with an expanded pitch range for the accented syllable and suppressed the pitch range of postfocus syllables. By contrast, Dutch speakers had the usual wide pitch range, just as did speakers of English in the same conditions (Xu & Xu, 2005). In the focus conditions, the peak of f_0 , the size of rise, the speed of rise toward the f_0 peak and the duration of the stressed syllable became significantly enlarged. The f_0 peak was found to align well before the word-final stressed syllable under focus but the f_0 valley consistently aligns with the onset of the stressed syllable.

The marking of focus in Standard French and Toulousian French is reported to be different. In addition to post-focus deaccentuation and phrasing, Toulousian French also uses a certain tonal pattern to mark focus (Chen & Destruel, 2010).

A study by Baumann, Becker, Grice & Mücke (2007) on German speech shows that speakers produced more downsteps under broad focus and more upsteps under contrastive focus than in neutral conditions. From contrastive focus to narrow focus and to broad focus, the f_0 peak was delayed, the f_0 height became lower, the pitch slope towards the peak decreased, the duration of nuclear syllables were shortened. The vowels in the accented syllables were more peripheral in the vowel space under contrastive or narrow focus than under broad focus.

Speakers of Korean and Japanese used different phrasings to mark focus differences (Jun, 1996; Pierrehumbert & Beckman, 1998; Selkirk & Tateishi, 1991; Ueyama & Jun, 1998). Focused words in Korean were additionally realized by increased f_0 , duration and intensity independent of the phrasing effect on focus. As in English and Mandarin, Korean post-focus elements were compressed, and this post-focus compression was found to be absent in Taiwanese and Cantonese (Lee & Xu, 2010; Wu & Xu, 2010).

Hanssen, Peters and Gussenhoven (2008) studied the impact of different focus conditions in utterances with falling intonation (H*L L%) in Standard Dutch. The corpus consisted of declaratives with broad, narrow informational and narrow corrective focus. Focus condition significantly affected onset duration and coda duration, but not the duration of the syllable nucleus. The onset in both narrow focus (NF) and corrective focus (CF) was longer than in broad focus (BF) and coda durations were significantly longer in BF and NF than in CF. The focus conditions also significantly affected the f_0 of the peak, which was higher in both BF and CF than in NF. The f_0 of the first elbow did not differ significantly under the three focus conditions, but the f_0 of the second elbow, the end of the fall, was significantly higher in BF than in NF and CF, and the same was true for the f_0 of the beginning of vowel of first postnuclear stressed syllable. Rate of f_0 slope was constant for the rise, but increased significantly going from broad focus to the two narrow focus conditions. The f_0 peak occurred later in BF than in NF and CF. Thus, (informational and corrective) narrow focus caused the onset and coda consonants of the accented syllable to be lengthened, and the falls of the rising-falling accentual contour to start earlier and to descend more steeply. All four measures indicate that their speakers aimed to create a firmer fall located within the syllable rime of the accented syllable.

Mandarin is a tone language whose focus cannot be realized by the provision of pitch accent as in West-Germanic languages. Focus in Mandarin was shown to be marked by longer duration and f_0 range expansion (Chen, 2006; Chen & Braun, 2006; Greif, 2010; Peng et al., 2005; Xu, 1999). The pitch range of the syllable in focus was expanded, pitch range of postfocal syllables was suppressed and the pitch range of prefocal syllables was kept largely intact (Xu & Xu, 2005).

Characteristics of a learner's first language (L1) may transfer to the second language (L2). It was found that Japanese and Korean English speakers were inspired by the intonation patterns in their mother language to realize focus in English and speakers with higher proficiency were more native-speaker like (Ueyama & Jun, 1998). These transfers were also reported in the studies by Goad and White (2009) and therefore they proposed the Prosodic Transfer Hypothesis. Since Mandarin does not permit adjunction to the prosodic word, it is not necessary to represent tense and agreement in English. The use of adjunction in Mandarin phonology can explain the fact that Chinese speakers of English delete the inflection in their oral production (White & Steele, 2003). Due to the difference in prosodic structure between Turkish and English, Turkish speakers of English either substituted or stressed English articles (Goad & White, 2009). This was further supported by Prévost (2010).

Swerts & Zerbib (2010) also found that speakers of English as a Second Language (L2) from Africa marked focus in different ways from the native speakers. More proficient speakers of English realized the focus like L1 English speakers, but less proficient ones transferred features from L1, such as signalling focus, resulting in a different perceived prominence of words from the L1 English speakers.

The strategies adopted by German speakers of English to realize narrow and corrective focus in their read and semi-spontaneous speech in L1 German and L2 English were different in the pitch alignments and the phonetic extent of rises (O'Brien & Gut, 2010). Differences in tonal alignment in the three focus conditions were explained totally by L1 influence. Many differences in L2 English from the native speech were caused by the phonetic realization of phonological categories rather than a divergent phonology (O'Brien & Gut, 2010).

In this study, we tried to answer two questions:

- a. Do Chinese speakers of Dutch adopt the same strategies to realize the three focus conditions as native speakers of the Standard Dutch?
- b. If there are differences, do these reflect differences in the prosodic levels of the Chinese speakers of Dutch?

6.2 Method

6.2.1 Materials

We used contextualized declarative sentences from the corpus used in the Nijmegen project *Intonation in Varieties of Dutch* that were intended to elicit broad, narrow, and corrective focus in three sets of sentences. Each set has four target words (*Manderen*, *Momberen*, *Memberen*, *Munderen*) which are pseudo placenames, thus resulting in 12 test sentences altogether. They were arranged in mini-dialogues as shown in (1) above, in which 'A' is context and 'B' the response to 'A', the test sentence. The nuclear accent word were underlined. The nuclear pitch accent in all sentences is expected to occur on the target words. Sonorants in the stressed syllable (CVC) of target words are used because they have shown to behave similarly in peak timing, at least in American English (Van Santen & Hirschberg, 1994). The stress patterns of all target words and test sentences were identical.

6.2.2 Procedure

The three focus conditions were blocked. Two practice dialogues and the four randomized mini-dialogues for each focus condition were put into a Powerpoint file with a practice mini-dialogue at the beginning of each block. Subjects were asked to practise the response sentence in these practice mini-dialogues, which were played from a powerpoint presentation on a laptop, before the recording of the block took place. Their performance was checked by the experimenter, who went ahead with the recording if the subjects imitated the correct accent placement and intonation contour. During the recording, the experimenter played the context sentences in the experimental mini-dialogues, and the subjects read aloud the response sentence from a page in a booklet on which the dialogue was printed. Subjects were recorded with a Zoom H4 Handy Digital Recorder in different places: in the home, in classrooms or libraries; one subject was recorded in the studio of the Arts Faculty of Radboud University Nijmegen and three in the sound treated booth at the University of Groningen. All response sentences including the ones in the examples were recorded and subjects were allowed to repeat sentences when they felt their earlier attempt was not their best reading.

As a baseline for Standard Dutch, we selected the response *Manderen* for the three focus conditions.

6.2.3 Subjects

The Chinese participants in this study were the same as those who took part in the experiments described in Chapter 2 (see section 2.2.2). We also described the way in which they were divided into two groups: one with higher (CHD) and one with lower proficiency in Dutch. The native speakers of Standard Dutch in the corpus were 10 males and 13 females, aged from 14 to 49. No speakers reported they were deaf or had hearing problems.

6.2.4 Acoustic measurements and analysis

6.2.4.1 Labellings

We followed the method used by Hanssen et al. (2009) for the annotation of our Mandarin Dutch data. A textgrid with three tiers was created for each test sentence using a script in Praat (Boone & Weenink, 2009). The tonal labels of the f0 minima and maxima of the target words were placed on the first tier. The segmental boundaries of the test words were labeled on the second. The identifying labels of the nuclear contour as transcribed with ToDI (Gussenhoven et al., 2009) and comments on the sound file were provided on the third tier. Figure 6.1 shows these labels.

Table 6.1. Two tiers of labels on the target words

Name	Position
L ₁	elbow before the nuclear peak
H	maximum f0 of the pitch accent
L ₂	elbow after the nuclear peak
O ₁	beginning of nuclear onset
N ₁	beginning of nuclear vowel
C	beginning of nuclear coda
O ₂	beginning of the onset in the 2 nd syllable
N ₂	beginning of the vowel in the 2 nd syllable
O ₃	beginning of the onset in the 3 rd syllable
N ₃	beginning of the vowel in the 3 rd syllable
O ₄	beginning of the onset in the postnuclear stressed syllable
N ₄	beginning of vowel in the postnuclear stressed syllable
E	end of the postnuclear word

Figure 6.1. Tonal and segmental labels for a target word under broad focus. The labels are placed on the waveform, pitch contour, and spectrogram for *Ik zou wel naar Mombereen willen fietsen*, read by a Chinese speaker. The tonal labels of the f_0 minima and maxima are placed on the segmental boundaries of the test word (O_1 – O_4) and *willen* (O_4 – E) are placed on the second tier. The third tier gives, from left to right, the identification label for the sentence, the nuclear contour and a comment.

The label for the f_0 maxima (H) of the pitch accent was placed automatically; we used the *Praat* function that gives the location of the highest pitch in a selected interval. Placing the labels for the f_0 minima at the beginning of the contour (L_1) and at the end of the nuclear contour was less straightforward, however. Considering that the rise-fall slope (which is calculated by dividing f_0 excursion by f_0 duration) is an important variable in the study, it is essential that the labels are not placed too early or too late. We defined the elbow as the point on the pitch signal where a sudden change in slope is visible and labeled this turning point manually as the elbow of the f_0 contour.

The segmental boundaries on the second tier were labeled manually based on auditory information and visual inspection of the spectrogram.

and the waveform. Since the boundaries between segments are rarely clear-cut, the point where phonemes least affected each other was chosen as the location of the boundary. All segmental boundaries on this tier were placed at negative-to-positive zero-crossings.

6.2.4.2 Variables

In the present study, we used the following variables, as in Table 6.2, to describe the prosodic and the phonetic features of the target words in different focus conditions.

Table 6.2. Overview of 23 variables used in this chapter. Exc = f0 excursion duration. See Table 6.1 and figure 6.1 for definition of landmarks O₁, V₁, N₁, N₂, N₄, L₁, L₂. All f0 values are in semitones (st), durations are in seconds

Nr.	Variable	Variable meaning	Expression with
1.	Odur	Onset duration	O ₁ to V ₁
2.	Vdur	Nuclear vowel duration	V ₁ to C ₁
3.	Cdur	Coda duration in nucleus	C ₁ to O ₂
4.	Rdur	Rime duration in nucleus	N ₁ to O ₂
5.	Sylldur	Duration of accented syllable	O ₁ to O ₂
6.	Wdur	Accented word duration	O ₁ to O ₂
7.	Postwd	Duration of <i>willen</i>	O ₄ to E
8.	O ₁ Hexc	Excursion from onset to peak	f0 excursion from
9.	Fallexc	Excursion of fall	f0 excursion from
10.	Nucleus fall exc	Excursion of nucleus fall	f0 excursion from
11.	H-N ₂ exc	Excursion from peak to the second vowel	f0 excursion from
12.	H-N ₄ exc	Excursion from peak to the vowel in <i>willen</i>	f0 excursion from
13.	pd	Peak relative to nuclear vowel (peak delay)	Timing from H to
14.	Pd/rime	Percentage pd in the rime	Pd/duration of r
15.	Falldur	Duration of Fall	Duration from H
16.	Risedur	Duration of Rise	Duration from L
17.	Hf0-Ef0	Peak relative to end of <i>willen</i>	f0 excursion from
18.	L ₁ -Hexc	Excursion from the first elbow to peak	f0 excursion from
19.	Risesp	Speed of Rise	$(H(st) - L_1(st)) / ($
20.	Fallsp	Speed of Fall	$(H(st) - L_2(st)) / ($
21.	O ₁ f0-Ef0	Onset f0 relative to the end of the post word	O ₁ f0-Ef0
22.	L ₁ f0-Ef0	f0 of the first elbow relative to the end of <i>willen</i>	L ₁ f0-Ef0
23.	L ₂ f0-Ef0	f0 of the second elbow relative to the end of <i>willen</i>	L ₂ f0-Ef0

6.3 Results

6.3.1 Missing data

The three-syllable-target words *Manderen*, *Momberen*, *Memberen* and *Munderen* are pseudo placenames and were difficult for some Chinese speakers of Dutch to pronounce in some test sentences. There are generally four types of error they made, as Table 6.3 shows. Though we trained the Chinese subjects before the recording, there were still 62 (25.8%) utterances that could not be used for statistical analysis due to various errors in the target words. More than half (56.5%) of these errors were due to incorrect stress on the target words (e.g. *Mandéren* instead of *Mánderen*), 35.5% from incorrect accentuation, either because subjects deaccented the target word or accented the last word of the sentence. The remaining 8% was made up of to cases of incorrect intonation by the CLDs and CHDs each and three cases of incorrect pronunciation by the CLDs. The choice of three-syllabled words was based on an original interest in the effect of the right-edge word boundary on the timing of the end of the fall, a variable that was later abandoned.

Table 6.3. Absolute (N) and relative (%) frequency of production errors by Chinese speakers of Dutch with higher proficiency in Dutch (CHD) and lower proficiency (CLD) under broad focus (BF), corrective focus (CF) and narrow focus (NF); PRO = proficiency, WST = wrong stress, WAC = wrong accent, WIN = wrong intonation, WPR = wrong pronunciation

Focus	PRO	WST		WAC		WIN		WPR		<i>sum</i>	
		N	%	N	%	N	%	N	%	N	%
BF	CHD	2	3.2	3	4.8	1	1.6	0	0	6	9.7
	CLD	10	16.1	10	16.1	1	1.6	0	0	21	33.9
CF	CHD	4	6.5	0	0	0	0	0	0	4	6.5
	CLD	4	6.5	4	6.5	0	0	0	0	8	12.9
NF	CHD	4	6.5	0	0	0	0	0	0	4	6.5
	CLD	11	11.7	5	8.1	0	0	3	4.8	19	30.9
<i>sum</i>		35	56.5	22	35.5	2	3.2	3	4.8	62	100

One CHD subject mispronounced all the target words under corrective and narrow focus. Of the CLD subjects, one could not pronounce the target words correctly in any focus condition; one could only produce the target words correctly under corrective focus, and one could not

pronounce them correctly under broad focus. We decided to exclude these four subjects from the analysis. Out of the 62 sentences with missing data, this left 14 sentences with missing data for 14 participants. We replaced these missing values with the mean value of the focus condition concerned.

6.3.2 Comparing focus effects across groups

Figure 6.2 shows the average pitch contours in the three conditions for the three groups, based on a hundred sentences extracted from the stretch of speech from the onset of the target word to the end of the postnuclear word with the help of a *Praat* script. The timing was expressed relative to O_1 and pitch was expressed in Hz with reference to the end of the postnuclear word, a low pitch for broad focus utterance. This enabled us to compare f_0 across male and female speakers. The marks in the averaged contours give the temporal boundaries of the target words and the postnuclear words.

We analysed the data with a General Linear Model (GLM) (repeated measures ANOVA) for each of the 23 variables. Focus was the within-subject factor with three levels (i.e., the three conditions), and the groups as between-subjects variable. The significance level was set at .05. When the assumption of sphericity was violated, we reported Huynh-Feldt corrected p values, rather than Greenhouse-Geisser correction, which is very conservative. Table 6.1 shows the results of the analysis.

Figure 6.2. Averaged contours for three focus conditions (BF: Broad focus; NF: Narrow Focus; CF: Corrective focus) by native speakers of Standard Dutch (NSD), Chinese speakers of Dutch with higher proficiency (CHD) and Chinese speakers of Dutch with lower proficiency (CLD). The contours are aligned at the onset of the target word and the offset of the next word, *willen*. Crosses, circles and squares are the segmental boundaries in the target word and the post-nuclear word. f0 (semitones) is expressed relative to the end of the post-target word.

Table 6.4. Results of RM-ANOVA (* = significant)

NO	Variable	Within groups		Between groups
		focus	focus×groups	
1	Odur		*	*
2	Vdur			*
3	Cdur	*	*	*
4	Rdur		*	
5	Sylldur			*
6	Wdur	*		*
7	Postwd	*		*
8	O ₁ Hexc			
9	Fallexc			*
10	Nucleus		*	*
	fall exc			
11	H-N ₂ exc			
12	H- N ₄ exc			
13	pd			*
14	Pd/rime		*	*
15	Falldur		*	*
16	Risedur			
17	Hf0- Ef0			
18	L ₁ -Hexc			
19	risesp			
20	fallsp			
21	O ₁ f0-Ef0			
22	L ₁ f0-Ef0			
23	L ₂ f0-Ef0			*

Since we are interested in the differences in the focus effects between groups, we will focus on the significant interactions between conditions and groups.

Syllable Onset duration

While the focus condition did not yield significantly different onset durations within groups ($F[2, 68] = 2.1, p > .05, \eta^2 = .01$), the interaction between groups and focus condition is significant ($F[4, 68] = 2.6, p < .05, \eta^2 = .03$). From broad to narrow and corrective focus, both L2 groups decreased the onset duration, but L1 speakers increased it by 7 ms from broad to narrow and corrective. There was a main effect for group ($F[1, 34] = 4.6, p < .05, \eta^2 = .20$), with Bonferroni multiple comparisons showing significantly longer onset duration by CLDs than

There are no significant differences between CLDs and NSDs or between CHDs and NSDs.

Figure 6.3. The onset duration (O1–V1) of the accented syllable in the three focus conditions (BF: Broad focus; NF: Narrow Focus; CF: Corrective focus) by native speakers of Standard Dutch (NSD), Chinese speakers of Dutch with higher proficiency (CHD) and Chinese speakers of Dutch with lower proficiency (CLD).

Coda duration

A main effect of focus was found ($F[2, 68] = 3.3, p < .05, \eta^2 = .10$) as well as an interaction between group and focus ($F[4, 68] = 2.8, p < .05, \eta^2 = .10$). Both CLDs and NSDs have their longest coda durations under narrow focus and the shortest under corrective focus, but CHDs have longest coda duration under broad focus the shortest coda duration under narrow focus. Between subjects, a main effect of group ($F[2, 34] = 8.8, p < .01, \eta^2 = .30$) was largely due to the fact that coda durations in the NSDs are significantly longer than those by CHDs and CLDs. No significant differences were found between CHDs and CLDs.

Figure 6.4. The coda duration (C1–O2) of the accented syllable in the three focus conditions (BF: Broad focus; NF: Narrow focus; CF: Corrective focus) for three groups of speakers (NSD: Standard Dutch; CHD: Chinese speakers of Dutch with high proficiency; CLD: Chinese speakers of Dutch with lower proficiency).

Rime duration

Focus effects on rime duration are not significant ($F[2, 68] = 1.2, \eta^2 = .10$), but a significant interaction between group and focus was found ($F[4, 68] = 3.4, p < .05, \eta^2 = .17$). The rime duration decreased from broad to narrow to corrective focus, a pattern found in none of the other groups. NSDs have longer rimes in narrow focus than in broad focus, but shorter rimes in corrective focus, than in neutral focus. For CHDs, narrow focus yielded longer rimes than the other two conditions, and the shortest occurred under broad focus. The differences in rime duration between the three groups are not significant ($F[2, 34] = 2.6, p = .13$).

Figure 6.5. The rime duration (N1–O2) of the accented syllable in the three focus conditions (Broad focus: BF, Narrow focus: NF, Corrective focus: CF) by native speakers of Standard Dutch (NSD), Chinese speakers of Dutch with higher proficiency (CHD) and Chinese speakers of Dutch with lower proficiency (CLD).

Nuclear fall excursion

Within subjects, the focus effects on nuclear fall excursion are not significant ($F[2, 68] = 2.4$, $p > .05$, $\eta^2 = .10$), but the interaction between groups and focus conditions is significant ($F[4, 68] = 3.8$, $p < .05$, $\eta^2 = .20$). The nuclear fall excursions by NSDs increased from broad to narrow to corrective focus, but those by CHDs decreased. For CLDs, no regular pattern was found. The differences in the nuclear fall excursion between groups are significant ($F[2, 68] = 4.7$, $p < .05$, $\eta^2 = .20$). Multiple comparisons showed that excursions by NSDs were significantly greater than those by CLDs, but those by CHDs did not significantly differ from those of the other groups.

Figure 6.6. The nuclear fall f_0 excursion (H-O2) in the three focus conditions (BF: Broad focus; NF: Narrow focus; CF: Corrective focus) by native speakers of Dutch (NSD), Chinese speakers of Dutch with higher proficiency (CHD), and Chinese speakers of Dutch with lower proficiency (CLD).

Relative Peak Delay in the rime

The focus effects on the peak delay relative to the rime onset were not significant ($F[2, 68] = .56$, $p > .05$, $\eta^2 = .02$), but a significant interaction between group and focus was found ($F[4, 64.7] = 3.12$, $p < .05$, $\eta^2 = .20$). Relative peak delay decreases from broad to narrow focus for the NSDs. For CLDs, it is largest under broad focus and smallest under narrow focus, while for CHDs the opposite pattern is found. Overall differences between groups are also significant ($F[2, 68] = 3.12$, $p < .05$, $\eta^2 = .20$), with CHDs' peak delays being later than those of NSDs and CLDs. No significant differences were found between CLDs and NSDs.

Figure 6.7. Relative peak delay (peak delay from rime onset divided by the rime duration) in three focus conditions (BF: Broad focus; NF: Narrow focus; CF: Corrective focus) by native speakers of Standard Dutch (NSD), Chinese speakers of Dutch with higher proficiency (CHD) and Chinese speakers of Dutch with lower proficiency (CLD).

Fall duration

No significant effects of focus condition on Fall duration were found ($F[1.4, 47.8] = 2.8, p > .05, \eta^2 = .10$), but a significant interaction was found between group and focus ($F[2.8, 47.8] = 3.8, p < .05, \eta^2 = .20$). The Fall durations for NSDs decreased from broad to narrow to corrective focus, but neither the CHDs nor the CLDs showed this behaviour. The effect of group is significant ($F[2, 34] = 3.8, p < .05, \eta^2 = .20$), but only CHD and NSD differ from each other.

Figure 6.8. The fall duration (H–L2) in the three focus conditions (BF: Broad focus; NF: Narrow focus; CF: Corrective focus) by native speakers of Standard Dutch (NSD), Chinese speakers of Dutch with higher proficiency (CHD) and Chinese speakers of Dutch with lower proficiency (CLD).

In summary, NSDs increase the *onset duration* and the *nuclear excursion* going from broad to narrow and corrective focus conditions and decrease them, and CLDs decrease the onset duration and the nuclear Fall excursion. NSDs additionally decrease both the *coda duration* relative to the rime and the Fall duration in the same series of conditions. Neither CHDs nor CLDs show a coherent pattern here. CHDs decrease the Fall duration going from broad to the two narrow focus conditions. The *coda duration* and the *rime duration* by NSDs have increased across the focus conditions for the NSDs and CHDs, but not for the CLDs. Rime duration has increased across the three focus conditions in the data for the NSDs. CHDs cannot be said to have outperformed the CLDs in this experiment. In fact, a case could be made that in a number of conditions CLD behaviour was closer to that of the NSDs.

6.4 Discussion

Overall, these results indicate that the phonetic detail in the realization of H*L falling contours in IP-internal syllables is specific to Standard Dutch. Chinese speakers of Dutch perform pitch falls that resemble the Dutch pitch falls both in shape and approximate timing, but neither the detailed phonetics of these falls nor the systematic variation across different focus conditions match the phonetic patterning of the native speakers. The differences lie in the durations of onset, coda, rime and the fall, in the relative peak delay in the rime and in the f₀ excursions of the nuclear syllable. Summarizing the findings for the native speakers, we find that, going from broad informational via narrow informational to narrow corrective focus, NSDs increase the onset duration, increase the fall excursion, move the beginning of the fall forward and decrease the fall duration. The increase in f₀ excursion together with the decrease in fall duration mean that slopes are steeper as the focus is more specific. These findings have parallels in earlier research. Tendencies to lengthen onset consonants under stress have been widely noted (e.g. Huss, 1978; Gussenhoven, 1999, for English). Second, the increase in the *excursion* of the fall is a commonly reported effect of emphasis and focus. Third, early peak placements under enhancing focus conditions have been reported for other languages (Smiljanić & Hualde, 2000). Even when peak delay is expressed in absolute distance from the rime beginning rather than in terms of a percentage of the rime duration, the regularity holds for the NSDs (from broad via narrow informational to narrow contrastive the absolute values are 118, 104 and 99 ms). Fourth, steeper falls were reported by Hanssen et al. (2008), who interpreted their data as hyper-articulation of the H*L pitch accent. Because the rising movement towards the peak remains unaffected, they took this finding as evidence for the analysis of the pitch peak as due to a H*L pitch accent preceded by a L-tone as opposed for a LH* pitch accent followed by a L-tone. In the data presented here, the regularity is stronger, with a gradient decrease in Fall duration across the three focus conditions. The NSDs therefore produced higher, earlier and faster Falls, i.e. H*L pitch accents, as the communicative situation demanded greater articulatory precision. One phonetic measure failed to show the same gradient pattern. The NSDs produced the longest coda and rime durations in the intermediate narrow informational condition, and differences with the two other focus conditions were small. This shows that rime lengthening is not necessarily a concomitant of hyper-articulation. Rather, we suggest that it

can be that the effort to hyper-articulate the fall by making it lead to a shortening not just of the falling pitch movement, but of the rime on which it was executed. The fine phonetic behavior of the NSDs thus constitutes a coherent set of strategies to increase articulatory precision.

By comparison, the Chinese speakers of Dutch display different behaviour. Even though there are many significant differences in the measures we have chosen, these do not obviously add up to a clear pattern. Perhaps it is best characterized as 'uncertain'. Significantly, van der Lely and Gussenhoven (2008) found that speakers of Standard Dutch do not display regular hyperarticulation responses in a similar task. That such responses are in part a matter of choice may mean that when speaking a foreign language, speakers will at first not commit to any specific response. The uncertain patterns, which may exist somewhere in their interlanguage system, may contribute to the foreign accent.

Although He et al. (2011; also chapter 2) found that our monolingual group, the CHDs, got better scores in judging the accents, including those that are governed by focus, and to be most consistent with their choices. The present study shows that the CHDs did not do better than CLDs in a production test. They failed to produce different accents from the native speakers, and in fact the CLDs did better in some measures than the CHDs. This shows that the relationship between production and perception is complex (Llisterri, 1995). Abrahamsson & Hult (2009) found that early Spanish learners of Swedish were not as good as native speakers as native-like, but that only a few of them were native-like and their behaviour under detailed linguistic scrutiny was not native-like. In our case, only some subjects among the CLDs were native-like. Still, it is fair to conclude that the features of the stimuli producing different focus conditions are so detailed that their accurate realization apparently takes a great deal of L2 exposure and practice before it can be learnt.

The fact that the CLDs did better on some measures than the CHDs has no ready explanation, other than that these are chance differences. Possibly, however, the CLDs took the pre-recording training more seriously, paying more attention to what they had to say in their reading than did the CHDs.

Finally, we found more differences than did Hansen et al. (2008) with similar data. As Table 3 shows, focus condition affected the durations of onset, coda, rime and the duration of the fall, the nuclear fall excursion and the peak delay relative to the rime duration. But no significant differences were found in peak height, the two elbows and the speed of Fall and Rise by Hanssen et al. (2008). Our Dutch data included only a single test word from the Dutch corpus, whereas Hanssen et al. used four words with the same stress patterns that inevitably had different segmental compositions. Another difference is that we normalized f_0 relative to the end of the post nuclear stressed word rather than the speaker's final low, as in Hanssen et al. (2008).

6.5 References

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Chapter 7

Conclusions

The main contents of this dissertation can be summarized as in Figure 7.1. Two perception experiments (Experiments 1 and 2) and three production experiments (Experiments 3, 4 and 5) were designed to reveal different aspects of the prosody of Mandarin-accented Dutch. The perception experiments and the production experiments are essentially complementary. Initially, there are a number of possible reasons why the prosody of non-native speakers sounds foreign, and the first task therefore is to establish what the foreign accent derives from. The perception experiments in this dissertation therefore address the question whether Chinese learners of English recognize native Dutch prosody as correct, as authentically Dutch, or whether they cannot tell the difference between a correct and an incorrect prosodic structure. If native Dutch utterances do not strike the Chinese learners as different from Dutch utterances with inappropriate or evidently incorrect prosody, then we cannot expect that their production will be correct. However, if the learners appear to be able to tell correct and incorrect prosodic structures apart, any inability on their part to produce correct prosody must be attributed to an inability to produce phonetically realistic renderings of those prosodic structures. Practically, the first situation would call for a training course in which learners are exposed more to Dutch prosody in context, in the second situation they will need phonetic tuition.

The production experiments were of two kinds. Experiment 3 investigated the extent to which Mandarin speakers of Dutch were able to choose the right melodic contour in a limited number of idiomatic sentence types. This experiment tests their knowledge of the usage of intonation contours in a production task. Experiments 1, 2 and 3 thus together concern the assessment of semantic and morphological knowledge of Dutch intonation by Mandarin Chinese L1 speakers of the language. The other two experiments addressed their ability to execute the pitch movements of Dutch. Independently of whether learners know what prosodic

structure to use in a given situation, their production of those may be more or less foreign. The question addressed in experiments 4 and 5 is to what extent Chinese learners of Dutch are able to identify the phonetic features of Dutch intonation. For instance, do they identify pitch falls in the same way as native speakers do? And do they produce a pitch fall in the same way as native speakers do? Do they speak with more emphasis, or when the fall is executed near the end of the utterance? So rather than studying the competence of Chinese learners in their morphological contour choices, in these experiments we are interested in their competence in the phonetic realization of these contours.

Figure 7.1: Mandarin-accented Dutch prosody was investigated in three experiments: one perception experiment addressing Mandarin L1 speakers' knowledge of the appropriateness of the location and type of pitch accents (accentuation and pitch contours), through a production experiment that tested their knowledge of Dutch idioms, and two production experiments investigating the phonetic realization of pitch contours.

The first perception experiment was conducted to see how Chinese learners of Dutch identify the correct accentuation patterns for different categories of Dutch sentences. Thirty-six stimuli (6 sentences $\times$ 6 accents) were presented to 20 Dutch native listeners (NSD) and 20 Chinese

ers of Dutch as a second language (CSD). In this forced-choice task, listeners had to decide whether one of two versions of each sentence was pronounced with optimal prosody, and to indicate how confident they were about their choice on a five-point scale. Per test item only one accent placement was prosodically optimal ('correct'), as determined prior to the test by a panel of Dutch intonologists. Subjects only judged one version.

NSDs' correctness scores were significantly higher than those by the Chinese learners with high proficiency in Dutch (CHD), and the correctness scores of the latter were significantly higher than those obtained for the low-proficiency learners (CLD). Along with the correctness scores, confidence ratings decreased from NSDs to CHDs to CLDs. The results show that Chinese learners of English have imperfect knowledge of where the pitch accents should be located in Dutch sentences, and that they are aware of this lack of knowledge, because of their lower confidence scores. It was found that accentuation for new information is easier to evaluate for Chinese listeners than accentuations due to morphological rules.

The second perception experiment was designed to explore to what extent Chinese learners of Dutch are able to identify the most appropriate intonation contour for sentences in context, where 'appropriate' is defined as the choice made by a large majority of native speakers. We presented the subjects with 26 written sentences in the order they came in a story. Subjects were given a choice from four intonation contours, which differed per sentence. In each case, they were instructed to select the most appropriate intonation contour for the sentence in a forced choice task. The results show that the Chinese subjects selected the most appropriate version less often than the native speakers did, that their selections from the three less appropriate competitors were more chaotic than those of the control group, and that the performance by the CHDs was closer to that of the native speakers than the performance by the CLDs. The assignment of an intonation contour to a contextualized sentence is argued to be a precisely defined, if little understood part of the linguistic competence of native speakers of Dutch, which is only very partly present in Chinese learners. Our search for any alternative strategies the Chinese subjects might have used led to the identification of a policy to assign rising contours to orthographic sentences closed by a question mark and falling contours to sentences closed by a full stop, a

comma or an exclamation mark. In addition, we found that they avoided choosing intonation contours ending in downstep pitch or a falling-rising pitch, which we interpreted as a strategy of favouring pitch contours that resemble Chinese L2. The general acquisition profile follows findings in other L2 linguistic competence in that their performance correlated with age of arrival (AOA), not with either age or length of time they had been exposed to Dutch. As far as we are aware, this is the first investigation of L2 learners' competence in melody selection.

Experiment 3 was designed to study the melodic choices in Dutch based on seven sets of sentences composed so as to elicit particular intonation contours. Each of these seven sets of sentences represented an intonational 'idiom', meaning that typically only one pitch contour was available for them. For example, a sentence ending in the pattern *toch* have a H*L H% contour on the last accented syllable. A comparison of readings of these (6 × 7 =) 42 sentences by a small group of native speakers of Standard Dutch is established as the baseline for what the 'correct' contours are. 'Errors' by Chinese readers were weighed when the consensus was higher in the Dutch group.

The Chinese subjects chose an appropriate intonation contour for each of these seven structures to some degree. They had fewer production errors for *wat*-exclamations and alternative questions, for which falls are used in Standard Dutch. The more difficult structures were those with *toch* in the sense of 'self-evidence', sentences with *echt*, *echt zo goedkoop?*, reporting clauses and vocative chants. Chinese subjects did better in choosing optimal contours for the type of sentence with particles *hoor* or *hè* than for the questions with *toch*, even though in three cases the same fall-rise intonation contour is to be used. However, they found the fall-rise harder to produce than the fall. Chinese speakers of Dutch with low proficiency made significantly more nuclear pitch accent errors and boundary errors than the Chinese subjects with high proficiency, and the Chinese subjects with low proficiency made significantly more boundary errors than the native speakers. These production data were analysed in terms of additional features. First, we found that the Chinese speakers produced more IPs than the native speakers. Moreover, the Chinese speakers of Dutch paused more often than the native speakers.

but the durations of the pauses were not significantly different. Third, speech rate and articulation rate of the Chinese speakers with lower proficiency in Dutch were significantly slower than their counterparts with high proficiency and the native speakers. The native speakers' nPVI (normalised Pairwise Variability Index, for which low values indicate that the speech is relatively 'staccato') was significantly larger than those of the Chinese speakers and the nPVI of the Chinese speakers with higher proficiency in Dutch was significantly larger than the Chinese speakers of Dutch with lower proficiency. Also, the Chinese speakers with lower proficiency have significantly more prenuclear pitch accents than their counterparts with higher proficiency and the native speakers. The Chinese speakers of Dutch with higher proficiency in fact accented the sentences in a similar way as the native speakers, although they do sometimes accent function words expressing given information. It was striking that some Chinese subjects, both in the higher and lower proficiency groups, incorrectly placed pitch accents on the second component of compound words.

Experiment 4 was designed to study how Chinese speakers of Dutch (CSD) produced three Dutch pitch contours (H*L L%; L*H H%; H*L H%) under time pressure, that is, when segmental material on which the pitch contours are to be produced is in short supply. Increasing degrees of time pressure were created by placing the four Dutch monosyllabic proper names *Loom*, *Lom*, *Loof* and *Lof* in final position in the IP (intonational phrase). These words vary in the duration of the sonorant portion of the rime, because the vowels have phonologically different lengths and because of the variation in the sonorant status of the coda (/f/ and /m/). These test words were embedded in three short carrier sentences, a declarative with narrow-information focus, a yes-no question, and a rhetorical question with corrective focus, so as to elicit three nuclear intonation contours, the Fall, the Rise and the Fall-rise. Unlike less proficient Chinese learners of Dutch, more advanced learners produce Rises and Falls much the way native speakers do. As sonorant rimes are shorter, these contours are compressed by native speakers and by the more proficient learners in the group of Chinese subjects. The detailed patterning of these adjustments is not exactly the same, however. In particular, in the case of the Fall, NSD end the fall for *Lom* earlier than in the longer *Loom*. In these data, the striking findings are that the lower proficiency group does not follow the pattern of NSD in any respect except that *Lom*, *Loom* have later falls than *Lof*, *Loof*. This suggests that,

to them, there is no distinction between the long and short Dutch. In fact, all CHDs, but not the CLDs, were able to produce short and the long vowels correctly in the three sentences. This suggests that the CLDs made no quantity difference. Generalizations of the sonorant rimes by CLDs were longer than the ones by the native speakers and also longer than the corresponding ones by CHDs except for *Loof* in the Fall and the Rise. Finally, the Chinese subgroup managed to reproduce the behaviour of the native speakers in the realization of the Fall-rise, which reflects the fact that no sibilant occurs on single syllables in their native language. No pitch differences were found between the three groups.

In Experiment 5, we studied the impact of different types of focus and the position of target word on the falling intonation (H*L L% a). Three sets of Dutch declaratives were used to elicit broad, narrow and narrow corrective focus conditions. Each set had four target words and four pseudo-place names *Manderen*, *Momberen*, *Memberen* and *Munsteren*. 23 potentially sensitive phonetic measures were found to have significant effects. These variables are the durations of the onset, the rise, the duration of the accented syllable, the duration of the fall, the f0 excursion, the fall and the time alignment of the f0 peak. The participants with higher proficiency did not outperform those with lower proficiency. This suggests that the phonetic realization of focus conditions should be learned. Learning this is more difficult than learning how to accent for intonation, for instance. The features investigated in Experiment 5 are substantially below a level of perception that would be reached in a perception experiment with native speakers.

Chinese speakers of Dutch have some linguistic knowledge of Dutch accentuation and intonation. They can choose certain pitch contours to express themselves according to textual context. This suggests that the Chinese speakers of Dutch and the native speakers of Dutch are similar phonologically and phonetically in their read speech. More precisely, there are more pauses in IPs, lower speech and articulation rate, and higher Variability Indices. In the phonetic realization of intonation, as investigated in Experiments 4 and 5, differences in specific phonetic variables between the groups were found. These would have been more pronounced if Chinese learners of Dutch are to speak the language in spontaneous speech like native speakers speak, but it must be remembered that the effect of this phonetic knowledge is likely to be low.

As summarized above, this dissertation mainly describes the prosodic features of Mandarin-accented Dutch phonologically and phonetically. Further research can be done on a number of topics.

Firstly, the Chinese speakers of Dutch, regardless of their proficiency level, have problems with the morphological rules in Dutch, because they cannot identify the correct accentuation in the sentences in Experiment 1 or put the pitch accent appropriately on certain words of everyday Dutch in Experiment 3. This leaves ample room for language teaching in a linguistic environment in which Chinese, a tone language, is used as the first language.

Secondly, some pitch contours, like the fall-rise, the half fall and the high rise are difficult to produce for Chinese speakers of Dutch. The question how to teach learners to *choose* pitch contours on the basis of the syntactic structure and their meaning of the sentences in context, and how to teach them to *produce* these correctly is of great importance. Although the pedagogical issue was never really touched on in this dissertation, we have speculated on the reasons why certain structures are difficult for the Chinese speakers of Dutch.

Thirdly, as there are more prenuclear pitch accents in the Dutch of Chinese speakers than in the speech of native speakers, it is worthwhile to study their phonetic realization, as well as to devise training material for the production of unaccented stretches of speech.

Fourthly, the materials on which the dissertation is based all represent scripted speech, and speech style may affect the prosody. In future studies, we could study Chinese speakers' Dutch prosody in spontaneous speech and find the prosodic differences between the speech styles.

Last but not least, not all of the theories and models in phonological acquisition which were discussed in the first chapter were called upon in the explanation of the results of the five experiments. Most of them are concerned with the acquisition of phonemes or phonetic segments and this dissertation generally focused on sentence accent and intonation. It is difficult to apply them therefore to explain the experiment results directly. In addition, these theories or models concern issues of transfer, markedness and age. Age was touched upon in the discussion of the perception experiments, but not in the production experiments, due to the

lack of variation in age in those groups, making any division into groups for statistical analyses hard. We did establish that those who came to the Netherlands earlier (Age of Arrival, or AOA) had higher levels in Dutch, see Chapter 2 & 3), and evidently AOA played an important role in the participants' behaviour in the experiment. This dissertation has focused on the description of the features of prosody of Mandarin-accented Dutch against a background of previous research and theories in second language acquisition. Transfer or the lack thereof was noted whenever we found data that enabled us to do so (see for example the case of the non-transfer of phonetic enhancement for emphasis in chapter 5). A more systematic evaluation of these latter theories and the results will have to await future study.

Samenvatting

Het Mandarijn (of: Standaard Chinees) is met zijn 1,25 miljard sprekers een van de meest gebruikte talen op aarde. Het is een toontaal waarin vier lexicale tonen (vier verschillende woordmelodieën) worden gebruikt om woorden van elkaar te laten verschillen. Het Nederlands heeft geen woordtonen, maar gebruikt verschillen in melodie om verschillende pragmatische betekenissen te onderscheiden op het niveau van de zin. Er is op dit moment nog weinig bekend over de moeilijkheden die sprekers met een toontaalachtergrond (zoals Mandarijn) ondervinden als zij een tweede of vreemde taal moeten verwerven zonder woordtonen maar met veel verschillende zinsmelodieën met pragmatische betekenissen (zoals het Nederlands). Dit proefschrift is bedoeld als een eerste poging om deze lacune in onze kennis op te vullen.

Dit proefschrift geeft op hoofdlijnen een fonetische en fonologische beschrijving van de prosodische eigenschappen van Nederlands gesproken met een Chinees accent. Het omvat twee perceptie-experimenten (Experiment 1 & 2) en drie productie-experimenten (Experiment 3, 4 & 5) die zijn afgenomen met het doel verschillende aspecten bloot te leggen van de prosodie van Nederlands gesproken met een Chinees accent. Er waren twee soorten productie-experimenten. Experiment 3 onderzocht de mate waarin Mandarijnsprekers van het Nederlands is staat waren de juiste melodische contour te kiezen bij een beperkt aantal idiomatiche zinstypen. Dit experiment test hun gebruikskennis van intonatiecontouren in een productietaak. Op deze manier vormen de twee perceptie-experimenten en Experiment 3 samen een poging om de semantische en morfologische kennis van de Nederlandse zinsmelodie vast te stellen bij Nederlandssprekenden met Mandarijn als moedertaal. Experimenten 4 & 5 richtten zich op het vermogen bij deze sprekers om de toonhoogtebewegingen van het Nederlands te maken. Ongeacht de vraag of leerders weten welke prosodische structuur ze in een gegeven situatie moeten gebruiken, kan hun productie van deze structuren in meerdere of mindere mate buitenlands klinken. De vraag die in experimenten 4 en 5 wordt gesteld is hoe goed Chinese leerders van het

Nederlands de fonetische kenmerken van de Nederlanders kunnen produceren. Ik onderzoek hier dus niet hun beheersing van Nederlands op basis van hun keuze voor een specifieke melodie, hoeverre zij de fonetische realisatie van specifieke toonhoogtes beheersen.

De productie- en perceptie-experimenten zijn complementair en geven een aantal redenen aan te wijzen waarom de prosodie van non-native taalsprekers buitenlands klinkt. De eerste taak is daarom vast te stellen waardoor het buitenlandse accent wordt veroorzaakt. De perceptie-experimenten richten zich op de vraag of Chinese leerders de prosodie van Nederlands de prosodie van moedertaalsprekers van het Nederlands correct herkennen, d.w.z. als authentiek Nederlands, dan wel als een correcte en een incorrecte prosodische structuur niet uit elkaar kunnen houden. Als Nederlandse spraakuitingen van moedertaalsprekers horen van Chinese leerders even goed klinken als Nederlandse spraakuitingen met minder geslaagde of zelfs apert foute prosodie, dan verwachten we niet verwachten dat hun productie correct zal zijn. Als Chinese leerders de leerders wél in staat blijken correcte en foute structuren uit elkaar te houden, dan moet hun onvermogen om correcte prosodische structuren te produceren worden toegeschreven aan een onvermogen om de authentieke weergaven van deze prosodische structuren voor te stellen. In de onderwijspraktijk zou het eerste scenario onderwijs voor Chinese leerders worden blootgesteld aan veel Nederlandse prosodie. In de tweede situatie hebben de leerders vooral behoefte aan onderricht.

Twintig Chinese sprekers van het Nederlands namen deel aan de productie-experimenten. Daarnaast namen 20 moedertaalsprekers van het standaardnederlands deel aan de twee perceptie-experimenten. De productie van spraak van vijf moedertaalsprekers van het Standaardnederlands werd gebruikt als ijkpunt waartegen de prestaties van de niet-moedertaalsprekers werden vergeleken. Experiment 3 konden worden afgezet. De data in Experiment 3 werden afgeleid van het corpus Standaardnederlands (Project *Variëteiten van het Nederlands*) aan het CLS (Centre for Language Studies) van de Radboud Universiteit Nijmegen. Alle Chinese deelnemers waren mannen, 17 vrouwen, met leeftijden tussen 17 en 53 jaar), moedertaalsprekers van het Mandarijn en afkomstig uit het noorden van China. Allen hadden voldoende Nederlands geleerd om aan de experimenten te kunnen deelnemen. Zij werden door drie Ned

perts ingedeeld in een groep met een relatief hoge beheersingsgraad van het Nederlands (CHN) of een met een relatief lage beheersing van het Nederlands (CLN) aan de hand van hun uitspraak en prosodie in een aantal voorgelezen spraakfragmenten. De Nederlandse deelnemers waren naar eigen zeggen moedertaalsprekers van het Standaardnederlands in de leeftijd van 18 tot 54 jaar.

Experiment 1

Het eerste experiment is een perceptieproef dat is uitgevoerd om na te gaan hoe goed Chinese leerders van het Nederlands de correcte accentuering kunnen vaststellen in zes typen Nederlandse zinnen. Zesendertig stimuli (6 zinnen $\times$ 6 categorieën) werden voorgelegd aan 20 moedertaalluisteraars van het Nederlands (NT1) en 20 Chinese leerders van het Nederlands als tweede taal (NT2). In deze gedwongen-keuzetaak moesten de luisteraars beslissen welke van twee versies van elke zin was uitgesproken met optimale prosodie en op een vijfpunt-schaal aangeven hoe zeker zij waren van hun keuze. Voor ieder testitem was maar één accentplaatsing prosodisch optimaal ('correct'), zoals eerder vastgesteld door een panel van Nederlandse intonologen. Elke proefpersoon beoordeelde slechts één versie van elke zin.

De correctheidsscores van de NT1 luisteraars lagen significant hoger dan die van de Chinese leerders met hoge beheersingsgraad van het Nederlands (CHN) en de correctheidsscores van deze groep lagen weer significant hoger dan die van de leerders met een lagere beheersingsgraad (CLN). Parallel aan de correctheidsscores liepen ook de zekerheidsscores af van NT1 via CHN naar CLN. De resultaten tonen aan dat Chinese leerders van het Nederlands een gebrekkige kennis bezitten van waar de toonhoogteaccenten in Nederlandse zinnen moeten liggen en zich bewust zijn van de mate van dat kennisgebrek (wat immers blijkt uit hun lagere zekerheidsscores). Een tweede bevinding was dat het accentueren van nieuwe informatie gemakkelijker te beoordelen was voor de Chinese luisteraars dan accentuering op grond van morfologische regels.

Experiment 2

Experiment 2 was opgezet om na te gaan in hoeverre Chinese proefpersonen van het Nederlands in staat zijn om de meest toepasselijke intonatiecontour te kiezen voor zinnen in context, waar 'toepasselijk' is als de keus van de grote meerderheid van de moedertaalsprekers. De proefpersonen boden de proefpersonen 26 geschreven zinnen aan in de vorm van een verhaal die in een verhaal voorkwamen. De proefpersonen hadden de keus uit vier intonatiecontouren, die per zin verschilden. De proefpersonen werden steeds om de meest toepasselijke intonatiecontour te selecteren (geen gedwongen keuzen uit de vier voorgegeven mogelijkheden). De resultaten wijzen uit dat de Chinese proefpersonen de meest toepasselijke intonatiecontour minder vaak kozen dan de moedertaalluisteraars, dat hun keus voor de meest toepasselijke intonatiecontour drie minder toepasselijke contouren chaotischer was bij de Chinese proefpersonen en dat de prestaties van de CHN-groep dichterbij lagen bij de moedertaalluisteraars dan het geval was bij de prestaties van de Nederlandse groep. Mijn stelling is dat de toewijzing van een intonatiecontour aan een zin in context een precies gedefinieerd, zij het nog slecht begrepen onderdeel is van de taalcompetentie van moedertaalsprekers van het Nederlands en dat dit vermogen slechts in zeer beperkte mate aanwezig is bij Chinese leerders. Aanvullende pogingen om alternatieve strategieën voor het spoor te komen die de Chinese proefpersonen zouden kunnen gebruiken bracht aan het licht dat deze systematische keuzes van intonatiecontour melodieën toewijzen aan zinnen die in hun geschreven vorm eindigen worden met een vraagteken, en dalende melodieën aan zinnen die in hun geschreven vorm eindigen met een punt, komma of uitroepteken. De resultaten vinden we dat de Chinese deelnemers over de gehele linie de meest toepasselijke intonatiecontouren schuwden die eindigden met gedownstepte tooncontouren of met een stijging-dalingcontour. Wij interpreteren deze resultaten als een strategie die de voorkeur geeft aan toonhoogtecontouren die overeenkomen met Chinese woordtonen. Het algemene taalprofiel komt overeen met wat gevonden is bij andere gebieden van taalbeheersing. Zo correleerde het prestatieniveau met de leeftijd van de proefpersonen, de komst in Nederland, maar niet met de kalenderleeftijd van de proefpersonen of met de tijd die zij al waren blootgesteld aan Nederlandse taal aanbod. Voor zover wij hebben kunnen nagaan is dit het eerste experimentele onderzoek naar de rol van de beheersingsgraad van de eerste (moeder) de/vreemde taal) bij de selectie van zinsmelodieën.

Experiment 3

Experiment 3 was opgezet om de melodische keuzes te onderzoeken in de spraakproductie aan de hand van zeven groepen zinnen die erop gericht waren om specifieke toonhoogtecontouren te ontlokken aan de proefpersonen. Elk van die zeven groepen zinnen vertegenwoordigde een intonatieel 'idioom', wat inhoudt dat per set slechts één specifieke toonhoogtecontour in aanmerking komt. Bij voorbeeld, een zin die eindigt met het partikel *hè* zal een H*L H% contour hebben op de laatste geaccentueerde lettergreep. Een corpus van voorgelezen realisaties van deze ($6 \times 7 =$) 42 zinnen door vijf moedertaalsprekers van het Standaardnederlands werd gebruikt om vast te stellen wat de 'correcte' contouren zijn. 'Fouten' die gemaakt waren door de Chinese lezers werden zwaarder meegewogen naar mate de consensus bij de Nederlandse groep hoger was.

De Chinese proefpersonen slaagden er tot op zekere hoogte in een passende intonatiecontour bij een aantal van de zeven zinnen te kiezen. Zij hadden relatief weinig moeite met *wat*-uitroepen en met alternatieve vragen, voor welke zinstypen het Standaardnederlands hele of halve dalingen gebruikt. Moeilijker structuren zijn vragen met *toch* (zoals in de reclameslagzin *Ik ben toch niet gek!*), zinnen met *echt*, als in *Was het echt zo goedkoop?*, en in zinsdelen volgend op stukken directe rede en in de roeptoon (*vocative chant*). Chinese proefpersonen presteerden beter als zij optimale contouren moesten kiezen bij zinstypen die eindigden op de partikels *hoor* of *hè* dan bij vragen die eindigden op *toch*, ook al zou in alle drie deze gevallen dezelfde daling-stijging contour gebruikt moeten worden. Algemeen gesproken vonden zij de daling-stijging contour moeilijker dan een daling of een stijging alleen. Chinese sprekers van het Nederlands met een relatief lage beheersingsgraad maakten significant meer fouten bij nucleaire toonhoogteaccenten en grenstonen dan de Chinese proefpersonen met een hogere beheersingsgraad, en deze produceerden weer significant meer fouten bij de grenstonen dan de moedertaalsprekers. Deze productiedata zijn gebruikt om aanvullende vragen over de uitspraak van Chinese sprekers van het Nederlands te onderzoeken. Allereerst vonden we dat de Chinese sprekers van het Nederlands meer Intonatiefrases (IP's) produceerden dan de moedertaalsprekers. Ten tweede maakten de Chinese sprekers van het Nederlands binnen de IP's meer en vaker pauzes dan de moedertaalsprekers, al waren de duren van deze pauzes niet significant verschillend. Ten derde, de spreeknelheid en

de articulatiesnelheid van de Chinese sprekers met een lage beheersingsgraad (CLN) in het Nederlands lagen significant lager dan van de Nederlandse sprekers met een hoge beheersingsgraad van het Nederlands (CLN) en de moedertaalsprekers. Bij de moedertaalsprekers was de nPVI significant lager dan bij de CLN-sprekers. Volgens de gesed *Pairwise Variability Index*, waarvoor geldt dat lage waarden wijzen op een spraak die relatief 'staccato' is) significant groter dan bij de Nederlandse sprekers en de nPVI bij de CHN-groep was weer significant lager dan bij de CLN-groep. Ook maakten de CLN-sprekers significant meer nucleaire toonhoogteaccenten dan de CHN-groep en de Nederlandse controlegroep. Over het algemeen accentueerden de CHN-sprekers zinnen vrijwel op dezelfde manier als de moedertaalsprekers, zij af en toe een accent legden op een functiewoord of een gegeven informatie uitdrukt. Het was opvallend dat sommige proefpersonen, zowel in de CHN-groep als in de CLN-groep, vaak een te veelvuldig toonhoogteaccent plaatsten op het tweede deel van een zin of een woord.

Experiment 4

Experiment 4 had tot doel om na te gaan hoe Chinese sprekers de Nederlandse drie Nederlandse toonhoogtecontouren (H*L L%, H*L H%) produceerden onder tijdsdruk, d.w.z. als segmenten die beperkt voorhanden is. Oplopende graden van tijdsdruk werden gecreëerd door vier eenlettergrepige Nederlandse eigennamen *Loom*, *Lof* and *Lof* in de eindpositie van een Intonatiefrase (IP) op te nemen. De namen variëren in de duur van het sonorante rijm van de IP, omdat de klinkers fonologisch verschillende duren hebben en de coda's verschillen in sonorantie (/m/ is sonorant maar /f/ is niet). De testwoorden werden ingebed in drie korte draagzinnen, een zin met verengd informatiefocus, een *ja-nee*-vraag en een retoriek met correctief focus, ten einde drie nucleaire intonatiecontouren te ontlokken: de daling, de stijging en de daling-stijging. In tegenstelling tot de CLN-sprekers produceerden de CHN-sprekers stijgingen veelal op dezelfde manier als de moedertaalsprekers. Naarmate de sonorante rijmdelen korter zijn, worden deze contouren in de IP samengedrukt door zowel de moedertaalsprekers als de CHN-sprekers. De vormaanpassingen zijn echter niet tot in alle details hetzelfde voor de twee groepen. Zo laten de moedertaalsprekers de daling later in *Lom* dan in het langere *Loom*. Een opvallend resultaat is dat

groep in geen enkel opzicht het patroon volgt van de moedertaalsprekers behalve dat *Lom* en *Loom* latere dalingen hebben dan *Lof* en *Loof*. Dit suggereert dat er, voor deze sprekers, geen verschil is tussen de lange en de korte klinkers van het Nederlands. Alle CHN-sprekers, maar niet de CLN-sprekers, waren in staat de korte en lange klinkers correct uit te spreken in de drie zinstypen. De CLN-sprekers maken dus geen fonologisch duuronderscheid. Meer in het algemeen waren de duren van de sonorante rijmdelen bij de CLN-sprekers langer dan bij de moedertaalsprekers en ook langer dan bij de CHN-sprekers, met uitzondering van *Loof* in de daling en in de stijging. Ten slotte bleek geen van de twee Chinese sprekergroepen in staat het gedrag van de moedertaalsprekers te reproduceren bij de realisatie van de daling-stijging, wat het feit weerspiegelt dat dit patroon niet kan voorkomen op één enkele lettergreep in hun moedertaal. Tussen de drie sprekergroepen zijn geen verschillen gevonden in toonbereik, het verschil tussen hoogste en laagste toon.

Experiment 5

In Experiment 5 bestudeerden we het effect van verschillende typen focus en van positie van het doelwoord op dalende zinsmelodieën (H^*L $L\%$ and H^*L $\%$). Drie groepen Nederlands declaratieve zinnen werden gebruikt in brede, verengde en verengd-correctieve focuscondities. Elke groep bevatte vier doelwoorden, namelijk de pseudo-plaatsnamen *Manderen*, *Momberen*, *Memberen* en *Munderen*. Zes van 23 potentieel gevoelige fonetische maten bleken significante effecten op te leveren. Deze maten zijn de duren van de onset, het rijm en de coda van de geaccentueerde lettergreep, de duur van de daling, de f_0 excursie van de daling en de segmentale oplijning van de f_0 -piek. De CHN-sprekers deden het niet beter dan de CLN-groep. Duidelijk is dat de fonetische realisatie van focuscondities geleerd moet worden en dat dit moeilijker is dan, bij voorbeeld, leren om gegeven referenten niet te accentueren. De kenmerken die in Experiment 5 onderzocht zijn, zijn subtiel en blijven waarschijnlijk onder de perceptieve drempel van moedertaalsprekers.

Chinese sprekers van het Nederlands hebben al met al enige taalkundige kennis van zinsaccentuering en intonatie. Zij kunnen bepaalde toonhoogteaccenten en contouren kiezen om zich daarmee binnen context passend uit te drukken. Niettemin verschillen de Chinese sprekers van het Nederlands en de moedertaalsprekers zowel fonologisch als fonetisch in hun voorleesspraak. De scores die de (Mandarijn-) Chinese

sprekers van het Nederlands behaalden, waren vaak aanzienlijk die van de moedertaalsprekers. De voornaamste conclusie van dit onderzoek is dat de Chinese sprekers van het Nederlands kennis hebben van waar in de zin toonhoogteaccenten moeten worden geplaatst en van welke intonatiemelodie gebruikt moet worden in een zin in context. Daarnaast blijkt dat de voorleesspraak van de Chinese sprekers gekenmerkt wordt door meer toonhoogteaccenten, meer variatie binnen de Intonatiefrase, langzamere spreektempo en weinig variatie in de dueren van lettergrepen (lagere *Pairwise Variability Index*-waarden). De fonetische realisatie van de intonatiepatronen zoals onderzocht in experimenten 4 en 5 zijn verschillen gevonden tussen de groepen. De manier waarop focus en de beschikbaarheid van sonorante klanken de realisatie van toonhoogtedalingen beïnvloeden. Deze verschillen moeten worden geëlimineerd als Chinese leerders het Nederlands op precies dezelfde manier willen uitspreken als de moedertaalsprekers. Dit laat het zich aanzien dat de perceptieve effecten van deze verschillen gering zullen zijn.

总结

汉语官话或普通话是声调语言，有四个字调，以区别词汇的意义。荷语无字调，句子语用意义的表达依赖语调。以字调语言(如汉语官话)为母语的学习者习得没有字调但依赖声调区别句子语用意义的声调语言(如荷语)的外语或二语时，究竟会遇到哪些困难，目前研究尚少。本论文毕其力初步弥补其空缺。

论文主要从音系层面和语音层面描述带有汉语官话口音的荷语的韵律特征，由五个实验组成。第一和第二个实验是听觉感知实验，其他三个是产出实验；实验从不同角度研究带汉语官话口音的荷语韵律。产出实验分两种：第三个实验调查母语为汉语官话的荷语学习者朗读六类荷语句子，选择语调的正确性，考察被试的语调知识。第三个实验和两个听觉感知实验测试中国被试的荷语语调意义和词形学知识。第四和第五个产出实验探讨中国被试实现荷语语调音高走势的语音能力；研究他们荷语语调的语音特征。无论中国被试是否具有在一定的语境中选用荷语韵律结构的能力，他们朗读这些韵律结构时或多或少带有口音。所以，听觉实验探究中国被试正确选用语调的能力，产出实验研究他们语调的声学特征。

听觉实验和产出实验是互相补充的。诸多原因造成二语或外语学习者在韵律方面的“外国腔”。论文首要是确定“外国腔”从何而来：是音系上的差别还是语音上的差别？听觉感知实验要解决的是中国被试者能否正确辨别真实语境中的荷语韵律，即：能否识别正确和错误的韵律结构。如果中国被试认为荷兰本族语者正确的发音不恰当或不正确，那么就不企望中国被试能够正确地发音。如果他们在感知上能够区别正确和错误的读音，但不能正确地产出这些韵律结构，那就归因于他们的语音实现能力的欠缺。

从实践上看, 前种情况需要让学习者更多地接触荷语音的情况学习者则需要学习荷语的发音。

20 个中国被试参加上述 5 个实验和 20 个荷兰本族语者参加一个听觉感知实验。第三个实验中, 五个荷兰本族语者朗读句子的朗读作为比较标准, 探讨中国被试的荷语韵律特点。第二个和第五个实验中荷兰本族语者的数据来源于荷兰拉伐语言研究中心的“荷语方言的语调”研究项目所建立的“材料库”。20 个中国被试 3 男 7 女, 年龄最小 17 岁, 最大 25 岁。他们都来自于中国大陆北方, 母语为汉语官话。实验前, 中国被试对荷语充分, 有足够完成实验所需的荷语语言能力。3 个被试根据他们朗读中的发音和韵律表现, 把他们分成高水平组和低水平组 (CLD)。参加实验的本族语者年龄从 18 岁到 25 岁不等, 能操标准荷语。

实验 (一)

实验 (一) 是听觉感知实验, 研究中国荷语学习者识别重音的方式。在强迫选择任务中, 20 个学习者和 20 个荷兰本族语者听 36 个荷语句子, 判断这些句子重音是否在句首。在五分制的利克特量表 (Likert) 上表明他们对判断的信心。在句子中只考察一处句子重音是否正确, 测试前由荷语专家朗读录音; 录音有正确和错误两种形式, 形成两个对立版本。每个句子录音, 被试选择其中的一个版本进行测试。

荷兰本族语者的得分显著高于中国学习者中的高水平组。中国学习者中的高水平组的得分显著地高于学习者中的低水平组。他们的信心度也是由荷兰本族语者向低分组下降。实验结果表明: 荷语学习者对于荷语句子重音的判断信心好, 但他们清楚这一点, 如果得分低, 他们的信心度会下降。同时, 中国学习者对信息焦点处的重音判断比荷语中由母语者确定的句子重音要容易。

实验 (二)

实验 (二) 也是一个强迫选择的听觉实验, 研究中国学习者能否根据故事的语境, 给故事中的句子选用最为得当的语调。所谓“得当”指的是在特定语境下, 绝大多数荷语本族

语调。实验材料是一篇经过改写的荷语故事，由 26 个句子组成，每句给出四个不同的语调并录音。按故事发生顺序，被试者听这些句子的四个语调，根据语境选最佳的一个。实验结果表明中国被试选择得分不及荷兰本族语者高而且他们的选择和本族语者相比显得非常不一致；高水平组比低水平组接近本族语者的选择。语境中句子最佳语调的选用虽有争议，但明确界定，反映本族语者的语言能力。如果本族语言能力没有表现出来，学习者也不可能表现出来。学习者还可能采用其他的策略：问号结尾的句子用升调，问号、逗号和感叹号结尾的句子用降调。另外我们还发现：学习者大多趋向避免选择渐降的降调 (downstepped falling pitch) 和降升调 (falling-rising pitch)，这可能和他们偏爱与汉语字调类似的语调有关。中国被试的测试成绩和到达荷兰的年龄 (AOA) 显著相关，与年龄 (Age)、居留荷兰年限 (Length of Residence) 无显著关，和二语习得其他方面的研究结论基本一致。就我们所知，该实验是首次对二语学习者韵律选用的系统研究。

实验 (三)

实验 (三) 是产出实验，以七类荷语句子为语料，每类句子代表一类语调“成语”，而只有一种最合适的语调。该实验旨在调查中国荷语学习者朗读七类荷语句子的语调选择。譬如，荷语中以小品词 *bè* 结尾的句子最后一个重读音节用降升调 (H*L H%)。以五个荷兰本族语者朗读七类 42 个句子 (每类六个句子) 作为“正确”的语调标准，比较学习者朗读中语调的选用。如果本族语者的语调选用一致性很高，那么学习者的错误程度就更严重。

中国学习者一定程度上能够选用最得当的语调朗读七大类荷语句子。他们能够使用降调或半降调朗读标准荷语中 *wat* 形式的感叹句和选择疑问句，这两类句子在标准荷语中使用降调或半降调。中国学习者在朗读含有 *toch* 问句、含有 *echt* 的问句，如 *Was het echt zo goedkoop?*、句末汇报语 (reporting clauses) 和呼语 (vocative chants) 这些句子时，出现很多错误。虽然标准荷语中带有 *hoor*、*bè* 或 *toch* 的问句都使用降升调，但中国学习者朗读前面两类问句要比后一种好，能够选用正确的语调进行朗读。对于中国学习者来说，普遍的规律是：降调和升调简单，降升调较难。低水平的学习者比高水平的学习者出现更多的调核错误和边界调的错误，但高水平

的学习者比荷兰本族语者出现更多的边界调的错误，但所有这些差异显著。这些朗读材料的其他特点如语调短语量、语调短语内的停顿和其时长、语速 (speech rate) 和 (articulation rate)、毗邻配对变化系数 (nPVI) 也加以分析。在朗读中产生的语调短语、停顿显著地多于本族语者，时长没有显著差别。低水平学习者的语速和发音速度显著比高水平学习者和本族语者慢。本族语者的毗邻配对变化系数显著低于高水平学习者，而后者的毗邻配对变化系数又显著低于低水平学习者。毗邻配对变化系数越低表明发音不连贯。学习者的调头重音显著地多于高水平学习者和本族语者。学习者的句子重音形式实际上和本族语者的句子重音形式差不多，但是他们有时候重读功能词和重读已知信息；但是，中国学习者中，无论高水平学习者和低水平学习者都很少重读合成词的第二个组成成分。

实验 (四)

实验 (四) 研究中国荷语学习者在有时间压力下如何产生降调 (H*L L%)、升调 (L*H H%) 和降升调 (H*L H%) 的压力，即语调所在的音段时长受限制。虚构专有名词 *Loom*、*Lom*、*Loof* 和 *Lof* 四个单音节词分别置于语调短语的末尾，在时间压力逐渐增强，因为他们的韵部时长不同：长元音和短元音有别，尾音 /f/ 和 /m/ 的响度不同。各个测试单词分别置于陈述句和一般疑问句的信息焦点以及反问句中的焦点位置，要求被试分别用降调、升调和降升调朗读。随着测试压力增大，虽然调节方式具体细节不尽相同，但高水平学习者都压缩升调和降调，低水平学习者没有采用此策略。本族语者 *Lom* 的降调降得要比 *Loom* 的迟。除了 *Lom*、*Loom*、*Loof*、*Lof* 迟外，低水平学习者没有采取任何类似于本族语者的策略，低水平学习者发音甚至不能区分长元音和短元音。低水平学习者发音中能够区别长元音和短元音。低水平学习者的单音节词的韵部比本族语者的韵部长；也比高水平组测试单词的韵部长，但除降调和升调下的 *Loof* 外。中国学习者的降升调的降升调完全不一样，这反映了他们的母语在单音节词中很少出现这样复合的语调。三组之间的音域没有显著差别。

实验（五）

实验（五）研究被试如何实现不同类型的信息焦点以及陈述句中使用降调的信息焦点词位置的影响。以虚拟地名 *Manderen*、*Momberen*、*Memberen* 和 *Munderen* 为信息焦点词，分别置于宽焦点 (broad focus)、窄焦点 (narrow focus) 和纠正焦点 (corrective focus) 形成三套 12 个陈述句。三组被试相比较，23 个语音变量中，只有重读音节首音、韵部和尾音的时长，降调的时长，降调基频高低差异以及音高峰值时间对应等 6 个变量显著不同。高水平学习者实现不同信息焦点并不能胜过低水平学习者，虽然在句子重音听觉实验中，中国学习者感知新信息重音得分较高，这说明感知能力不能迁移成为产出能力，如何实现不同信息焦点必须习得。和感知实验相比，实验（五）所调查的语音特点很精细，即使是本族语者也达不到像感知实验所取得的理想结果。

中国荷语学习者掌握了一定的句子重音和语调的语言知识，能够根据篇章语境选择一定的重音和语调表达自己思想。但是，他们朗读材料的韵律在音系特征和语音特征两方面都不同于荷兰本族语者。在两个听觉实验中他们的得分显著少于本族语者的得分，表明他们的音系知识不及本族语者；朗读产出实验里，学习者有富余的句子重音；有更多的语调短语；语速、发音速度和毗邻配对变化系数都远远低于族语者；实验(四)和实验（五）也发现学习者的语音实现中的一些变量也不同于本族者。所以，如果学习者要产出地道的荷语，这些方面都得习得，虽然语音知识的感知微妙，效果低。

Appendices

Appendix 1: Corpus belonging to Chapter 2

A Word stress

1. *Er staat een OOievaar in de wei/ooieV.AAR in de wei.*
There's a stork in the field.
2. *Toen vochten de Nederlanders tegen de SPANjaarden/spanJAARden.*
At that time, the Dutch fought against the Spanish
3. *Er is een Adelaar ontsnapt/adeLAAR ontsnapt*
An eagle has escaped
4. *Er is een Olifantje geboren/oliFANTje geboren.*
An elephant has been born.
5. *Zijn vrouw houdt van SIEraden/sieRADen.*
His wife likes jewelry.
6. *Dat is de DOMinee/domiNEE.*
That's the vicar.

B Compounds

1. *Ze hebben een grote GROENietuin/groenteTUIN.*
They have a large kitchen garden.
2. *Op zondag eten ze altijd KRENTenbrood/krentenBROOD.*
On Sundays they always have raisin bread.
3. *Je kunt hem beter in de FIETsenkelder stallen/fietsenKELder stallen.*
You'd better park it in the bicycle parking space in the basement.
4. *Ik wil een nieuwe KOEkenpan/koekenPAN.*
I'd like a new frying pan.
5. *Luister 's naar dat ORgelspel/orgelSPEL.*
Listen to the playing of the organ.
6. *Er is daar een leuke BOEKwinkel/boekWINkel.*
There's a nice bookshop there.

C Proper names

1. *Dit is mevrouw VROEGindewei/vroegindeWEL.*
This is mrs. Vroegindewei (literally 'early in the field').
2. *Hij heet NAAKTgeboren/naaktgeBOren.*
His name is Naaktgeboren.
3. *Dat is voor Jan LEEFflang/leeftLANG.*
That's for Jan Leeftlang.
4. *Ken jij Mia ZELdenthuis/zeldenTHUIS?*
Do you know Mia Zeldenthuis?
5. *Vraag dat maar aan Ria ZONdervan/zonderVAN.*
Please just ask Ria Zondervan.
6. *De beste verf komt van VETtewinkel/vetteWINKel.*
The best paint is produced by Vettewinkel.

D SAAR (eventive sentences)

1. *Ze hebben een aantal nieuwe WERken aangekocht/werken AANgekocht.*
They've acquired a number of new works of art.
2. *Waar kan ik schone BORDen vinden/ borden VINden?*
Where can I find clean plates?
3. *Wanneer moeten we de VUILniszakken buiten zetten/vuilniszakken buiten ZETten?*
When should we put the garbage out?
4. *Is er een ONgeluk gebeurd/ongeluk geBEURD?*
Has there been an accident?
5. *Moeten we niet een DOKter waarschuwen/dokter WAARschuwen?*
Shouldn't we call a doctor?
6. *De vuilnisman heeft de verkeerde ZAK meegenomen/zak MEEgenomen.*
The garbage man has taken the wrong bag.

E Non-eventive sentences

1. *U wordt verzocht eventuele schade te MELden/SCHAden te melden.*
You are requested to report any damage.
2. *Ik zou die misstap TOEgeven/MISstap toegeven.*
I'd own up to that misdemeanor.
3. *Je moet een hond AANKijken/een HOND aankijken.*
You must look a dog in the eyes.
4. *U wordt verzocht uw lege glazen hier ACHter te laten/GLAzen hier achter te laten.*
You are requested to leave your empty glasses behind.
5. *De wereld draait DOOR/WEreld draait door.*
The world goes on.
6. *Vissen moeten ZWEMmen/VISsen moeten zwemmen.*
Fish must swim.

F Focus

1. *Ik heb wel een mooie BRUIne jas gezien. Maar ik zocht eigenlijk een ZWARte jas/zwarte JAS.*
I did see a nice brown coat. But I was really looking for a black coat.
2. *Er zijn DRIE Rode KNIKKers. Maar ik zoek nog een paar BLAUwe knikkers/blauwe KNIKKers.*
There are three red marbles. But I'm still looking for some blue marbles.
3. *GERard rijdt in een jaPANse auto, maar wil eigenlijk een FRANse auto/franse AUto.*
Gerard drives a Japanese car, but he would really like a French car.
4. *Laat je je auto Overspuiten? Je kunt ook je auto laten WASsen/je AUto laten wassen.*
Are you having your car repainted? You might just have your car washed.
5. *Veel dieren leven onder de GROND. Er zijn ook SLANGen die ondergronds leven/slangen die onderGRONDS leven.*
Many animals live underground. There are also snakes that live underground.
6. *Het sceNario van Zwartboek is van gerard SOEteman, maar paul verhoeven heeft de film geregisSEERD/FILM geregisseerd.*
The scenario of Zwartboek is by Gerard Soetman, but Paul Verhoeven directed the film.

Appendix 2: Corpus belonging to Chapter 3

Each of the 26 text fragments is given with an English translation and phonological representations. For each fragment, the text in bold print indicates the phonologically variable portions of the four speech files, with any cross-splicing being indicated at the point where the bold-faced text begins, which have been provided with stylized phonetic realizations. Any preceding text indicates an invariable portion of the four speech files. The phonological transcriptions of the variable portions are in bold print if they differ across versions. The scores by the Dutch and Chinese subjects for each of the four contours are given before and after the slash, respectively.

Fragment 0

A: 13/4

Het winterkoninkje

%H !H*L L%

C: 0/2

Het winterkoninkje

%H !H*L H%

The willow wren

B: 6/7

Het winterkoninkje

%H H*L L%

D: 1/7

Het winterkoninkje

%H H*L %

Fragment 1*Het winterkoninkje en zijn vrouw*

%L H*L L*H H%

The willow wren and his wife

A: 20/19

wilden voor hun jongen wat te eten halen

%H H*L L*H H*L L%

C: 0/0

wilden voor hun jongen wat te eten halen

%H H*L L*H L*H H%

wanted to go and get some food for their children

B: 0/1

wilden voor hun jongen wat te eten halen

%H H*L L*H

D: 0/0

wilden voor hun jongen wat te eten halen

%H H L L*H

Fragment 2*Omdat hun kinderen op die dag jarig waren*

%L H*L H*L H%

A: 19/12

C: 0/3

they were born one month earlier

wilden ze extra lekker voedsel meebrengen

they wanted to bring especially nice food for them.

Fragment 3

Ze vlogen naar de eiken, en de beuken, en de dennenbomen,
 They flew to the oaks, and the beeches, and the fir-trees,

A: 20/17

C: 0/0

'They searched everywhere!'

B: 0/3

D: 0/0

Fragment 4

Na één uur hadden ze een hele smulpartij verzameld:
 After an hour they had collected a large amount of delicacies:

A: 20/9

lekkere citroenvlinders, malse mestkevers, pittige regenwormen
 %L H* % %L H* % %L H*

B: 0/1

lekkere citroenvlinders, malse mestkevers, pittige regenwormen
 %H L* H% %H L* H% %H L*

C: 0/4

lekkere citroenvlinders, malse mestkevers, pittige regenwormen
 %L H*L H% %L H*L H% %L H*L

D: 0/6

lekkere citroenvlinders, malse mestkevers, pittige regenwormen
 %L H* H% %L H* H% %L H*

delicious brimstone butterflies, juicy earthworms, spicy dung beetles

en een heleboel andere lekkere dingetjes.

%L H* !H*L L%
 and many more delicacies.

Fragment 5

A: 19/10

Eindelijk kwam het winterkoninkje weer thuis.

%LH*

!H*L L%

B: 0/10

Eindelijk

kwam het winterkoninkje weer thuis.

%LH*L L%

%L

H*L L%

C: 1/0

Eindelijk kwam het winterkoninkje weer thuis.

%LL*H

H*L L%

D: 0/0

Eindelijk kwam het winterkoninkje weer thuis.

%LH*

H*L L%

Finally the willow wren returned to the nest.

Fragment 6*Toen er zeven kleine vogeltjes,*

%L

H*L

H*L

%

when seven little birds,

A: 3/2

z'n kinderen,

%L H*L %

C: 0/3

z'n kinderen,

%L L*H H%

his children,

B: 5/10

z'n kinderen,

%L H*L L%

D: 12/5

z'n kinderen,

%L H*L H%

te voorschijn kwamen,

%L H*L

H%

made their appearance.

zag-ie dat ze bibberden van angst!

%L

H*

!H*L L%

he saw that they were trembling with fear!

Fragment 7

A: 19/3

Wat is er met jullie gebeurd?

%L

H*L %

B: 1/7

Wat is er met jullie gebeurd?

%L

H*L L%

Jullie zijn helemaal in de war!

%L

H*L %

Jullie zijn helemaal in de war!

%L

H*L L%

C: 0/0

D: 0/10

What has happened to you?

You are all confused!

Fragment 8

Ach, vader

%L H*L H*L L%

Oh, daddy,

A: 16/5

B: 1/6

C: 0/0

D: 3/9

A big bogeyman just came along!

Fragment 9

A: 18/11

B: 0/3

C: 2/5

D: 0/1

What's that you're saying?

Fragment 10

A: 19/11

C: 0/5

B: 1/2

D: 0/2

Fragment 11

A: 14/5

C: 0/11

B: 0/2

D: 6/2

Fragment 12

A: 19/18

C: 0/0

B: 0/1

D: 1/1

Fragment 13

A: 17/5

B: 0/0

C: 0/1

D: 3/14

Fragment 14

A: 19/8

C: 0/0

B: 1/12

D: 0/0

Fragment 15

A: 14/5

B: 1/5

C: 5/10

D: 0/0

Fragment 16

A: 12/6

B: 3/11

C: 4/2

D: 1/1

But we don't know, do we now!

Fragment 17

A: 4/4

B: 0/4

C: 2/7

*Rustig maar, kinderen! En zeg 's: Waar is-ie **gebleven?***

%L

H*L H%

D: 14/5

*Rustig maar, kinderen! En zeg 's: Waar is-ie **gebleven?***

%L

L*H H%

Calm down, children, and tell me: Where did he go?

Fragment 18*Hij is daarheen **gegaan!****En de kinderen **wezen** naar het don*

%L H*L L%

He went there!

%L H*L H*

And the children pointed at the da

*Wacht maar, oude leeuw!**Als ik je op het spoor kom,*

%L H*L L%

Just you wait, old lion!

%L H* H%

If I track you down,

A: 19/18

B: 0/0

zal** ik je wel 'n lesje **leren!

%L H*L %

C: 0/0

zal** ik je wel 'n lesje **leren!

%L H*L H%

D: 1/2

Zal** ik je wel 'n lesje **leren!

%L L*H H%

I'll teach you a lesson!

Zal** ik je wel 'n lesje **leren!

%L H+!H %

Fragment 19*Toen vloog de vader het bos in,**en zocht overal.*

%LH*L !H*L !H*L !H*L L%

Then the father flew into the forest.

%L H* !H*L

He searched everyw

*Uiteindelijk**zag-ie de leeuw**achter de braamstruiken*

%L H*LH% %L H*L L*H%

finally he found the lion strolling behind some blackberry bushes

B: 1/5

C: 5/10

D: 0/0

Fragment 16

A: 12/6

C: 4/2

But we don't know, do we now!

B: 3/11

D: 1/1

Fragment 17

A: 4/4

B: 0/4

De leeuw

|
%L L*H %
The lion

zag er heel gevaarlijk uit maar 't winterkoninkje dat was niet
| | | | |
%L H* !H*L L% %L L*HL H% %LH*LH
looked very dangerous, but the willow wren he wasn't afraid

Hij streek neer op de leeuw z'n rug en begon op 'm te schelden.
| | | | |
%L H*L !H*L !H*L L*H % %L H* !H*L L%
He landed on the lion's back, and started to scold him.

A: 17/19

Wat heb jij bij mijn nest te zoeken! Hoe durf je mijn kindertjes bang te maken!
| | | | |
%L H*L % %L H*L
B: 0/0

Wat heb jij bij mijn nest te zoeken! Hoe durf je mijn kindertjes bang te maken!
| | | | |
%L H*L H% %L H*L
C: 0/1

Wat heb jij bij mijn nest te zoeken! Hoe durf je mijn kindertjes bang te maken!
| | | | |
%L L*H H% %L L*H
D: 3/0

Wat heb jij bij mijn nest te zoeken! Hoe durf je mijn kindertjes bang te maken!
| | | | |
%L H* H% %L H*
What are you doing near my nest! How dare you frighten my children!

Fragment 20

A: 15/14

Maar de leeuw trok zich er niets van aan
| | | | |
%L H*L H* !H*L L%
But the lion drew himself nothing from it

B: 1/3

%L H*L H* H*L H%

C: 4/1

%L H*L H* L*H H%

D: 0/2

%L H*L H* H*+H %

But the lion was unperturbed,

en liep gewoon door.

%L H* !H*L L%

and just kept walking.

Fragment 21

Toen het winterkoninkje zag dat de leeuw wilde ophoepelen

%L H*L H*L H*L H%

When the willow-wren saw that the lion just wanted to walk away.

A: 18/14

%L H*L L% L L%

B: 0/0

%L H*L H% L H%

C: 1/0

%L H*L L% L H%

D: 1/6

Ging-ie nog veel heviger tekeer, 't kleine opdondertje.

%L H*L H% L L%

he vented his rage even more fiercely, the tiny animal

Fragment 22

A: 20/14

Jij hebt daar niks te zoeken, zeg ik je!

%L H*L %

C: 0/4

Jij hebt daar niks te zoeken, zeg ik je!

%L H*!H %

You have no business there, I tell you!

B: 0/1

Jij hebt daar niks te zoeken, zeg ik je!

%L H*L

D: 0/1

Jij hebt daar niks te zoeken, zeg ik je!

%L L*H

Fragment 23

En als je nog eens terugkomt

%L H*L H%

And if you dare to come back,

A: 19/19

dan zul je wel eens zien!

%L H*L L%

C: 0/0

dan zul je wel eens zien!

%L H* H%

you'll see what's going to happen!

B: 1/0

dan zul je wel eens zien!

%L H* %

D: 0/1

dan zul je wel eens zien!

%L H*L H%

Fragment 24

Ik zal het niet graag doen,

%L H*L L*H H%

I wouldn't like to do this at all,

A: 20/13

B: 0/7

Fragment 25

*Daarop vloog-ie weer terug naar z'n nest**en sprak tegen z'n kleintjes:*

A: 20/12

Appendix 3: Corpus belonging to Chapter 4

A. H*L L% 'of niet' /end of list

1. *Je moet kiezen: wil je liever fruitsalade of wil je liever ijs?*
You will have to choose: would you rather have fruit salad or ice cream?
2. *Weet je 't al? Krijg je nou wel een visum of krijg je geen visum?*
Do you know yet? Will you or will you not get a visa?
3. *Wat een raar weer. Zou 't nou gaan regenen of niet?*
What strange weather! Is it going to rain or not?
4. *Het is niet zo ver naar Zwolle. Ga je met de auto of met de trein?*
It's not that far to Zwolle. Are you taking the car or the train?
5. *We eten kip. Heb je daar liever rijst bij of aardappelen?*
We're having chicken. Would you rather have rice with that or potatoes?
6. *We hebben twee mogelijkheden: willen we op gas koken of elektrisch?*
We have two options: do we want to cook on gas or on electricity?

B. H*L H% 'toch' /self evidence

1. *Je hoeft niet meer te werken. Je hebt toch al genoeg gedaan deze week?*
You don't have to work any more. Haven't you done enough for the week?
2. *Je kan niet naar school. Je bent toch ziek?*
You can't go to school. You're sick, aren't you?
3. *Ga je nou weer naar de supermarkt? We hebben alle boodschappen toch al gedaan?*
Are you going to the supermarket again? But haven't we done all our shopping?
4. *Waarom geef je een feest? Je bent toch niet jarig?*
Why are you throwing a party? It's not your birthday, is it?
5. *We hebben wel een huisdier! We hebben toch een hond?*
We do have a pet! We have a dog, don't we?
6. *Waarom veeg je je handen aan je broek af? Er zijn toch handdoeken?*
Why are you wiping your hands on your trousers? We have towels, don't we?

C. H* H% 'echt?' /surprised question

1. *Zei je nou echt dat je naar buiten wilde? In de regen?*
Did you really say you were going to go out? In the rain?

2. *Heeft ze echt een negen gehaald? Zonder te leren?*
Has she really got a top mark? Without doing any work for it?
3. *Staat er echt een politieauto voor de deur? Met zwaailichten?*
Is there really a police car in front of the house? With flashing lights?
4. *Is hij echt te laat gekomen? Op z'n examen?*
Did he really arrive late? For his exam?
5. *Was het echt zo goedkoop? In de uitverkoop?*
Was it really that cheap? In the sales?
6. *Heb jij dat echt zelf getekend? Met dat potlood?*
Did you really draw this yourself? With that pencil?

D. H*L % 'he said'/reporting clause

1. *Hij keek ons de hele tijd strak aan. Toen zei-die: Dat nooit!*
He looked hard at us the whole time. Then he said: 'That, never!'
2. *Ze wist het niet. Daarom vroeg ze: Wie gaat er mee?*
She didn't know. That's why she asked: 'Who's coming?'
3. *Hij keek haar na. Toen riep-ie: Vergeet de bloemen niet!*
He followed her with his eyes as she left. Then he shouted: 'Don't forget the flowers!'
4. *Ik was het niet met hem eens. En dus zei ik: 't Klopt niet!*
I didn't agree with him. So I said: 'It's not right!'
5. *Ik geloofde hem niet. Daarom vroeg ik: Is 't echt waar?*
I didn't believe him. That's why I asked: 'Is it really true?'
6. *We verdienen er niks aan! Daarom zeg ik: Niet doen!*
We're not gaining anything by it. That's why I'm saying: 'Don't do it!'

E. H*+!H vocative chant

1. *Schat-je! We hebben weer kaa-aas!*
Honey! We have cheese again!
2. *Jo-han-na! Ik wil niet naar de tand-arts!*
Johanna! I don't want to go to the dentist!
3. *Kin-de-ren! Het is e-tens-tijd!*
Children! Dinner time!

4. *Ja-an! Je hemd hangt uit je broek!*
Jan! Your shirt is hanging out of your trousers!
5. *Ji-ip! Je moet naar schoo-ool!*
Jip! You should go to school!
6. *Jan-ne-ke! Je moet je huis-werk nog ma-ken!*
Janneke! You still have to do your homework!

F. H*L H% 'hè, hoor'/hearer appeal

1. *Het wordt laat. Maar je moet wel je eten opeten, hoor!*
It's getting late. But you should finish you meal!
2. *De televisie doet 't niet. Dat vind je zeker jammer, hè?*
The TV isn't working. You don't like that, now do you?
3. *We rijden om 9 uur weg. Dat is vroeg genoeg, hoor!*
We're leaving at nine. Don't worry, that's early enough!
4. *Heb je weer wat te klagen? Je gaat niet zeuren, hè?*
Are you complaining again? No whining, okay?
5. *Wil je naar die tekenfilm? Die is leuk, hoor!*
Do you want to see that animation film? It's funny, you know!
6. *Wat sta je nou te treuzelen? Je bent bang, hè?*
What are you tarrying for? You're afraid, aren't you?

G. H*L (L%) wat-exclamations

1. *Kijk daar 's! Wat is dat een rare fiets!*
Look over there! What a funny bike!
2. *Er is geen thee meer. Wat drinken jullie toch veel!*
We're out of tea. You're drinking so much!
3. *Ik ben vanmorgen in de stad geweest. Wat leuk is het daar!*
I was in town this morning. It's ever so nice there!
4. *Het is erg warm. Wat stoken jullie veel!*
It's very hot. Your heating is turned up really high!
5. *Kijk 's uit het raam naar de overkant. Wat een grote berg stenen!*
Look out of the window across the street. What a large pile of bricks!
6. *Ik ga niet meer zwemmen hier. Wat is het water koud!*
I won't swim here anymore. The water is so cold!

Appendix 4: Corpus belonging to Chapter 5

I. Listen to and practise two examples with the contour H*L L%

1. A. *Met wie zijn ze naar de film geweest?*
Who did they go to the cinema with?
B. *Ze waren meegegaan met Bernadette.*
They'd gone with Bernadette
2. A. *Van wie is die auto?*
Whose car is that?
B. *Die is van Bakker Bart.*
It belongs to Bart's Bakery

Test sentences:

3. A. *Met wie gaat Roel naar 't concert?*
Who is Roel going to the concert with?
B. *Hij gaat met Marjel de Lof.*
He is going with Marjel de Lof.
4. A. *Van wie is dat dikke boek?*
Who does that thick book belong to?
B. *Dat is van Professor Loof.*
That is Professor Loof's.
5. A. *Met wie gingen de kinderen naar de dierentuin?*
Who did the children go to the zoo with?
B. *Ze gingen met meester Lom.*
They went with Mr Lom, their teacher.
6. A. *Met wie gaat je baas morgen trouwen?*
Who is your boss marrying tomorrow?
B. *Hij trouwt met mevrouw de Loom.*
He is going to marry Ms de Loom.

II. Listen to and practise two examples with the contour L*H H%

1. A. *Was dat Jan? Ik had hem niet herkend.*
Was that Jan? I hadn't recognized him.
B. *Je broer liep ook mee in de optocht.*
Your brother was also in the procession.

2. A. *We moeten de gordijnen ophalen bij de stomerij.*
We should pick up the curtains from the cleaners.
- B. *Zijn ze bij Palthe? Daar brengen we de kleren toch altijd?*
Are they at Palthe's? That's where we always take them, right?

Test sentences

3. A. *Trek je jas aan; we vertrekken zo naar Eindhoven.*
Put your coat on; we're leaving for Eindhoven soon.
- B. *Gaan we daar naar tante Lof? Gezellig!*
Are we visiting Aunt Lof? Nice!
4. A. *We gaan zo onze caravan ophalen voor de vakantie.*
We will pick up our caravan for the holiday in a minute.
- B. *Staat-ie bij familie Looft? Daar stallen wij 'm ook altijd.*
Is it parked at the Looft family's place? That's where we always keep
5. A. *Ik zag net je broer Koen met je buurvrouw langslopen.*
I just saw your brother Koen and your neighbour walk by.
- B. *Liep-ie naast mevrouw de Lom? Wat raar, die kennen elkaar toch niet?*
Did he walk beside Mrs de Lom? Odd, I thought they didn't know
6. A. *Ik moet straks naar de baas komen, omdat ik weer te laat was vanmorgen.*
I will have to go to the boss in a minute, because I was late again this
- B. *Moet je naar dokter Loom? Oei, maak je borst dan maar nat!*
Do you have to go and see doctor Loom? Ouch! Then you can exp

III. Listen to and practise two examples with the contour H*L H%

1. A. *Roelant Dalweide komt straks ook.*
Roelant Dalweide will come too.
- B. *Die heet toch Roelant Weijendaal?*
Isn't his name Roelant Weijendaal?
2. A. *Ik zag net Jan van de Korde.*
I just saw Jan van de Korde.
- B. *Jan van de Korde? Wat raar, die was toch in het buitenland?*
How odd. Wasn't he abroad?

Test sentences

3. A. *Ga je mee naar Bakkerij 't Stoepje?*
Are you coming to the Stoepje Bakery?
B. *We gaan toch naar Bakker Lof?*
But aren't we going to Lof's Bakery?
4. A. *Meester Boelens gaat mee op schoolreis.*
Mr. Boelens, the teacher, will join the school trip
B. *Je ging toch met meester Looft?*
But weren't you going with Mr. Looft?
5. A. *Pepijn de Heer komt straks ook naar 't feest.*
Pepijn de Heer komt will come to the party too.
B. *Hij heet toch Pepijn de Lom?*
Isn't his name Pepijn de Lom?
6. A. *Dit antieke horloge is nog van opa Thijssen geweest.*
This ancient wristwatch belonged to grandfather Thijssen.
B. *Het was toch van opa Loom?*
Wasn't it grandfather Loom's?

Appendix 5: Corpus belonging to Chapter 6

Listen to and practise two examples with H*L L% (broad focus focus)

1. A. *Wat gaan jullie vandaag doen?*
What are you going to do today?
B. *We gaan naar Harlingen fietsen.*
We're going to cycle to Harlingen.
2. A. *Waar fietsen jullie morgen naartoe?*
Where are you going to ride your bicycle today?
B. *We gaan naar Laren fietsen.*
We're going to cycle to Laren.

Test sentences

3. A. *Wat zijn de plannen voor morgen?*
What are the plans for tomorrow?
B. *Ik zou wel naar **Momberen** willen fietsen.*
I would like to cycle to Momberen
4. A. *Zijn er voor vanavond al plannen gemaakt?*
Do we already have plans for tonight?
B. *Ja, we zouden bij **Memberen** willen eten.*
Yes, we would like to eat out near Memberen.
5. A. *Zijn er al vakantieplannen?*
Do we already have holiday plans?
B. *We zouden naar **Munderen** willen liften.*
We would like to hitchhike to Munderen
6. A. *Wat is er?*
What is it?
B. *Ik had je naar **Manderen** willen rijden.*
I had wanted to drive you to Manderen.
7. A. *Waar zouden de Janssens heen willen lopen?*
Where would the Janssens want to walk to?
B. *Ze zouden naar **Memberen** willen lopen.*
They would like to walk to Memberen.
8. A. *Waar zouden je oom en tante willen wonen?*
Where would your uncle and your aunt like to live?
B. *Ze zouden bij **Manderen** willen wonen.*
They would like to live near Manderen.

9. A. *Waar zouden jullie willen blijven?*
Where would you like to stay?
B. *We zouden bij **Munderen** willen blijven.*
We would like to stay near Munderen.
10. A. *Waar zou Karel je heen willen brengen?*
Where would Karel like to take you?
B. *Hij zou me naar **Momberen** willen brengen.*
He would like to take me to Momberen.
11. A. *Had je me uit Beverwijk willen halen?*
Had you wanted to fetch me from Beverwijk?
B. *Nee, ik had je uit **Munderen** willen halen.*
No, I had wanted to fetch you from Munderen.
12. A. *Zouden de piloten bij Eindhoven willen landen?*
Would the pilots want to land near Eindhoven?
B. *Nee, ze zouden bij **Memberen** willen landen.*
No, they would like to land near Memberen.
13. A. *Had je moeder je naar Zaltbommel willen sturen?*
Had your mother wanted to send you to Zaltbommel?
B. *Nee, ze had me naar **Momberen** willen sturen.*
No, she had wanted to send me to Momberen.
14. A. *Zouden jullie naar Montfort willen rennen?*
Would you like to run to Montfort?
B. *Nee, we zouden naar **Manderen** willen rennen.*
No, we would like to run to Manderen.

Curriculum Vitae

He Xuliang was born in Huangmei in Hubei province, China, on 9 August 1971. He went to Hubei Normal University to major in English Language and Literature in 1991 and obtained his Bachelor degree in 1995. He was employed by that university after his graduation and worked there as an English instructor for four years. He enrolled in Shaaxi Normal University to study Foreign Languages and Applied Linguistics in September 1999, where he took his MA in June 2002. After his graduation he returned to Hubei Normal University to work in the English Department. In 2003 he obtained a teaching position in the School of Foreign Studies in Nantong University, Nantong, Jiangsu Province. During that engagement, he went to Queensland University of Science and Technology, Australia, to study Communicative Teaching for three months. At Radboud University Nijmegen, he worked on the PhD project which resulted in this dissertation from 15 December 2008 to 15 September 2011. He is now an associate professor in the School of Foreign Studies at Nantong University.

Xuliang He

Mandarin-accented Dutch Prosody

The dissertation reports on two perception experiments (Experiments 1 & 2) and three production experiments (Experiments 3, 4 & 5) that explore the phonetics and phonetics of the prosody of Mandarin-accented Dutch. Experiment 1 was conducted to see how well Chinese speakers of Dutch (CSD) identify the accentuation patterns in Dutch sentences, while Experiment 2 explored the extent to which they are able to identify the most appropriate intonation for sentences in context. Experiment 3 studied their choice of intonation in the production of seven 'intonational idioms'. Experiment 4 investigated whether CSDs produced Dutch monosyllabic Falls, Rises and Fall-rises under varying conditions of the availability of sonorant sounds. Experiment 5 studied how different levels of focus affected the pronunciation of falling intonation.

The perception experiments showed that CSDs do not know what intonation pattern to use and what words to accent when faced with contextualized sentences. This finding reveals that CSDs could not be expected to produce correct Dutch even if their command of the phonetics was perfect. Experiment 3 confirmed that this conclusion is correct on the basis of a production experiment in which CSDs failed to produce the right melody in 'intonational idioms'. Together with Experiments 4 and 5, this experiment also showed that CSDs do not conform to the phonetic routines used by native speakers and often transfer L1 prosodic patterns to their Dutch. The one exception was the lack of any transfer from Mandarin to the pronunciation of pitch falls as a function of focus.

This dissertation will be of interest to all those working on phonetics, prosody, Dutch and Mandarin Chinese phonology as well as second language acquisition.

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