The syntax-semantics interface of multi-morpheme motion constructions in Chinese:

An analysis based on hierarchical scalar structure

Abstract

This study analyzes semantic constraints affecting the order of motion morphemes in Mandarin Chinese multi-morpheme motion constructions (MMMCs, e.g. *zǒu-jìn fángjiān* 'walk into the room' (lit.) 'walk-enter room' vs. *jìn-zǒu (lit.) 'enter-walk'). We classify Chinese motion morphemes into four types based on recent study on "scale structure". Then, we propose an implicational scalar hierarchy formed by the four types of morphemes that can be used to predict the order of motion morphemes in Chinese MMMCs. Our corpus studies demonstrate that the hierarchy can explain the morpheme order of MMMCs for a comprehensive range of existing natural Chinese data. We anticipate that our scalar hierarchy may be extensible to serial-verb motion constructions in other languages as well.

1. Introduction

This paper explains lexical semantic effect that constrains the order of adjacent morphemes in expressions consisting of multiple motion morphemes. For such purpose, we will propose a hierarchy of motion morphemes based on their scale structure, which could be applicable to serial-morpheme (verb) motion constructions in other languages as well.

The term "directed motion event" in this paper refers to an event in which an object moves spontaneously (without an explicit external cause such as pushing or moving) in a certain direction with respect to a reference object and ends up in a new location. The moving object and the reference object are called "figure" and "ground" (Talmy 2000: 25), respectively. Verbs that denote motion are traditionally divided into two types: "manner-of-motion verbs" and "path verbs" (Talmy 2000). A manner-of-motion verb lexicalizes motion and manner, e.g., *fly* specifies the means of motion, but does not indicate in which direction a figure moves; a path verb lexicalizes motion and path (or direction, path and direction are used interchangeably in this work), e.g., *enter* specifies motion into an enclosed region, but does not indicate in which manner a figure enters (Talmy 2000).

In Modern Mandarin Chinese (hereafter "Chinese"), a motion event can be expressed in a variety of ways. For instance, both the verbal morphemes expressing manner-of-motion and path can be the only morpheme in a motion expression, as in (1a) and (1b) respectively.

(1) a. *Xiǎohái   zài jiē-shàng   **pǎo***   (*pǎo* 'run': manner-of-motion)
     little.child   at   street-on   run
     'The kid is running on the street.'

  b. *Xiǎohái   **jìn**-le   fángjiān*   (*jìn* 'enter': path)
     little.child   ascend-ASP   second.floor
     'The kid went up to the second floor.'[1]

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1 Abbreviations used in this paper: CLF = classifier/measure word; IMP = imperfective; MOD = modifier; NEG = negative marker; PROG = progressive; REL = relative clause marker.

43 In addition, more than one verbal motion morpheme can occur together to express a motion

44 event. As illustrated in (2), *zŏu* 'walk' specifies manner of motion and *jìn* 'enter' specifies path

45 of motion, and they co-occur in a single motion expression.

46

47 (2) *Tā*   **zŏu-jìn**   *fángjiān*

48 she   walk-enter   room

49 'She walked into the room.'*²*

50

51 Motion constructions consisting of multiple verbal motion morphemes are very common in

52 Chinese. For example, in the first 20 chapters of the novel *Tàiyáng Zhào Zài Sānggānhé-shàng*

53 (*The Sun Shines Over Sanggan River*), 146 out of 223 (65.5%) tokens of motion constructions

54 consist of more than one motion morpheme. In this paper, we call such constructions "multi-

55 morpheme motion constructions (MMMCs, hereafter)." In addition, motion morphemes are

56 called "M1", "M2" and"M3" respectively according to their left to right order in a MMMC for

57 convenience. For example, *zŏu* 'walk' is M1 and *jìn* 'enter' is M2 in (2).

58   Previous studies have not reached an agreement on the morpho-syntactic statuses of

59 motion morphemes appearing in MMMCs. For example, M2 is sometimes treated as a

60 directional complement to its preceding motion morpheme M1, and thus not as a full verb, as in

61 Liu (1998), Liang (2007), Lamarre (2007, 2008) and Peyraube (2006), among many others. In

62 contrast, Tai (2003) claims that the so-called directional complement M2, instead of M1, actually

63 functions as the main verb in a motion construction. For example, M2 *jìn* 'enter' in a MMMC

64 *zŏu-jìn* 'walk-enter' in (2) can appear as the only verb in the motion expression in (1b). In

65 addition, *dào* 'arrive' appearing in M2 or M3 positions are considered as a co-verb (Li and

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2 A compound, especially a noun compound such as *fángjiān* 'room' (lit.) 'room room', is
treated as a word unit in this paper. But for motion expressions, a hyphen is used to connect
morphemes within a compound and each motion morpheme is glossed, because our analysis was
based on the lexical semantic information of each morpheme. To determine if a given
combination of motion morphemes is a word unit or not, we tested the combination with the
perfective suffix *-le*. If a combination cannot be separated by *-le*, it was treated as a compound or
a word. For example, *zŏu-jìn* 'walk-enter' in *zŏu-jìn fángjiān* 'run-enter room' was treated as a
compound because *-le* cannot be inserted in between *zŏu* 'walk' and *jìn* 'enter'; in contrast, in
zŏu jìn-lái 'run enter-come', *-le* can be inserted in between *zŏu* 'walk 'and *jìn-lái* 'enter-come', so
zŏu and *jìn-lái* were treated as two words.

66 Thompson 1981), a full verb (i.e. main verb of verbal compound, Tai 2003) or preposition

67 (Lammarre 2007, 2008).

68   Nonetheless, we would like to ask readers to leave behind any pre-assumption regarding

69 the morpho-syntactic status of motion morphemes that we are discussing here, because we

70 attempt to show how lexical semantic information of each morpheme constrains the distribution

71 of these morphemes.[3]

72   Regarding the order of motion morphemes in MMMCs, previous studies (Lu 1977,

73 among others) have claimed that manner-of-motion morphemes must precede path morphemes,

74 so that for example, *jìn* 'enter' may not precede *zǒu* 'walk', cf. (3) and (2).

75

76 (3) **Tā*   ***jìn-zǒu***   *jiàoshì*

77   she   enter-walk   classroom

78   # '(intended meaning) She walked into the classroom.'

79

80 However, when two path morphemes co-occur, their order does not seem as fixed as the

81 sequences consisting of a manner-of-motion morpheme and a path morpheme. For instance, *tuì*

82 'recede', *huí* 'return', and *dào* 'arrive' are all path morphemes. When *tuì* and *huí* co-occur, *huí*

83 must follow *tuì*, as in (4); when *huí* and *dào* co-occur, *huí* must precede *dào*, as in (5).

84

85 (4) a. *Dírén*   ***tuì-huí***   *guānwài*   (path-path)

86   enemy   recede-return pass-outside

87   'The enemy receded back outside the pass.'

88

89   b.* *Dírén*   ***huí-tuì***   *guānwài*

90   enemy   return-recede pass-outside

91

92

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3 Because we focus on the lexical semantics of each motion morpheme, the approach adopted in our paper can be applied to full verbs, complements, and even bound motion morphemes (morphemes that are no longer used as full verbs). That is why we use the term "morpheme" to cover all motion morphemes in Chinese. But we will also use the term "verb" when necessary, especially when we refer to previous studies of English motion verbs.

93   (5) a. *Tā*   ***huí-dào***   *jiàoshì*   (path-path)

94   she   return-arrive   classroom

95   'She returned (back) to the classroom.'

96

97   b. * *Tā*   ***dào-huí***   *jiàoshì*

98   she   arrive-return   classroom

99

100 When two path morphemes occur in a motion construction, what determines their relative order?

101 If we rely on the manner-path dichotomy, it is not clear why one order is acceptable (4a, 5a)

102 whereas the other is not (4b, 5b).

103   In addition, examples are occasionally found in which two path morphemes can appear in

104 either order, such as the *huí* 'return' and *fǎn* 'return' in (6).

105

106 (6) a. *Jǐ-ge*   *wénshì*   *jiù*   ***huí-fǎn***   *le*

107   several-CLF   scholar   then   return-return   ASP

108   'Several scholars then went back.' (PKU Corpus[4])

109

110   b. *Sān diǎnzhōng*   *qǐchéng*   ***fǎn-huí***   *xuéxiào*

111   three o'clock   set.off   return-return   school

112   '[They] started to go back to school at three o'clock.' (PKU Corpus)

113

114 In this case, both *huí-fǎn* 'return-return' and *fǎn-huí* 'return-return' sound natural. It is logical to

115 ask if there is any consistent way to predict grammatical word order in multi-morpheme motion

116 constructions in Chinese.

117   This study investigates what lexical semantic constraint determines the order of motion

118 morphemes in Chinese MMMCs in light of recent works on scale structure in directed motion

119 verbs (Rappaport Hovav and Levin 2010, among others). We present this as a more refined work

120 based on Talmy's two-way classification (manner-of-motion verbs and path verbs).

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4 PKU Corpus in this paper refers to the corpus of Modern Chinese constructed by the
Center for Chinese Linguistics at Beijing University. Currently, the corpus has 307,317,060
characters updated on 7/20/2009. See http://ccl.pku.edu.cn/

The reminder of this paper is organized as follows. Section 2 provides background information regarding MMMCs in Modern Chinese. We also introduce previous approaches explaining morpheme order and provide critiques. In Section 3, we suggest as an alternative concept of scale structure associated with directed motion morpehemes by Rappaport Hovav and Levin (2010). A set of independent diagnostics is proposed to test the scale structures of each given morpheme in Chinese. Then we propose an implicational hierarchy that can be used to predict the morpheme order of MMMCs. In Sections 4 and 5, two corpus studies are carried out to verify the hierarchy. In the first study, we examine all existing MMMCs in selected chapters of three Modern Chinese novels in order to investigate whether the morphemes in these constructions are in an order consistent with the hierarchy. In the second study, we investigate whether motion morphemes of the highest frequency and the morphemes they co-occur with in MMMCs are in in the order predicted by the hierarchy. We also discuss the results from the two corpus studies that confirmed our hypothesis that the order of morphemes in motion constructions follows our hierarchy. Section 6 summarizes and concludes our study.

2. Preliminaries

2.1 Basic properties of motion event expressions in Chinese

MMMCs have been treated as a (sub)type of the resultative verbal construction ("RVC") in previous studies (Li and Thompson 1981, Ross 1990, Shi 2002, Xiao and McEnery 2004, Xu 2006, Hsiao 2009, among many others). However, diverse combinations of M1-M2 as exemplified in (4-6) make us question whether all M1-M2 collocations in motion expressions are necessarily a subtype of RVC. Let us examine in greater detail the differences between the MMMC and the RVC by examining previous studies that classify the MMMC as a subtype of the RVC.

 2.2 Semantic differences between RVC and MMMC

Previous studies (Hashimoto 1757, Li and Thompson 1981, Ross 1990, Shi 2002, Xiao and McEnery 2004, among many others, cf. Lu 1977) often treat the MMMC as a (sub)type of the RVC: as pointed out in Li and Thompson (1981: 58), the M2 in an MMMC "signals the direction in which the subject moves as the result of the displacement [M1]." As in (7), the M2 *shàng*

151 ‘ascend’ specifying the upward direction in which the kid is moving, and it is understood as a

152 result of his action of running.

153

154 (7) *Xiǎohái*   **pǎo-shàng**   *èrlóu*

155   little.kid   run-ascend   second.floor

156   ‘The kid ran up to the second floor.’

157

158   However, there are at least two problems with identifying MMMC with RVC. First, as

159 pointed out by Lu (1977), M1 and R in an RVC show a temporal order in that the result is not

160 presupposed to exist before the action denoted in M1 takes place. In contrast, in an MMMC,

161 there is not necessarily such a presupposition regarding M1 and M2 (Lu 1977). We can test the

162 temporal order between M1 and R in an RVC and between M1 and M2 in an MMMC by looking

163 at whether the M1s in these two constructions can take the imperfective marker –*zhe*. As

164 illustrated in (8a), -*zhe* is not allowed to modify the M1 *dǎ* ‘hit’ in an RVC, whereas the M1 *pǎo*

165 ‘run’ in a MMMC can be modified by –*zhe*, as in (8b).

166

167 (8) a. * *Tā*   **dǎ-zhe**   **sǐ**-*le*   *yī-zhī*   *lǎoshǔ*

168   she   hit-IMP   die-ASP   one-CLF   rat

169   # ‘(intended meaning) She made the rat dead [by] hitting.’

170

171   b. *Xiǎohái*   **pǎo-zhe**   **shàng**-*le*   *lóutī*

172   little.kid   run-IMP   ascend-ASP   stairs

173   ‘The child went up the stairs [by] running.’

174

175 Therefore, while the state denoted by R might always occur later than the action denoted by M1

176 in an RVC, the motion denoted in M2 does not necessarily occur temporally later than the action

177 denoted in M1 in an MMMC. Instead, the motion in M1 and M2 can occur simultaneously. As

178 illustrated in (8b), running and ascending can happen at the same time especially if the figure

179 was standing at the lower end of the stairs before he started running up them.

180   Another reason that the MMMC is treated as a subtype of the RVC is that in an MMMC,

181 the M2 signals the direction of motion as a result of action denoted in M1 (Li and Thompson

182 1981). This observation is correct: the domain of direction and the domain of result can be

183 understood from the shared perspective (also see Xiao and McEnery 2004), and path verbs are

184 identified as a type of result verb by Levin and Rapparport Hovav (1992)[5]. Motion verbs and

185 verbs specifying resultant status have in common in that both specify a type of change to a single

186 property. For example, a rat goes through a change from a state of not being dead to the state of

187 being dead as it gets beaten over a period of time. A child's location goes through a change from

188 downstairs to upstairs as he runs up the stairs.

189   However, previous studies have not pointed out that in Chinese motion constructions, or

190 directional RVCs, there can be different types of M2 and thus not provided a more fine-grained

191 analysis of these M2s. The following examples demonstrate that the verbal phrase *shàng lóu*

192 'ascend stairs' can be understood telically (9a) or atelically (9b)[6].

193

194 (9) a. *Xiǎohái* **zài**　**wǔ**　**fēnzhōng-nèi**　*shàng*　　*lóu*　*le*　　　(telic)

195   little.kid　in　　five　minute-inside　ascend　　floor　ASP

196   'The kid went upstair in five minutes.'

197

198   b. *Xiǎohái* *shàng*　*lóu*　　　*shàng-le*　　**wǔ**　**fēnzhōng**.　(atelic)

199   little.kid　ascend　upstair　　ascend-ASP　five　　minute

200   'The kid has been going up to upstair for 5 minutes.'

201

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5 Although Lu (1977) is among a few studies claiming that the Chinese MMMC is not equivalent to the RVC, Lu's discussion is not sufficiently accurate, due to lack of understanding that change of direction can be analyzed as a result in the domain of directed motion. For instance, Lu claims that the Chinese MMMC consists of "manner-direction" verb collocations in which M1 must denote the manner of motion and M2 must denote the direction of motion, and the direction cannot be understood as a result.
6 We use the term (a)telicity as a property of phrases, following Krifka (1989) among others. Quantized expressions are telic, and expressions that have cumulative reference are atelic. There is also a standpoint which defines (a)telicity as a property of individual verb, including Garey (1957) who introduced this term, among others.

202 *Shàng lóu* 'ascend stairs' has a telic reading in (9a) because it can be harmoniously modified by

203 a frame adverbial 'in five minutes', but it is atelic in (9b) in that it can be also modified by a

204 durative adverbial 'for five minutes.'[7]

205   In contrast, the path morpheme *dào* 'arrive' only behaves telically, as in (10).

206

207 (10) a. *Xiǎohái* **zài wǔ fēnzhōng-nèi** *dào-le* *èrlóu*   (telic)

208   little.kid in five minute-inside arrive-ASP second.floor

209   'The kid arrived at the second floor in five minutes.'

210

211 b. * *Xiǎohái* *dào* *èrlóu* *dào-le*   **wǔ** **fēnzhōng**   (atelic)

212   little.kid arrive second.floor arrive-ASP five minute

213   #'(intended meaning) The kid has been arriving at the second floor for five minutes.'

214

215 (10a) shows that the phrase *dào èrlóu* 'arrive second floor' denotes a telic event, as it is well-

216 modified by a frame adverbial. However, as in (10b), duration of 'arriving' cannot be inferred. It

217 suggests that the event of arriving reaches its inherent endpoint instantaneously.

218   The differences between *shàng* 'ascend' in (9) and *dào* 'arrive' in (10) with respect to

219 telicity suggest that there must be different types of path morphemes. In addition, the more

220 important point is that besides "manner-direction" (Lu 1977) or "manner/action-result" (Li and

221 Thompson 1981, among others), the semantic relationship between M1 and M2 in a MMMC can

222 be much more diverse. We have already seen from examples (4-6) that not only manner-path

223 relationships, but also path-path relationships, can be expressed by an MMMC. As shown in (11),

224 besides the M1 *tuì* 'recede' that denotes a direction along which the figure moves back, the M2

225 *huí* 'return' also expresses a backward direction of motion.

226

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7 Frame adverbials (*in X time*) and durative adverbials (*for X time*) have been traditionally used to test (a)telicity of VP in English since Vendler (1967). Xiao and McEnery (2006) suggest that the corresponding *in*-adverbials and *for*-adverbials in Chinese should be used for (a)telicity test with special carefulness and that some of preverbal or postverbal temporal adverbials in Chinese show different meanings from the temporal frame or duration of events. These exceptions include expressions such as *zhè sān tiān* 'these three days' denoting "range" in the preverbal position and durative adverbials such as *sān tiān* 'three days' used in negated sentences. For further discussion, see Xiao and McEnery (2006).

227 (11) *Dírén* **tuì-huí** *guānwài* (=4a)

228 enemy recede-return pass.outside

229 'The enemy receded back to the outside of the path.'

230

231 In what follows, we provide a few tests that distinguish path morphemes from manner-of-

232 motion morphemes for more accurate analysis in this study. According to Rappaport Hovav and

233 Levin (2010) and Rappaport Hovav (2008), a path morpheme differs from a manner-of-motion

234 morpheme in at least two respects of syntax-semantics interface.

235 First, semantically, the motion lexicalized by path morphemes can be realized via

236 different manners. This allows path morphemes to be modified by phrases expressing various

237 manners. For instance, a figure can return to a place by running or walking:

238

239 (12) *Dírén* **pǎo/zǒu-zhe** *huí* *guānwài*

240 enemy run/walk-IMP return pass.outside

241 'The enemy returned to the outside of the pass by running/walking.'

242

243 In contrast, the specific manner of a given motion event cannot be modified again by any other

244 kind of manner of motion. For example, *fēi* 'fly' denotes motion in the manner of flying, and

245 thus cannot be realized by running or walking, as shown in (13)[8].

246

247 (13) * *Tā* **pǎo/zǒu-zhe** *fēi*

248 he run/walk-IMP fly

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8 Two manner-of-motion morphemes might co-occur only if the first morpheme loses its literal meaning and functions as a modifier of the second morpheme. As illustrated in (i), the first morpheme *fēi* 'fly' does not literally mean a flying event, but is a modifier of the morpheme *pǎo* 'run', indicating that the moving objects are running at a very fast speed as if they are flying.

(i) *tāmen zài* *chēxiāng* *dǐng-shàng* **fēi-pǎo**,
  they at carriage top-on.top.of fly-run

  yígègè *dōu* *xiàng yě hóuzi shìde*
  one.CLF.CLF all like wild monkey like
  'They are running at a speed of flying on top of the carriage. Each looks like a wild monkey.' (PKU Corpus)

#'(intended meaning) He flew by running/walking.'

Second, a manner-of-motion morpheme can take result phrases that denote any state brought about by the morpheme (Rappaport Hovav 2008:22, cf. Filip 2004, Goldberg 1991, Levin and Rappaport Hovav 1995, Simpson 1983, Tenny 1994). As illustrated in (14), diverse result states such as 'being tired', 'losing shoes', or 'arrival at school' can follow the manner-of-motion morpheme *pǎo* 'run'.

(14) a. *Tā   pǎo-lèi   le*
        he   run-tired   ASP
        'He was tired as a result of running.'

    b. *Tā   pǎo-diū-le   xiézi*
        he   run-lose-ASP   shoe
        'He lost his shoes as a result of running.'

    c. *Tā   pǎo-dào-le   xuéxiào*
        he   run-arrive-ASP   school
        'He ran to the school.'

However, a path morpheme can be followed only by result phrases that are related to the direction of the motion that the morpheme denotes, usually result phrases specifying an endpoint to the path. As illustrated in (15), the path morphemes *huí* 'return' can be modified only by phrases denoting the state of 'being outside of the pass,' which is related to the path of the motion events they denote, cf. *pǎo* 'run' in (14).

(15) a. **Dírén   huí   guānwài   huí-lèi   le*
         enemy   return pass.outside   return-tired   ASP
        # '(intended meaning) The enemy was tired as a result of returning outside of the pass.'

280 b. * *Dírén* **huí** **guānwài** **huí-diū-le** **wǔ qì**

281   Enemy return pass.outside return-lose-ASP weapon

282   # '(intended meaning) The enemy lost his weapon as a result of returning outside of the

283   pass.'

285 c. *Dírén* **huí-dào-le** **guānwài**

286   enemy return-arrive-PERF pass.outside

287   'The enemy returned outside of the pass.'

In addition to the fact that some previous analyses neglected different types of path morphemes in both manner-path morpheme combinations and in path-path morpheme combinations, some studies (Lu 1977, Ma 2008, among others) have mistakenly treated M1s that are path morphemes as manner-of-motion morphemes. For instance, Lu (1977) classifies the M1 in his MMMC examples such as *jiàng xiàlái* 'descend towards speaker' and *shēng shàngqù* 'ascend away from speaker' as manner-of-motion morphemes. However, *jiàng* and *shēng* do not lexicalize any manner information according to Rappaport Hovav and Levin's (2010) tests of path morphemes above. For instance, *jiàng* 'descend' allows only a resultant complement that further specifies the endpoint of the motion that it lexicalizes:

(16) a. * *Fēijī* **jiàng-huài-le** **yǐnqíng**

300   plane descend-break-ASP engine

301   # '(intended meaning) The engine of the plane was broken as a result of the plane's

302   descending.'

304 b. * *Fēijī* **jiàng-diào-le** **yī-zhī** **jǐyì**

305   plane descend-lose-ASP one-CLF wing

306   # '(intended meaning) The plane lost one of its wings as a result of its descending.'

308 c. *Fēijī* **jiàng-dào-le** **dīmiàn**

309   plane descend-arrive-PERF ground

310   'The plane descended to the ground.'

311

312 Besides such difference in the lexical semantics of morphemes in two constructions, MMMCs

313 and RVCs are also syntactically different[9]. First, while RVC mainly concerns compounds

314 consisting of two morphemes, MMMCs might have three morphemes M1M2M3, e.g., *huá*

315 'slide', *luò* 'fall', and *dào* 'arrive' in (17).

316

317 (17) *Shēngpà tā   **huá-luò-dào***   *dī-shàng*
318   fear   she   slide-fall-arrive   floor-on
319   '[The parents] feared that she would slide and fall onto the floor.'] *(Tàiyáng Chūshì)*

320

321   Furthermore, morphemes in MMMCs can be separated, showing that not all morphemes

322 form compounds (Paul 2008), whereas morphemes in RVC cannot be separated.

323

324 (18) a. *kàn-jiàn   Zhū Dé **zǒu-le**   **jìn-lái***

325   see-see   Zhu De   walk-ASP   enter-come

326   '[He] saw Zhu De walk in [towards him]'   *(Hóng Piàodài)*

327

328   b. **Zhāngsān **kàn-le**   **wán**   yīběn   shū*

329   Zhangsan read-ASP complete one.CL   book

330   'Zhangsan finished reading a book.'

331

332 In this section, we have shown that neither the previous claim that the MMMC is a subtype of

333 the RVC, nor the traditional understanding of the MMMC as a "manner-direction" morpheme

334 combination can account for the entire picture of diverse syntax-semantic relationships

335 represented by M1 and M2 in a MMMC. Instead, we showed that when M1 and M2 of a MMMC

336 represent a manner-path relationship, there can be different types of M2 as the path morpheme.

337 In addition, M1 and M2 of motion expressions may represent a variety of path-path relationships,

338 where neither M1 nor M2 expresses a manner of motion event.

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9 We are grateful for an anonymous reviewer for directing our attention to this syntactic
difference. For detailed discussion on formal syntactic analysis on MMMCs and RVCs, which is
beyond the scope of this work, see Paul (2008), Sybesma (1999) and Wu (2004).

339   In the following section, we will present a more comprehensive perspective to the

340   understanding various dynamics of path morphemes in order to examine semantic constraints

341   determining the order of morphemes appearing in the M1 and M2 positions of MMMCs.

342

3. Classification of motion morphemes in Chinese

344   Degree achievements are found to have both telic and atelic uses (Dowty 1979, Hay, Kennedy

345   and Levin 1999, among many others). As illustrated in (19), the path verb *descend* can take both

346   the 'for 20 minutes' and the 'take 20 minutes' reading of the adverbial *in 20 minutes*, and thus it

347   cannot be classified simply as an activity verb or as an accomplishment verb, based on the

348   traditional aspectual classification of verbs in Dowty (1979) and Vendler (1967).

349

350   (19) *The plane descended in/for 20 minutes*. (Rappaport Hovav and Levin 2010)

351

352   Recent work (Rappaport Hovav and Levin 2010, Rappaport Hovav 2008, Hay, Kennedy,

353   and Levin 1999, among others) has proposed the notion of scalar change as an alternative. In the

354   motion domain, a motion event can be measured through the scale lexicalized by the motion

355   verbs. The scale structure lexicalized by motion verbs plays a key role in determining the verbs'

356   telicity, which traditional event structure (e.g., Dowty 1979/Vendler 1967 aspectual classification)

357   fails to do.

358   According to Rappaport Hovav and Levin (2010), motion morphemes can be classified

359   into four types based on three features in terms of scale: the first feature is existence of a scale,

360   i.e. whether the motion takes place along a scale, which classifies motion morphemes into

361   nonscalar change motion morphemes (hereafter "nonscalar change M", e.g., *fly, run, walk*) and

362   scalar change motion morphemes (hereafter "scalar change M", e.g., *recede, return, enter*); The

363   second feature is boundedness, i.e. whether a scale has an endpoint or not, which further divides

364   scalar change motion morphemes into open scale motion morphemes (hereafter "open scale M",

365   e.g., *recede, ascend*) and closed scale motion morpheme (hereafter "closed M", e.g., *return,*

366   *enter*); The third feature is punctuality, i.e. whether motion along a scale is durative (with

367   multiple points) or punctual (with two points, i.e. the starting and ending points), which divides

368   closed scale motion morphemes into multi-point closed scale motion morphemes (hereafter

369   "multi-pt closed scale M", e.g., *return, come*) and two-point closed scale motion morphemes

370   (hereafter "two-pt closed scale M", e.g., *enter, arrive*).

371   Non-scalar change motion verbs are equivalent to manner-of-motion verbs in Talmy

372   (2000), whereas the other three types are subtypes of Talmy's path verbs, each with a different

373   scale structure (ibid.). In the remainder of this section, we introduce each type of motion verbs

374   and provide tests to determine in which type each Chinese motion morpheme belongs.

375

376   **3.1 Non-scalar change motion morphemes vs. Scalar change motion morphemes**

377   Both manner-of-motion and path morphemes involve some kind of change (see Dowty 1979,

378   Filip 1993/99, Verkuyl 1989 for a discussion of morphemes that involve and do not involve

379   change). Among the types of change lexicalized in morphemes, the most fundamental

380   distinction is whether or not a morpheme lexically specifies a *scale* of change (McClure 1994,

381   Rappaport Hovav 2008). All manner-of-motion morphemes specify non-scalar changes, and all

382   path morphemes specify scalar changes.[10] A scale of change is composed of a set of points or

383   intervals that measure values on a distinct dimension such as height or temperature (Kennedy

384   2001, Kennedy and McNally 2005). According to Rappaport Hovav and Levin (2010), in the

385   domain of motion events, a scale is understood on the dimension of distance, that is, the distance

386   of the figure with respect to the ground: being at a position on the path with respect to the ground

387   is understood as having a distinct value on the scale associated with the motion verb, and

388   movement along the path is equivalent to a value change in the scale. For example, the verb

389   *descend* lexically specifies a spatial sacle: the measuring points on its scale are ordered along the

390   direction of gravity so the descending event is measurable, e.g., a descending motion of a pencil

391   from a table to a floor is halfway done when the pencil moves halfway on its path (Rappaport

392   Hovav and Levin 2010).

393   While scalar change Ms lexicalize a directed change in value on a single dimension, non-

394   scalar change Ms cannot be characterized in terms of a single scale of change. Most of the non-

395   scalar changes involve complex changes, i.e. a combination of multiple changes. For example,

396   Rappaport Hovav and Levin (2010) aruge that the verb *jog* involves movement of both arms and

---

10 Rappaport Hovav and Levin (2010) argue that a single motion verb can be classified only as
either a manner verb or a path verb, but cannot have both manner and path meanings at the same
time.

397 legs, but no movement can be understood as "the necessary starting point of motion, that is, one
398 can start jogging by moving one's left leg first or one's right leg first" (ibid.: 32).

399   We suggest two diagnostics to distinguish non-scalar change Ms from scalar change Ms.
400 These tests demonstrate that scalar change Ms lexically specify a scale, whereas non-scalar
401 change Ms do not specify such scale (Rappaport Hovav, 2008). The first diagnostic tests whether
402 a given motion morpheme lexically specifies a direction or not. Since a nonscalar change motion
403 morpheme denote complex change which is not related to any single specific direction, such
404 morpheme can co-occur with modifying phrases that express any direction. For instance, in a
405 running event, a figure can run forward or backward, as in (20).

406

407 (20) *xiàng*   *qián/hòu*   *pǎo*
408   toward   front/back   run
409   'run forward/backward'

410

411 In contrast, a scalar change motion morpheme specifies an inherent direction, so it only allows
412 phrases expressing directions that are compatible with the direction specified in the given motion
413 morpheme. For instance, a figure is assumed to move backward in a receding event, so *tuì*
414 'recede' does not allow a preposition phrase expressing a forward direction.

415

416 (21) a. *xiàng qián   *tuì*
417   toward front   recede

418

419   b. *xiàng*   *hòu*   *tuì*
420   toward   back   recede
421   'recede backward'

422

423   The fact that scalar change Ms lexically specify a scale is demonstrated by our second
424 test as well. Result phrases either denote a scale or introduce a bound that is related to the scale
425 lexically specified by a given morpheme (Goldberg 1991, Levin and Rappaport Hovav 1995,
426 Wechsler 2005, among many others). There is also a generally applied constraint that a predicate
427 cannot contain two phrases that delimit the event (Flip 2004, Goldberg 1991, Levin and

428 Rappaport Hovav 1995, Simpson 1983, Tenny 1994). For this reason, nonscalar change Ms that

429 do not have any scale to begin with can appear with various types of result phrases, as in (22),

430 whereas scalar change Ms only allow result phrases that specify or elaborate a bound on a

431 lexically-specified scale (Rappaport Hovav 2008), as in (23).

432

433 (22) a. *Tā   zài   pǎo*

434   He   PROG run

435   'He is running.'

436

437   b. *Tā   pǎo-lèi   le*

438   He   run-tired   ASP

439   'He was tired as a result of running.'

440

441   c. *Tā   pǎo-diū-le   xié*

442   He   run-lose-ASP shoes

443   'He lost his shoes as a result of running.'

444

445   d. *Tā   pǎo-dào   xuéxiào   le*

446   He   run-arrive   school   ASP

447   'He ran to the school.'

448

449 (23) a. *Tā   shàng shān   le*

450   She   go-up mountain ASP

451   'She went up the mountain.'

452

453   b. * *Tā   shàng-lèi   le*

454   She   go.up-tired   ASP

455   # '(intended meaning) She was tired as a result of going up on the mountain.'

456

457   c. * *Tā   shàng-diū-le   xié*

458   She   go.up-lose-ASP   shoes

17

459   # '(intended meaning) She lost her shoes as a result of going up on the mountain.'

460

461   d. *Tā* **shàng-dào**   **shāndǐng**   *le*

462   she go.up-arrive   summit   ASP

463   'She went up to the summit of the mountain.'

464

(22b-d) show that the non-scalar change M *pǎo* 'run' can co-occur with various types of result

phrases such as 'tired', 'lost shoes', and 'arrive at school'. In contrast, as shown in (23), the

scalar motion M *shàng* 'climb' only allows result phrases such as 'arrving at the summit' (23d)

which elaborate on an ending point for the lexically-specified scale.

The primary distinction between non-scalar change Ms and scalar change Ms is whether

the morpheme lexicalizes a scale along which a figure moves. Therefore, non-scalar change Ms

are equivalent to Talmy's manner-of-motion morphemes, whereas a scalar change Ms are

equivalent to Talmy's path morphemes. However, Rapparport Hovav and Levin (2010), among

others, further divide scalar change Ms (or Talmy's path morphemes) into three sub-types, which

thus allow us to explain the inconsistent behaviors of motion morphemes that cross the

traditional two-way classification of motion morphemes. In the following sections, we introduce

the three sub-types of scalar change Ms and their diagnostics.

3.2 Open scale motion morphemes vs. closed scale motion morpheme

Scalar change Ms first can be classified into two types based on whether or not the scale

lexicalized by a given scalar change M has an endpoint, i.e. whether the scale is bounded or

unbounded (cf. Rappaport Hovav and Levin 2010).[11] For example, *come* and *return* lexically

specify a closed path, whereas *descend* and *rise* lexically specify an open path (Rappaport Hovav

and Levin 2010).

---

11 Rapparport Hovav and Levin (2010) first classify scalar change verbs into two types based on
whether a given scalar change verb lexicalizes a multi-point scale or two-point scale, i.e. whether
the directed motion denoted in the verb is durative or punctual. However, in this paper, we first
classify scalar change morphemes into two types based on the feature of boundedness. However,
this difference in the order of classification does not affect the result of classification of
individual morphemes.

A scalar change M with a bounded scale does not allow the figure to progress beyond the bound, usually the point on a scale where the ground is located. For instance, in *He came to the school at 8am*, the school is the bound of the event of coming. Therefore, the coming event finishes when the figure arrives at the school. Although the figure can move beyond the school, such motion is no longer conceived as part of the coming event. In contrast, an ascending event denoted by ascend does not specify endpoint, so in such an event, a figure can potentially move up forever. In other words, a figure moving on an open scale does not have an endpoint to arrive at. Therefore, by looking at whether a scalar change M allows a figure to move without limitation on a scale, we can distinguish an open scale M from a closed scale M.

In Chinese, comparison can be expressed by a *gèng* 'more' comparative followed by degree adjectives/adverbs, e.g., *gèng yuǎn* 'further' (lit.) 'more far', *gèng gāo* 'higher' (lit.) 'more high'. If a scalar change M is compatible with the *gèng* comparative, then the morpheme has an open scale which allows a figure to move further in the scale; otherwise, it has a closed scale. As illustrated in (24), *shēng* 'ascend' and *jiàng* 'descend' allow the *gèng* comparative.

(24) a. *qìqiú   zài   5-fēnzhōng   qián   jiù   xiàng shàng   shēng   le*
        balloon in   5-minute   before then   toward up   ascend ASP

        *xiànzài   yīnggāi   **shēng**   **de**   **gèng gāo**   le*
        now   must   ascend   MOD   more high   ASP
        'The balloon began ascending five minutes ago, now it must have ascended
         higher.'

    b. *fēijī   zài   5-fēnzhōng   qián   jiù   xiàng xià   jiàng   le*
        plane in   5-minute   before then   toward below descend   ASP

        *xiànzài   yīnggāi   **jiàng**   **de**   **gèng dī**   le*
        now   must   descend   MOD   more low   ASP
        'The airplane began descending downward five minutes ago, now it must have
         descended more.'

In contrast, *huí* 'return' and *qù* 'go' in (25) are incompatible with the comparative; once the figure has reached the endpoint, the returning/going event is finished.

(25) a. *tā   zài   5-fēnzhōng   qián   jiù   huí   jiā   le*

    he   at   5-minute   before then   return home   ASP

    xiànzài   yīnggāi   **huí   de   gèng   yǔan le*

    now   must   return MOD   more   far   ASP

  'He began returning home five minutes ago, #now he must have returned

    farther.' (intended meaning)

  b. *tā   zài   5-fēnzhōng   qián   jiù   qù   xuéxiào   le*

    he   in   5-minute   before then   go   school   ASP

    * *xiànzài   yīnggāi   **qù   de   gèng   yǔan** le*

    now   must   go   MOD   more   far   ASP

  'He began going to school five minutes ago, #now he must have gone farther.'

                   (intended meaning)

Therefore, we can determine that *shēng* 'ascend' and *jiàng* 'descend' are open scale Ms, whereas *huí* 'return' and *qù* 'go' are closed scale Ms.

3.3 Multi-point closed scale motion morpheme vs. two-point closed scale motion morpheme
According to Beavers (2008), "two-point scales only have two values as they are associated with attributes that basically encode having or not having a particular property, and the transition from one value to the other is conceptualized as instantaneous." For example, an event described in *we reached the summit* is true only when we have a particular property of 'being at the summit' (Rappaport Hovav 2008). Examples of two-pt closed scale Ms in English include *arrive*, *depart*, *enter* and *exit*.

Unlike two-point closed scales, multi-point closed scales are composed of a minimum and a maximum value as well as many values in between them (Rappaport Hovav and Levin 2010).

546 The starting point of a motion event is understood to be associated with the minimum value, the

547 endpoint with the maximum value, and the points between the starting and the end point are

548 understood as values that the motion event may have as the figure moves along the scale.

549 Therefore, motion along a multi-point closed scale takes time, and thus such motion is conceived

550 asdurative (ibid.). Examples of directed motion verbs describing gradual traversals of a closed

551 path in English include *return*, *come*, and *go* (ibid.).[12]

552   This property of scale, whether a scale has multi-point or two-point, divides closed scale

553 Ms into two types: multi-pt closed scale Ms and two-pt closed scale Ms. As illustrated in (26),

554 the closed scale Ms *huí* 'return' and *qù* 'go' allow duration adverbials, which indicates that these

555 verbs have multi-point scales.

556

557 (26) a. *Tā*   *huí*   *jiā*   **huí-le**   **20**   **fēnzhōng,** *hái méi dào*   *jiā*

558   she   return   home   return-ASP   20   minute   yet   not   arrive   home

559   'She has been going back home for 20 minutes but has not arrived at home yet.'

560

561   b. *Tā*   *qù*   *xuéxiào*   **qù-le**   **20**   **fēnzhōng,** *hái méi dào*   *jiā*

562   she   go   school   go-ASP   20   minute   yet   not   arrive   home

563   'She has been on the road going to school for 20 minutes but has not arrived at school

564   yet.'

565

566 In contrast, the closed scale Ms *dào* 'arrive' and *jìn* 'enter' do not allow duration adverbials,

567 which indicates that they have two-point scales, as shown in (27).

568

569 (27) a. *Tā   *dào*   *xuéxiào*   **dào-le**   **20**   **fēnzhōng**

570   she   arrive   school   arrive-ASP   20   minute

571   # 'She has been arriving at school for 20 minutes.'

572

573   b. * *Tā*   *jìn*   *fángjiān*   **jìn-le**   **20**   **fēnzhōng**

---

12 Open scale Ms also describe motion associated with multi points. For example, *we ascended the stairs* is true if the value, i.e. our location along the path associated with the stairs, increases by any value, even by a couple of stairs (Rappaport Hovav 2008). Other examples include *advance, descend, fall, recede*, and *rise* (Rappaport Hovav and Levin 2010).

she enter room   enter-ASP   20   minute

'She has been entering the room for 20 minutes.'

The second test examines whether a given closed scale M allows gradual progress on a lexically-specified path. As illustrated in (28), the closed sacle M *huí* 'return' and *qù* 'go' can describe a gradual movement along a path. Therefore these verbs have multi-point scales.

(28) a. *Tā huí sùshè huí-le   yībàn, xiūxi-le yīhuìr, yòu   shànglù   le*
         she return dorm return-ASP half   rest-ASP a.while again ascend.road ASP
         'She returned halfway to the dorm, rested for a while, and then continued on her way to
         the dorm.'

     b. *Tā qù xuéxiào qù-le   yībàn, xiūxi-le   yīhuìr,   yòu   shànglù   le*
         she go   school   go-ASP   half   rest-ASP a.while   again ascend.road   ASP
         'She went halfway to school, rested for a while, and then continued on her way to
         school.'

According to Rappaport Hovav (2008), multi-pt closed scale Ms entail some change along the scale, but a single change of a given multi-pt closed scale M is not necessarily the maximal change, even if the morpheme lexicalizes such a maximal change. In contrast, as in (29), the two-pt closed scale Ms *dào* 'arrive' and *jìn* 'enter' cannot appear in such description, reflecting their denotation of instantaneous change due to their lexicalized two-point scales. For two-pt closed scale Ms, the minimal change is also the maximal change (Rappaport Hovav 2008).

(29) a. **Tā   dào   sùshè dào-le   yībàn, xiūxi-le yīhuìr,   yòu   shànglù   le*
          she arrive   dorm arrive-ASP half   rest-ASP a.while   again ascend.road   ASP
          # '(intended meaning) She arrived at the dorm halfway, rested for a while, and then
            continued her way to the dorm.'

605   b. * *Tā jìn fángjiān jìn-le yībàn, xiūxi-le yīhuìr, yòu shànglù le*

606   she enter room   enter-ASP half   rest-ASP a-while   again ascend.road ASP

607   # '(intended meaning) She entered the room halfway, rested for a while, and then

608   continued entering the room.'

609

610   The closed sacle M *lái* 'come' seems to be on the borderline between multi-pt and two-pt

611 closed scale Ms because when eleven native speakers were presented with (30), their judgments

612 of its grammaticality varied: (30) was not accepted by seven speakers, accepted by three

613 speakers, whereas one speaker couldnot decide its grammaticality.

614

615 (30) *?Tā lái xuéxiào lái-le yībàn , xiūxi-le yīhuìr, yòu shànglù le*

616   she come school   come-ASP half   rest-ASP a.while again   ascend.road ASP

617   '?She came to school halfway, rested for a while, and then continued on her way on the

618   road.'

619

620   However, a change in the scale of *lái* 'come' does not imply the maximal change, i.e.

621 arrival at the endpoint of the scale. For instance, (31) is an example from Nakazawa (2006, 2008).

622 It indicates that a change in the motion denoted by *lái* 'come' does not entail the actual arrival at

623 the endpoint.

624

625 (31) tā bā diǎn **lái xuéxiào**,   dànshì hái   méi   dào

626   he eight o'clock come school   but   yet   NEG   arrive

627   'He came to school at eight, but he has not arrived.'   (Nakazawa 2006)

628

629 Therefore, the scale lexicalized in *lái* 'come' is composed of multiple points, and a coming event

630 is durative. However, considering *lái*'s behaviors in (30) and (31), we will classify *lái* as a multi-

631 pt closed scale M in our work; meanwhile the reason why *lái* shows such borderline result in

632 grammaticality test is left for future exploration.

633

634 **3.4 Summary of this section**

635   So far, we examined whether a morpheme lexically specifies a scale ([+/- scale]); among scalar

636 change Ms, we asked whether the scale lexicalized by a morpheme is open or closed ([+/-

637 bounded (open/closed scale)]); then among the closed scale Ms, we examined whether a given

638 scale entails two or multiple values [+/-punctual (two-point/multi-point scale)]. The following

639 table summarizes the relevant scalar structures of motion morphemes that we examined.

640

641 Table 1 Three features of scales determining four types of motion morphemes

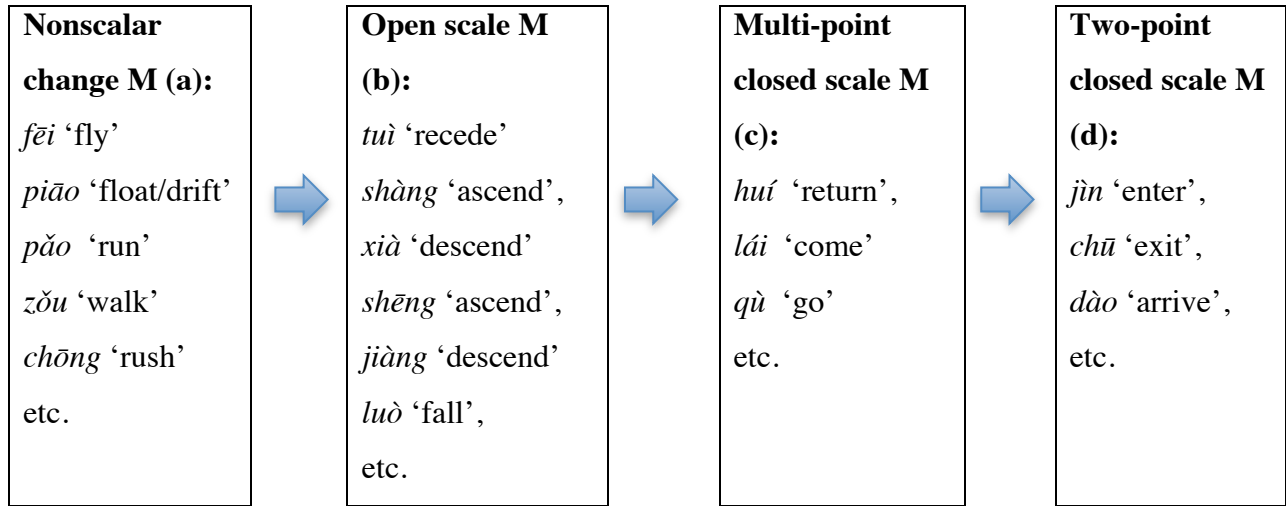| Types of motion morphemes	Features of scales		
	Existence of scale	Boundedness	Punctuality
Non-scalar change motion morpheme (*pǎo* 'run')	–	–	–
Open scale motion morphemes (*tuì* 'recede')	+	–	–
Multi-point closed scale motion morpheme (*huí* 'return')	+	+	–
Two-point closed scale motion morpheme (*dào* 'arrive')	+	+	+

642

643   The three different types of combinations of these features would yield the four

644 categories of motion morphemes: non-scalar change Ms (e.g., *zǒu* 'walk', *fēi* 'fly'), open scale

645 Ms (e.g., *jiàng* 'descend', *shēng* 'ascend'), multi-point closed scale Ms (e.g., *huí* 'return', *qù*

646 'go'), and two-point closed scale Ms (e.g., *dào* 'arrive', *jìn* 'enter').

647   We propose a hierarchy that is formed by these four types of motion morphemes to

648 predict the order of motion moprhemes in MMMCs. The hierarchy is laid out in (32).[13]

649

650

---

13 More examples of motion morphemes of each type are given here. Nonscalar change Ms: *bēn*
'rush', *gǎn* 'rush', *huá* 'slide', *liú* 'flow', *pá* 'climb', *guàng* 'stroll', *gǔn* 'roll', *táo* 'escape', *yǒng*
'rush forth', *duó* 'stroll'; open scale Ms: *chè* 'withdraw', *chén* 'sink', *luò* 'fall', *lí* 'leave', *xiàn*
'sink', *diào* 'fall', *zhǎng* 'rise', *zhuì* 'fall'; multi-pt closed scale Ms: *fǎn* 'return', *huí* 'return', *lái*
'come', *qù* 'go'; two-pt closed scale Ms: *rù* 'enter', *dǐ* 'arrive', *zhì* 'arrive', *dá* 'reach'.

651   (32)

Nonscalar change M (a):		Open scale M (b):		Multi-point closed scale M (c):		Two-point closed scale M (d):
fēi 'fly'		*tuì* 'recede'		*huí* 'return',		*jìn* 'enter',
piāo 'float/drift'		*shàng* 'ascend',		*lái* 'come'		*chū* 'exit',
pǎo 'run'		*xià* 'descend'		*qù* 'go'		*dào* 'arrive',
zǒu 'walk'		*shēng* 'ascend',		etc.		etc.
chōng 'rush'		*jiàng* 'descend'				
etc.		*luò* 'fall',				
		etc.				

652

653

654 This hierarchy predicts that when two motion morphemes co-occur in a MMMC, the M1 must

655 belong to a type that is left of or equal to a type of the M2 on the hierarchy. For instance, the

656 open scale M *tuì* 'recede' is located to the left of the multi-pt closed scale M *huí* 'return' on the

657 hierarchy in (32), so *tuì* can only occur to the left of *huí* (i.e. precede *huí*), as exemplified by *tuì-*

658 *huí Běijīng* 'recede back to Beijing' and **huí-tuì Běijīng*. Similarly, the non-scalar change M *pǎo*

659 'run' is located to the left side of the two-pt closed scale M *dào* 'arrive' on the hierarchy, so *pǎo*

660 can only precede *dào*, as exemplified by *pǎo-dào Běijīng* 'run to Beijing' and **dào-pǎo Běijīng*.

661 In other words, we predict that combinations of M1M2 that are {a, b}, {b, b}, {b, c}, {b, d} and

662 etc. should be available, but combinations such as {c, b} or {b, a} should be not available.

663   In the next section, we will verify this hierarchy of the order of motion morphemes via

664 two corpus studies. In the first study, we examine all MMMCs in selected chapters of three

665 novels, and investigate whether the morphemes in the constructions are consistent with the

666 hierarchy in (32). In the second study, we cross-validate the hierarchy from a different

667 perspective: from each type of motion morpheme, we choose the two most frequently used

668 morphemes and investigate whether these morphemes and their co-occurring motion morphemes

669 follow the order predicted by our hypothesis.

670

671 **4. Corpus study 1**

672 **4.1 Data source**

673 The data used in this study consist of selected chapters of three Modern Chinese novels. Table 2

674 provides information about these three novels.

675

676 Table 2. Data Sources

Title	*Tàiyáng Chūshì* 'The Sun was Born'	*Dìqiú de Hóng Piàodài* (*The Earth's Red flying Ribbon*) =*Hóng Piàodài*	*Tàiyáng Zhào Zài Sānggānhé-shàng* (*The Sun Shines over the Sanggan River*) = *Sānggānhé*
Author	Chi Li	Wei Wei	Ding Ling
Year	1992	1988	1952
Selection analyzed	entire novel	first 6 chapters	first 12 chapters
Number of characters	35,433	34,108	28,935

677

678 All three novels have great popular appeal in China. Among them, the language of *Tàiyáng*

679 *Chūshì* is closer to that of urbanites, whereas the language of *Hóng Piāodài and Sānggānhé* is

680 accessible to workers and soldiers. The novels are of different length. In order to keep the

681 number of characters relatively balanced among the four novels, only the first six chapters were

682 selected from *Hóng Piāodài*, and the first twelve chapters were selected from *Sānggānhé*. Given

683 their differences in content and style, these novels represent a reasonable size and diversity for

684 the purpose of this study.

685

686 **4.2 Data selection**

687 We compiled data for our analysis by extracting from the chapters listed above all sentences with

688 MMMCs appearing in (1) the M1M2 pattern (-*lái/qù* 'come/go'), and (2) the M1M2M3 pattern

689 (in which M3 is not a deictic morpheme, i.e. *lái/qù*). Then, we excluded:

690 • Motion expressions in which M2 was a bound morpheme and unproductive in

691   combination with various other morphemes appearing in the position of M1

692 • Motion expressions with the morphemes *guò* 'cross' and *chuān* 'traverse'

693 • Motion expressions with the morpheme *tiào* 'jump'

694 • Motion expressions with motion morphemes appearing as a single morpheme in the M1

695 pattern and the M1-*lái/qù* pattern

696

697 The motion expressions we examined include 201 tokens of two-morpheme MMMCs and two

698 tokens of three-morpheme MMMCs combined for a total of 203 tokens (90 unique types in total).

699 In what follows, we explain in detail why we chose to include or exclude the construction types

700 listed above.

701

702 **4.2.1 The inclusion of M1M2 (M3) MMMCs**

703 The corpus data show that most motion morphemes can occur both in "M1+M2" MMMCs and

704 in "M1+M2+*lái /qù* " MMMCs, as illustrated by *zǒu-jìn* 'walk enter' in (33).

705

706 (33) a. *Tāmen* ***zǒu-jìn***   *ménkǒu*   *yī*   *kàn*

707   they   walk-enter   entrance   one   see

708   'They went into the entrance and took a look.'   (*Hóng piàodài*)

709

710   b. …*Jǐ-ge*   *rén*   …   ***zǒu-jìn***   *cūn*   *lái*

711   … several-CLF   person … walk-enter village come

712   'Several people walked into the village.'   (*Sānggānhé*)

713

714   c. *kàn-jiàn*   *Zhū Dé* ***zǒu-le***   ***jìn***-*lái*

715   see-see   Zhu De   walk-ASP   enter-come

716   '[He] saw Zhu De walk in [towards him].'   (*Hóng piàodài*)

717

718 Therefore, when we examined the relative order of M1 and M2 MMMCs in the corpus, we did

719 not distinguish between "M1+M2" MMMCs and "M1+M2+*lái/qù* " MMMCs.

720   In addition, although we were primarily investigating the relative order and semantic

721 relationships between M1 and M2 in MMMCs, we also included three-morpheme MMMCs

722 (which are relatively infrequent) in which M3 was not a deictic morpheme (*lái/qù*). An example

723 of an included three-morpheme MMMC from the corpus is given in (34).

724

27

(34) *Shēngpà   tā   **huá-luò-dào**   dī-shàng*

    fear   she   slide-fall-arrive   floor-on

    '[The parents] feared that she would slide and fall onto the floor.' (*Tàiyáng Chūshì*)

4.2.3 Exclusion of deictic morphemes *lái /qù* in M2 or M3 position

We do not treat *lái* 'come' and *qù* 'go' as motion morphemes when they occur in M2 or M3
position, as in (35a-b), and their distribution in the sequences of "M1 + *lái/qù*" and "M1 + M2 +
lái/qù" is not examined by the study; our reasons are given in the remainder of this section.

(35) a. *xiàng   zìjǐ   jiā-lǐ   **zǒu-qù***   [*lái/qù* is M2]

        toward self   home-inside   walk-go

        '[He] walked towards his own home (away from the speaker).' (*Sānggānhé*)

    b. *cóng   xiǎoxiàng-lǐ   **zǒu**   chū-lái*   [*lái/qù* is M3]

       from   alley-inside   walk   exit-come

       '[He] walked out from the alley (towards the speaker).'   (*Sānggānhé*)

As previous discussed in sections 3.2-3.3, when *lái/qù* occurs as the only motion morpheme in a
motion construction, it is a multi-pt closed scale M which expresses a bounded motion event.
However, when *lái* and *qù* occur at the end of motion constructions, they do not express bounded
motion events anymore. In other words, their original lexical specification gets lost. We will
show this point in the followings.

        A multi-pt closed scale M denotes a bounded motion event, a closed scale M such as *huí*
'return' cannot co-occur with PPs denoting unbounded direction such as *xiàng xuéxiào* 'toward
school', as in (36a); in contrast, an open scale M or a nonscalar motion M such as *zǒu* 'walk'
denotes unbounded motion event, so such a morpheme can co-occur with *xiàng xuéxiào* 'toward
school', as in (36b).

(36) a. *Tā   **xiàng**   *xuéxiào*   **huí**   *le*

       he   toward school   return ASP

       # 'He returned toward the school.'

756

757   b. *Xiǎopō*   **xiàng** xuéxiào-lǐ   **zǒu**

758   Xiaopo   toward school-inside walk

759   'Xiaopo walked towards the inside of the school.'   (PKU Corpus)

760

761   Because *lái/qù* is multi-pt closed scale M expressing a bounded motion event when it is

762   used as the main motion morpheme in a motion expression, we can anticipate that *lái/qù* does not

763   co-occur with *xiàng xuéxiào* 'toward school', as illustrated in (37).

764

765   (37) a. **Tā*   **xiàng** xuéxiào   **lái/qù**   le

766   he   toward school   come/go   ASP

767   #'He came/went toward the school.'

768

769   However, when *lái/qù* follows another motion morpheme and occurs in M2 or M3 position, it no

770   longer specifies information about boundedness: when *lái/qù* follows a motion morpheme

771   denoting an unbounded event, e.g., *zǒu* 'walk', the combination *zǒu-lái/qù* 'walk-come/go' can

772   co-occur with *xiàng xuéxiào* 'toward school' as in (38a). In contrast, when *lái/qù* follows a

773   motion morpheme denoting a bounded motion event, e.g., *huí* 'return', the combination *huí*-lái

774   'return come' cannot be modified by *xiàng xuéxiào* 'toward school' as in (38b).

775

776   (38) a. *Women   měitiān   qīngchén   **xiàng** xuéxiào   **zǒu-qù**   shí

777   we   everyday morning   toward school   walk-go   when

778   'when we walk toward school every morning'   (PKU Corpus)

779

780   b. **xiàng*   xuéxiào   huí-lái

781   toward   school   return-come

782

783   The examples in (38) illustrate that when *lái/qù* occurs after another motion morpheme in M2 or

784   M3 positions, it is no longer a closed scale motion morpheme. Instead, the boundedness of a

785   motion construction consisting with a sequence of "M1(M2) + *lái/qù*" is determined by the

786   boundedness of the M1(M2) preceding *lái/qù*: the sequence denotes a bounded event if the

787 preceding morpheme expresses a bounded path, and an unbounded event if the preceding

788 morpheme specifies an unbounded path.

789   Therefore, we do not treat *lái/qù* in M2 or M3 position as a typical motion morpheme, and

790 our hierarchy is not used to predict the distribution of such *lái/qù*.[14] Accordingly, we treat

791 motion constructions such as (35a) as one-morpheme MMMCs, and (35b) as two-morpheme

792 MMMCs, and only examine the order of M1 and M2 in motion expressions with a "M1 + M2 +

793 *lái/qù*" sequence, i.e. *zǒu* 'walk' and *chū* 'exit'.

794

795 **4.2.4 Inclusion of productive bound morphemes in M2**

796 We included MMMCs in which M2 is a productive bound morpheme, specifically *rù* 'enter', *qǐ*

797 'rise', *kāi* 'apart' (lit.) 'open', *zǒu* 'away'.[15] Among these bound morphemes *qǐ* 'rise'and *kāi*

798 'apart' (lit.) 'open' are treated as directional complements by Chao (1968:458) and Li &

799 Thompson (1981: 59). In contrast, *rù* 'enter' was excluded by Chao (1968) for being less active

800 than *jìn* 'enter' in Mandarin, and *zǒu* 'away' was not discussed. In our corpus studies, we will

801 include bound morphemes in M2 position if they are relatively productive in combining with a

802 variety of motion morphemes. As illustrated in (39), *rù* 'enter' can follow diverse M1s.

803

804

---

14 We included MMMCs where *lái* and *qù* occur as M1.

(i) *Jīntiān*   *tā*   **lái-dào**   *xuéxiào*   *le*
    Taoday   she   come-arrive   school   ASP
    'Today, she came to school.'

15 Among these verbs, *kāi* (lit.) 'drive' and *zǒu* (lit.) 'walk' need special attention. They denote
manner of motion when appearing as free morphemes in M1 position.

(i) a.*Yuǎnchû*   **kāi**-*lái*   *yíliàng*   *qìchç*
    far.place   drive-come one.CLF   car
    'A car drives in this direction from a distant location.'

   b. *Tâ*   *mìitiân*   *zài*   *gôngyuán*   **zǒu**   *yîquân*
      she   everyday   at   park   walk   one.CLF
      'She walks one lap in the park everyday.'

However, when *kāi* and *zǒu* appear in M2 position as bound morphemes, they denote directed
motion.

30

805 (39) a. *Tā* *pǎo-rù* *bàngōngshì*

806   he   run-enter   office

807   'He ran into the office.'

808

809 b. *Shítou xiàn-rù* *yūní-li*

810   stone   sink-enter   silt-inside

811   'The stone sank into the silt.'

812

813 There are two major reasons to include these productive bound morphemes. First, these

814 morphemes were independent morphemes denoting directed motions in the history of Chinese.

815 Second, they still lexically specify directions in modern Chinese. As illustrated in (40), all the

816 M1s, *fēi* 'fly', *piāo* 'float', and *pǎo* 'run', are non-scalar change Ms that do not specify direction

817 of motion, so it is the bound morphemes that denote the direction of motion.

818

819 (40) a. *Fēijī* *fēi-rù* *yúncéng -zhōng*

820   plane   fly-enter   cloud-inside

821   'The plane flew into the cloud.'

822

823 b. *kuài* *tiān-hēi* *de* *shíhòu, hémiàn-shàng* **piāo-qǐ** *yānwù*

824   soon   sky-black   REL   time   river.face-on   float-rise   smoke

825   'When the sky was about to become dark, smoke floated and rose from the surface of the

826   river.' (http://bbs.uuu9.com/archiver/?tid-5056562.html)

827

828 c. *Xiǎomāo* *pǎo-kāi* *le*

829   little.cat   run-open   ASP

830   'The kitten ran away.'

831

832 d. *Xiǎoniǎo* *fēi-zǒu* *le*

833   little.bird   fly-walk   ASP

834   'The little bird flew away.'

835

836 **4.2.5 Exclusion of unproductive bound morphemes in M2**

837 In contrast to productive bound morphemes in M2 position specifically *rù* 'enter', *qǐ* 'rise', *kāi*

838 'apart' (lit.) 'open', *zǒu* 'away' (lit.) 'walk', motion expressions with a non-productive bound

839 morpheme were excluded. For instance, in (41), *chūfā* 'depart' (lit.) 'exit set out' includes the

840 bound morpheme *fā* ('set out' in classical Chinese).

841

842 (41) *Cǐ-cì*   *zì*   *Gānshěng*   *Xìngguó*   **chū-fā**

843   this-time   from   Gan.Province   Xingguo   depart

844   'This time, (they) departed from Xìngguò in Gan Province.'   (*Hóng Piàodài*)

845

846 Although *fā* can co-occur with very limited set of morphemes to denote a directed motion in

847 Chinese such as *chū-fā* (lit.) 'exit set out' and *jìn-fā* (lit.) 'enter set out', it is not productive in

848 compounding such as **fēi-fā* (lit.) 'fly set off', **tuì-fā* (lit.) 'recede set out', compared with other

849 relatively more productive bound motion mrophemes, e.g., *-rù* 'enter', as in *jìn-rù* 'enter enter',

850 *fēi-rù* 'fly enter', *tuì-rù* 'recede enter'.

851

852 **4.2.6 Exclusion of *guò* 'cross' and *chūan* 'traverse'**

853 According to Rappaport Hovav and Levin (2010), English *cross* and *traverse* are not typical

854 scalar change Ms because although these morphemes are asscoaited with paths, the points on the

855 path are not ordered in a lexically specified direction. For instance, in *John crossed that street*,

856 *cross* does not specify which side of the street John started crossing from. The Chinese motion

857 morphemes *guò* 'cross' and *chūan* 'traverse' are similar to English morphemes of crossing in this

858 way. For instance, in (42), the starting direction is not identifiable from the meaning of *guò*.

859

860 (42) *Tā* **guò**-*le*   *mǎlù*

861   He cross-ASP   street

862   'He crossed the street.'

863

864 For current analysis, we did not include *guò* and *chūan*, but further exploration on classification

865 of these motion morphemes will be useful in the future.

866

4. 3 Analysis

In order to code the motion morphemes in the data, we tested each morpheme in terms of four

types of motion morphemes, based on the set of diagnostics that we introduced in Section 3.

Here we give additional examples showing how we tested the scalar structure of productive

bound morphemes and of some motion morphemes that resulted in different scalar classifications

from those associated with the equivalent English verbs.

4.3.1 Testing the scale structures of productive bound morphemes

The scales asscociated with bound motion morphemes can also be identified via the tests

introduced in Section 3. Because bound motion morphemes cannot occur as the only morphemes

in a motion construction, we chose a non-scalar change M as M1 (e.g., *pǎo* 'run', *fēi* 'fly') so

that the M1 did not interfere with the interpretation of scalar structures of M2. For instance, by

testing whether the combinations of M1M2 are compatible with the comparative adverb *gèng*,

we found that that *qǐ* 'up' (lit.) 'rise', *kāi* 'away' (lit.) 'open', and *zǒu* 'away' (lit.) 'walk'

lexicalize open scales, whereas *rù* (lit.) 'enter' is accosiated with a closed scale, as in (43):

(43) a. *Qīngnián   zhěnggè **rén   fēi-qǐ   de   gèng gāo**, yòu hěn kuài luò-xià*

      young.man whole   person fly-rise MOD more high again very fast fall-descend

      'The whole body of the young man flew up higher, and then fell down very quickly.'

      (*http://tieba.baidu.com/f?kz=254566429*)

   b. *Wǒ   xiǎngyào yí-ge   rén   **zǒu-kāi   de   gèng yuǎn yìxiē***

     I   want   one-CLF   person walk-away   MOD more far   some

     'I wanted to walk away further.'   (http://www.topit.me/user/topic/12490)

   c. *Duìfāng   bǐ   zìjǐ   **táo-zǒu   de   gèng yuǎn***

     the.opposite.party   than   self   escape-away MOD more far

     'The opposite party escaped away further than us.'

     (http://www.qdwenxue.com/BookReader/1019535,24614485.aspx)

898   d. *Wǒmen zǒu-rù   fangjiān **zǒu-rù**   **de**   **gèng**   **yuǎn**

899   we   walk-enter   room   run-enter   MOD   more   far

900   #'We walked into the room farther.'

901

Then, we need to test whether *rù* (lit.) 'enter' is a multi-pt or two-pt closed scale M. As

illustrated in (44a), *zǒu-rù* 'walk enter' does not allow gradual progress in its motion, cf. (44b)

where the multi-pt closed scale M *huí* 'return' does; therefore, *rù* (lit.) 'enter' specifies a two-pt

closed scale.

(44) a. * *Tā zǒu-rù   fángjiān zǒu-rù-le   yíbàn, xiūxi-le yīhuìr,*

        she walk-enter   room   walk-enter-ASP half   rest-ASP   a.while

        yòu   shànglù   le

         again ascend.road   ASP

        #'She walked into the room halfway, rested for a while, and then continued on her way to

         the room.'

    b. *Tā   huí   sùshè huí-le   yībàn, xiūxi-le yīhuìr, yòu   shànglù   le* =(28)

         she return dorm return-ASP half   rest-ASP a.while again ascend.road ASP

         'She returned halfway to the dorm, rested for a while, and then continued on her way to

          the dorm.'

Therefore, with the diagnostics proposed in Section 3, all bound motion morphemes found in the

data can be tested in minimal pairs.

4.3.2 *Táo* 'escape' – Non-scalar change motion morpheme

According to Levin (1993), *escape* is a verb of directed motion in English. As illustrated in (45),

escape only takes result phrases that further elaborate a bound of the lexically specified scale.

(45) a. **He escaped **his shoes lost**.*

    b. **He escaped **tired.***

929   c. *He escaped* **to Shànghai.**

930

931 However, the morpheme *táo* 'escape' in Chinese seems to indicate manner of motion. As shown

932 in (46), *táo* 'escape' can be modified by a variety of result phrases.

933

934 (46) a. … *xiǎoqǐr*,…,   *jìng*   *táo-**diū**-le*   *yī.zhī*   *pò*   *bùxié*

935   Little.beggar…unexpectedly   escape-lose-ASP   one.CLF   worn   cloth.shoe

936   'The little beggar unexpectedly lost one of his worn cloth shoes when he escaped.'

937   (http://book.birdsee.com/files/article/html/0/220/734741.html)

938

939   b. *dàdǎn xiǎozéi*   ***táo-lèi-le***,   *jìng*   *zài cǎocóng -li*   *shuìzháo*   *le*

940   bold   little.thief   escape-tired-PERF   unexpectedly   at   brushwood-in   sleep   ASP

941   'The bold little thief fell asleep in the brushwood after he became tired in escaping.'

942   (http://sub-hzrb.hangzhou.com.cn/system/2010/07/15/010798758.shtml)

943

944   c. *tóngnián 2*   *yuè*   *dǐ* , *Wáng. Hǎi bīn*   *děngrén*   *táo-**dào***   ***Shàng hǎi***

945   same.year 2   month end Wang.Haibin   et.al.   escape-arrive   Shanghai

946   'In the same year, Wang Haibin and others escaped to Shanghai at the end of February.'

947   (PKU Corpus)

948

949 The contrast between (45) and (46) shows that the Chinese morpheme *táo* 'escape' is a non-

950 scalar change M.

951

952 **4.4 Coding**

953 Each M1 and M2 in the data was coded for three scalar features, [+/- scale], [+/- bounded], and

954 [+/- punctual]. The hierarchy in (32), rephrased here in (47), can be reformed into three sub-

955 hypotheses, as in (48).

956 (47)

Nonscalar change M (a): *pǎo* 'run'	→	**Open scale M (b):** *tuì* 'recede'	→	**Multi-point closed scale M (c):** *huí* return'	→	**Two-point closed scale M (d):** *dào* 'arrive'

35

957
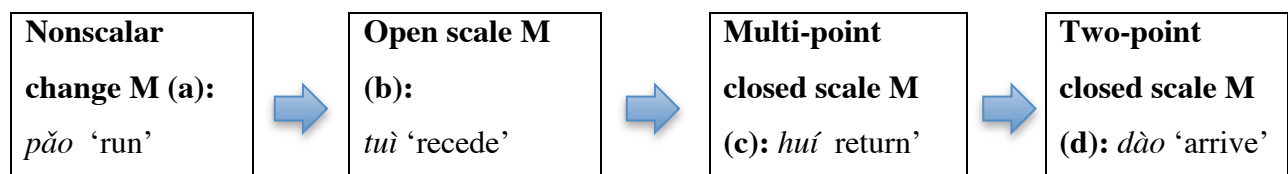
(48) In an MMMC,

   a. If M2 is [–scale], M1 can only be [–scale]; if M2 is [+scale], M1 can be [+scale] or
      [– scale];

   b. If M2 is [–bounded], then M1 must be [–bounded]; if M2 is [+bounded], then M1 can
      be [+bounded] or [–bounded];

   c. If M2 is [–punctual], M1 must be [-punctual]; if M2 is [+punctual], M1can be
      [+punctual] or [–punctual];

In terms of scalar feature, we can imagine the following four combinations for M1 and M2: [-scale, -scale], [-scale, +scale], [+scale, -scale], and [+scale, +scale]. However, if the scalar hierarchy is correct, then the combination [+scale, -scale] would not appear in natural Chinese data. Similarly, the combinations [+bounded, -bounded] or [+punctual, -punctual] are predicted not to occur in Chinese.

4.4 Results

We tested our data against hypothesis (48) and analyzed whether those combinations of scalar features of M1M2 excluded by the hypothesis existed in the data. Existence of such combinations would challenge our hypothesis.

Table 3 shows the frequency counts of all four combinations of scalar features of M1M2 analyzed in the data. The shaded combinations are the ones that were not predicted by our hypothesis.

Table 3 M1M2 combinations in selected chapters of three novels

|	**Existence of Scale**	**Boundedness**	**Punctuality**
[M1, M2]	[-scale, -scale]: 0	[-bounded, -bounded] : 46	[-punctual, -punctual]: 56
	[-scale, +scale]: 139	[-bounded, +bounded]: 121	[-punctual, +punctual]: 133
	[+scale, -scale]: 0	[+bounded, -bounded]: 0	[+punctual, -punctual]: 0
	[+scale, +scale]: 62	[+bounded, +bounded]: 44	[+punctual, +punctual]: 12
Total	201	201	201

As shown in Table 3, among the 201 instances of "M1M2" MMMCs, there are no instances of scalar-feature combinations that were unexpected by the hypothesis.

In addition, as shown in Table 3, certain combinations are shown with higher frequencies than the others with respect to each scalar feature. For instance, in terms of scale, [-scale, +scale] is the most frequent combination, whereas we found no instances of a [-scale, -scale] combination. This result indicates that M2 tends to be a scalar change M in MMMCs. In the corpus data we observed that scalar change Ms such as *chū* 'exit', *jìn* 'enter', *shàng* 'ascend', *xià* 'descend', and *dào* 'arrive' are the most frequently used M2s. Scalar change Ms such as *huí* 'return', *jìn* 'enter', and *shēng* 'ascend' also occured in M1 position, but M1 is filled more frequently by non-scalar change Ms such as *zǒu* 'walk', *pǎo* 'run', and *chuǎng* 'rush'.

In terms of boundedness, we found that the majority of M2s (82.1%, 165 out of 201 instances) lexicalized bounded scales, but the majority of M1s (83.1%, 167 out of 201 instances) lexicalized unbounded scales. In terms of punctuality, the majority of M1s (94%, 189 out of 201 tokens) are non-punctual (i.e. durative) morphemes, which include both non-scalar change morphemes (e.g., *zǒu* 'walk', *pǎo* 'run') and multi-point scalar change morphemes (e.g., *huí* 'return', *shēng* 'ascend'). In contrast, the majority of M2s (72.1%, 145 out of 201 tokens) denoted punctual motion.

Figures 1-3 demonstrate the frequencies of M1 and M2 in Chinese MMMCs in terms of each feature of scale: M1 tends to be [-scale], [+duration], and [-bounded], whereas M2 tends to be [+scale], [-duration], and [+bounded]. This result confirms our predictions from the scalar (semantic) hierarchy in (52-53).
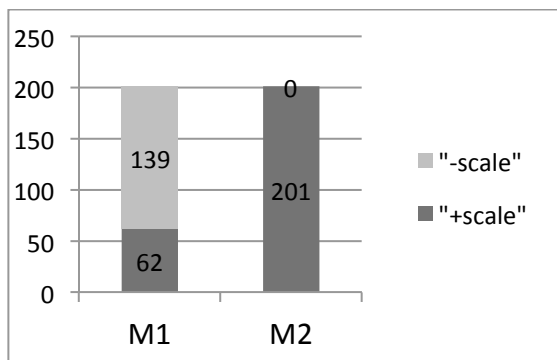
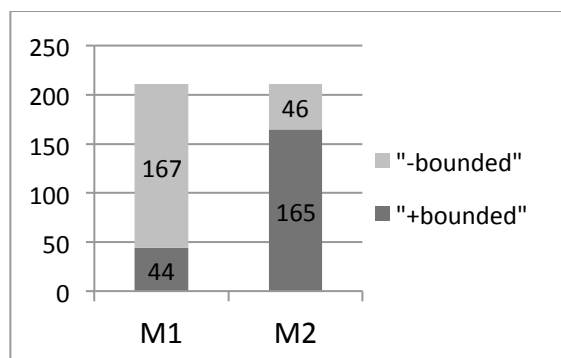Figure 1. The frequencies of M1 and M2 in Chinese MMMCs in terms of [+/-scale]
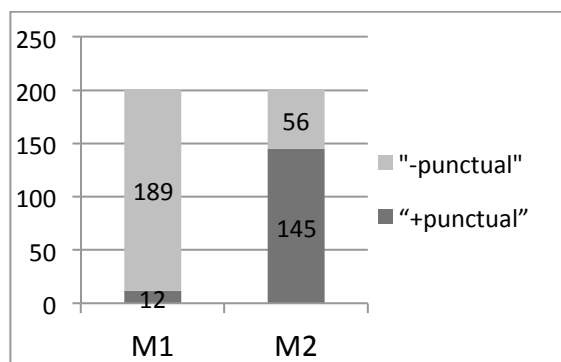
1006

1007

1008 Figure 2. The frequencies of M1 and M2 in Chinese MMMCs in terms of [+/-bounded]

1009

1010

1011 Figure 3. The frequencies of M1 and M2 in Chinese MMMCs in terms of [+/-bounded]

1012

1013 **5. Corpus study 2**

1014 We conducted a second corpus study to cross-validate our hypothesis from a different

1015 perspective. We focused on the highest frequency motion morphemes and examined all possible

1016 relative morpheme orderings of these morphemes with respect to other co-occurring morphemes

1017 in MMMCs.

1018

1019 **5.1 Data source and selection**

1020 As discussed in Section 3, Chinese motion morphemes can be classified into four types of scalar

1021 structures: non-scalar change Ms, open scale Ms, multi-pt closed scale Ms, and two-pt closed

1022 scale Ms. For this study, we chose the two morphemes of each type that occurred with the

1023 highest frequency in the first corpus study. We then searched for these morphemes in the PKU

1024 Corpus. Within the PKU Corpus, we narrowed down the genre to the novel category for two

reasons: first, novels reflect spoken language more directly than other types of written documents

such as news report or academic writings; second, using the same type of data, i.e. novels, in

Corpus Study 2 will enable us to cross-validate the result of Corpus Study 1 in a more consistent

way. Table 4 shows the most frequently occurring morphemes of each scalar type in the first

corpus study.

Table 4 Most frequently occurring motion morphemes of each scalar type

Morpheme type	non-scalar change Ms	open scale Ms	multi-pt closed scale Ms	two-pt closed scale Ms
Morphemes selected	*păo* 'run' *zŏu* 'walk'[16]	*shàng* 'ascend' *xià* 'descend'	*huí* 'return' *lái 'come'*	*dào* 'arrive' *chū* 'exit'

In order to make manual counting feasible, we only took the first 500 instances of

MMMCs that were returned from the search of each morpheme. Among those 500 instances, we

then selected MMMCs that fit the "M1M2" and "M1M2-*lái/qù*" patterns. Besides these two

patterns, we also included a few MMMCs in the form of "M1M2M3", where M3 is not a deictic

morpheme (*lái /qù*). This selection resulted in 569 tokens of two-morpheme MMMCs and 4

tokens of three-morpheme MMMCs, which form the data for our second corpus analysis. Among

total 573 tokens of MMMCs, there were 129 types of MMMCs in total.

5.2 Coding

We coded each morpheme in the data for its scalar features following the same coding principles

we introduced in the first corpus study. We then looked at the distribution of morphemes in

M1M2 (M3) and examined whether the relative ordering of the searched-for morphemes and the

other co-occurring motion morpheme(s) violated the scalar hierarchy in (32).

For instance, with the multi-pt closed scale M *huí* 'return', we postulated according to the

scalar hierarchy that two-pt closed scale Ms would not precede the multi-pt closed scale M *huí*.

In contrast, it should only be preceded by non-scalar change Ms or open scale Ms. If we found

---

16 In the category of non-scalar change Ms in Table 4, *zŏu* only refers to the free morpheme verb
denoting 'walk', but not the bound morpheme denoting 'away'.

1049 any unexpected ordering of the morpheme *huí* with respect to other motion morphemes, then the

1050 scalar hierarchy would be challenged.

1051

1052 **5.3 Results**

1053   Figures 4-7 display the distribution of each key morpheme and the motion morphemes

1054 preceding and following the key morphemes. Take Figure 4 for example. Figure 4 demonstrates

1055 the distribution of the two most frequent non-scalar change Ms *pǎo* 'run' and *zǒu* 'walk' in

1056 Figure 4a and Figure 4b, respectively. In Figure 4a, the middle column represents the frequency

1057 of the key morpheme *pǎo* 'run'. In total, there are 201 instances of *pǎo* 'run' found in MMMCs.

1058 The column on its left represents the different types of motion morphemes that occur after *pǎo*:

1059 58 instances of non-scalar change Ms. The column on the left of *pǎo* represents the types of

1060 motion morphemes that precede *pǎo*: 14 instances of open scale, 18 instances of multi-pt closed,

1061 and 111 instances of two-pt closed scale motion morphemes.

1062   For instance, as illustrated in (49a), the non-scalar change M *bēn* 'rush' precedes *pǎo*,

1063 and thus *bēn* was counted as one instance of a non-scalar change M preceding *pǎo*, whereas the

1064 two-pt closed scale M *dào* 'arrive' follows *pǎo* in (49b), so its frequency was counted as one

1065 instance of a "two-scale" morpheme.

1066

1067   (49) a. *Nà-ge   nǔ   tóngxué zài cāochǎng -shàng … bēn-**pǎo***

1068   that.CLF female student   at   play.ground-on   …. rush-run

1069   'That girl student was rushing on the playground.'

1070   [(*ben*: left, *pǎo*: middle column, PKU Corpus)]

1071

1072   b. **Pǎo-***dào*   *Qiānfó*   *sì*   *hòu -biān*

1073   run-arrive   thousand.Buddha   temple behind-side

1074   '[They] ran to the rear of the Thousand Buddha Temple.'

1075   [*pǎo*: middle, *dào*: right column, PKU Corpus]

1076

1077   Similarly, Figure 4b shows the frequency of the non-scalar change M *zǒu* 'walk' and the

1078 frequencies of motion verbs appearing to the left or right to *zǒu* in the data MVMCs. The height

1079 of each column in the chart indicates the total number of instances preceding or following the

1080 key morpheme, and numeric numbers to the right of each bar indicate the number of frequencies

1081 of each type of motion morphemes.

1082

Figure 4: Distribution of morpheme types preceding and following the two most frequent nonscalar change motion morphemes
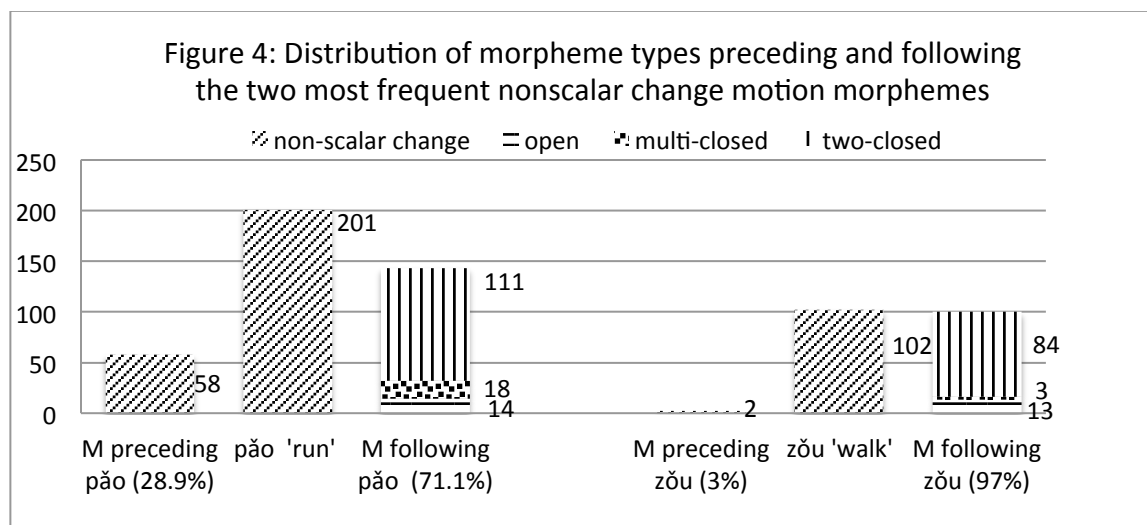
1083

1084   (4a) *păo* 'run'   (4b) *zŏu* 'walk'

1085

1086 The non-scalar change Ms *păo* and *zŏu* show similar distributions in terms of the types of motion

1087 morphemes that can co-occur to their left and right sides. Critically, we found that morphemes

1088 preceding *păo* and *zŏu* are all non-scalar change Ms. In addition, all types of scalar change Ms

1089 can follow *păo* and *zŏu*: two-pt closed scale Ms, as *dào* 'arrive' in *păo-dào* 'run-arrive', multi-pt

1090 closed scale Ms, as *huí* 'return' in *păo-huí* 'run-return', or open scale Ms, as *shàng* 'ascend' in

1091 *păo-shàng* 'run-ascend'; in contrast, non-scalar change Ms cannot follow *păo/zŏu*, e.g., **păo-táo*

1092 'run escape'. The relative ordering of *păo/zŏu* with respect to their co-occurring motion

1093 morphemes in MMMCs is consistent with the scalar hierarchy.

1094   The most frequent open scale Ms, *shàng* 'ascend' and *xià* 'descend' also have similar

1095 distribution in terms of order in MMMCs. See Figure 5.

1096

Figure 5: Distribution of morpheme types preceding and following the two most frequent open scale motion morphemes
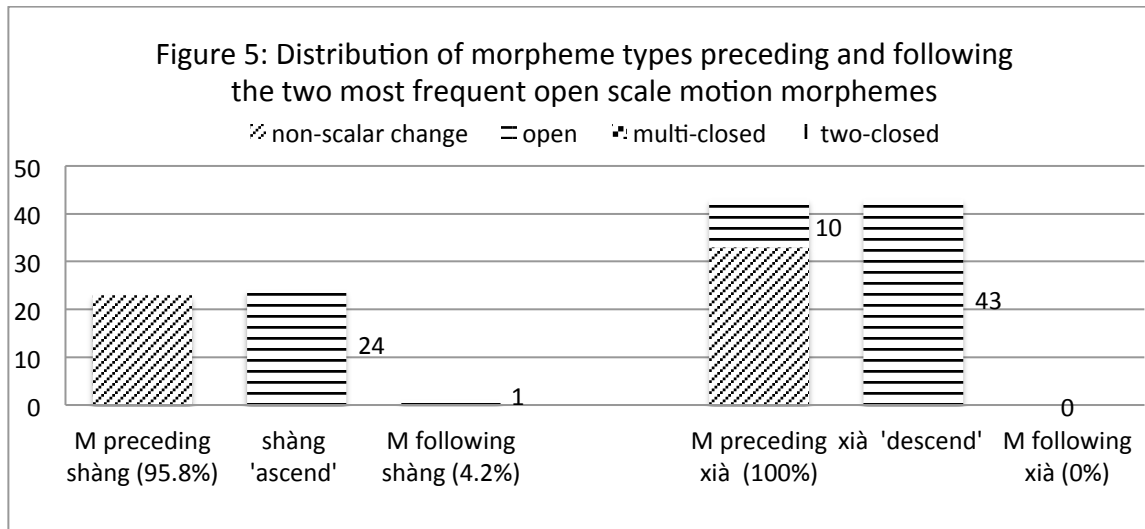
(5a) *shàng* 'ascend'　　　　　　　　(5b) *xià* 'descend'

As shown in the figure, *shàng* and *xià* tend to occur in M2 position. We found only one token of a morpheme following *shàng* or *xià* to the right, shown in (50).

(50) *Yī-xià   yī-xià   shàng-zhǎng zhídào yì   chū   lái   yíyàng*
　　One-time one-time ascend-rise   until   overflow exit   come   alike
　　'It rose up again and again until it was as if it was going to flow out.'
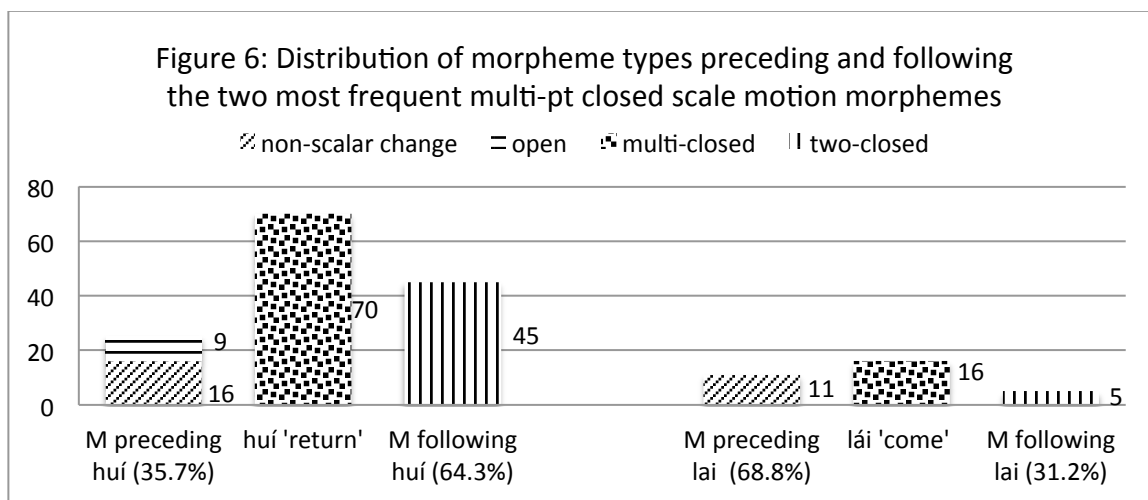
In this sentence, the morpheme following *shàng* is *zhǎng* 'rise', which is an open scale M just like *shàng*. The scalar hierarchy also postulates that morphemes of the same scale may co-occur in MMMCs. Therefore, the relative ordering of *shàng* and *zhǎng* does not violate the hierarchy.

In addition, only two types of morphemes occurred to the left of *shàng/xià*: non-scalar change Ms (e.g., *pá* 'climb' in *pá-shàng* 'climb ascend', *chōng* 'rush' in *chōng-xià* 'rush descend') and open scale Ms (e.g., *luò* 'fall' in *luò-xià* 'fall descend'). We found no two-pt or multi-pt closed scale Ms preceding the open scale Ms *shàng/xià*, confirming the scalar hierarchy in (32).

Next we present the distribution of multi-pt closed scale Ms *huí* 'return' and *lái* 'come' in MMMCs. As illustrated in Figure 6, there were no two-pt closed sacle Ms occurring to the left of *huí/lái*, e.g., *jìn-huí 'enter-return', and there were no non-scalar change Ms or open scale Ms

1118   occurring to the right of *huí*/*lái*, eg., *huí-shàng 'return-ascend'. These results also confirmed the
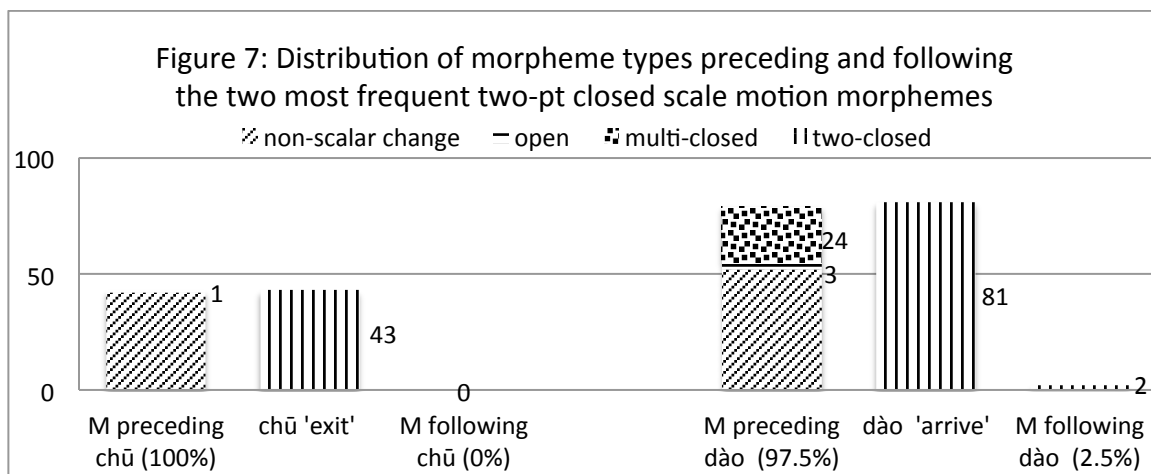
1119   scalar hierarchy.

1120

Figure 6: Distribution of morpheme types preceding and following the two most frequent multi-pt closed scale motion morphemes

non-scalar change   open   multi-closed   two-closed

M preceding huí (35.7%): 16
huí 'return': 70
M following huí (64.3%): 45
M preceding lai (68.8%): 11
lái 'come': 16
M following lai (31.2%): 5

1121

1122   (6a) *huí* 'return'   (6b) *lái* 'come'

1123

1124   Finally, the distributions of the two-pt closed scale Ms *dào* 'arrive' and *chū* 'exit' supported the

1125   hierarchy as well, as in Figure 7.

1126

Figure 7: Distribution of morpheme types preceding and following the two most frequent two-pt closed scale motion morphemes

non-scalar change   open   multi-closed   two-closed

M preceding chū (100%): 1
chū 'exit': 43
M following chū (0%): 0
M preceding dào (97.5%): 24, 3
dào 'arrive': 81
M following dào (2.5%): 2

1127

1128   (7a) *dào* 'arrive'   (7b) *chū* 'exit'

1129

1130   The two-pt closed scale Ms *dào* and *chū* tend to be M2 in MMMCs. We did not find any non-

1131   scalar change Ms or multi-pt closed scale Ms occurring to the right of *dào* or *chū*, e.g., *dào-pǎo

1132   'arrive-run', *dào-huí 'arrive-return'. In Figure 7a, the two instances of morphemes appearing to

43

1133 the right of *dào* 'arrive' included *dá* 'reach', a bound morpheme lexicalizing the same scalar

1134 features as *dào* 'arrive', i.e. a closed two-point scale, as illustrated in (51-52).

1135

1136 (51) *Tā* **dào**-*dá* *hòu ,* *jiù* *suǒqǔ* *jù běn* *lái* *kàn*

1137 She arrive-reach after, then ask play PURPOSE read

1138 'She asked for a play to read after she arrived.'

1139

1140 (52) *Jùzǔ* *yǐ* **dào**-*dá,* *bìng* *yǐ* *kāi* *pāi*

1141 Film.crew already arrive-reach and already start film

1142 'The film crew had already arrived, and they had started filming.'

1143

1144 In addition, all types of scalar change Ms except two-pt closed scale Ms can precede the two-pt

1145 closed sacle Ms *dào/chū* as shown in Figure 7: non-scalar change Ms, open scale Ms and multi-

1146 pt closed scale Ms were found to the left of two-pt closed scale Ms.

1147 In summary, Figures 4-7 suggest that morphemes with the same features of scale usually

1148 behave similarly. For instance, as shown in Figure 4, the non-scalar Ms tend to occur in M1

1149 position and may be followed by three other types of scalar change Ms, and as shown in Figure 7,

1150 the two-pt closed scale Ms usually occur in M2 position, and are unlikely to be followed by the

1151 three other types of motion morphemes. We did not find any MMMCs that served as

1152 counterexamples to our hypothesis. The results cross-validate the scalar hierarchy hypothesis and

1153 also the results of the first corpus study.

1154

1155 **6 Discussion**

1156 The results from the two corpus studies presented in Sections 4 and 5 indicate that the constituent

1157 order of morphemes in MMMCs follows the scalar hierarchy in (32). That is, a scalar change M

1158 may not precede a non-scalar change M; a morpheme denoting instantaneous motion may not

1159 precede a morpheme denoting durative motion, and a morpheme lexically specifying a bounded

1160 scale may not precede a morpheme specifying an unbounded scale.

1161 Additionally, we made a number of observations based on analysis of the results. First,

1162 two morphemes with the same scalar features may co-occur in a motion expression. For instance,

44

1163 as illustrated in (32), *luò* 'fall' is an open scale M like *xià* 'descend.' Both of them specify

1164 motion in the direction of gravity and they do not lexically specify an endpoint for the motion.

1165

1166 (53) *yèzi*   *yǐ jīng*   *fēnfēn*   **luò-xià**   (PKU Corpus)

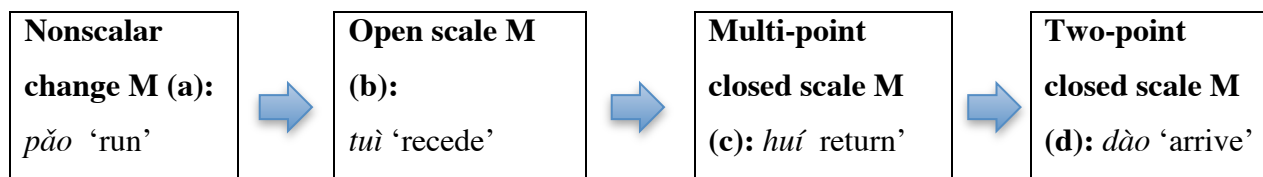1167   leaf   already   one.after.another   fall-descend

1168   'The leaves have fallen down one after another.'

1169

1170 The co-occurrence of two morphemes with the same scalar features is consistent with our

1171 prediction. As shown in (54, repeated from 32), the order of M1 and M2 should reflect their left-

1172 to-right order on the scalar hierarchy. This prediction also included the repetition of the same

1173 type of morphemes such as {b, b} or {c, c}.

1174

1175 (54)

Nonscalar change M (a): *pǎo* 'run'	Open scale M (b): *tuì* 'recede'	Multi-point closed scale M (c): *huí* return'	Two-point closed scale M (d): *dào* 'arrive'

1176

1177   Second, we observed from the data in the two corpus studies that MMMCs consisting of

1178 "path + path" are not rare in Chinese. In the data for the first corpus study, 74 out of 203

1179 MMMCs (36.5%) consisted of two scalar change Ms denoting direction. In the data for the

1180 second corpus study alone, 29 (35.7%) of 81 instances of MMMCs that involve the scalar change

1181 M *dào* 'arrive' consisted of a scalar change M denoting direction and the two-pt closed scale M

1182 *dào*, and 10 (26.3%) of the 38 instances of MMMCs that involve *xià* 'descend' consisted of *xià*

1183 and other scalar change M denoting direction. If we relied on the traditional understanding that

1184 manner morphemes must precede path morphemes in an MMMC, then all these instances would

1185 have had to be considered as exceptions to the rule.

1186   Third, we observed that the hierarchy can be applied to the relative ordering of three

1187 morphemes appearing in MMMCs in which M3 is not a deictic morpheme *lái/qù*. We found six

1188 tokens of three-morpheme MMMCs in the two corpus studies, e.g., (55).

1189

1190

1191

(55) *Tā*   *kāishǐ …*   **duó-huí-dào**   …*bàngōngtái -páng*

he   start   stroll-return-arrive   office.desk-side

'He started to stroll back to the office desk.'   (PKU Corpus)

M1 *duó* is a non-scalar change M, M2 *huí* is a multi-pt closed scale M, and M3 *dào* is a two-pt closed scale M, which is thus consistent with the hierarchy. Besides this example, we also found five more tokens of three-morpheme MMMCs when we searched for MMMCs using *huí* 'return' in the second corpus study. All these examples also confirmed our scalar hierarchy.[17]

     In the traditional treatment of MMMCs as a subtype of RVCs, *huí* 'return' and *dào* 'arrive' in (55) are understood as a bi-syllabic result complement. The scalar theory, however, enables us to analyze this example as having three motion morphemes that confirm the scalar hierarchy, because the combination of the three motion morphemes in (55) shows the features [non-scalar change, open scale, two-point closed scale].

     Fourth, the scalar hierarchy can be also used to explain the constituent ordering of morphemes in a RVC. Three RVC examples are given in (56):

(56) a. *Gōngrén*   *bǎ*   *lùmiàn*   **pū-kuān**-*le*   *sān*   *mí*

worker   BA   road.surface   pave-wide-ASP   three   meter

'The worker paved the road three meters wider. '

[*pū* 'pave': non-scalar change, *kuān* 'wide': open scale]

     b. *Dàfēng*   **chuī-gān**-*le*   *yīfu*

big.wind   blow-dry-ASP   clothes

'The strong wind blew the clothes dry.'

[*chuī* 'blow': non-scalar change, *gān* 'dry': multi-point closed scale]

     c. *Zhè-ge*   *xiǎo hái*   **dǎ-sǐ**-*le*   *yī-zhī*   *wénzi*

---

17 The six MMMCs with three non-deictic motion verbs are: **huá-luò-dào** *dì -shàng* 'slide onto the floor', **pēn-shè** *chū-lái* 'spurt out', **zuò-huí -dào** *shāfā-shàng* 'sit back onto the sofa', **duó-huí-dào** *bàngōngtái -páng* 'stroll back to the office desk', **luò-huí-dào** *gāobèiyǐ-lǐ* 'fall back into the high-back chair', **huá-luò- dào** *shuǐnídì-shàng* 'slide onto the concrete floor'.

1219   This-CLF   little.child   hit-die-PERF one-CLF   mosquito

1220   'The child hit a mosquito to death.'

1221   [*dǎ* 'hit': non-scalar change, *sǐ* 'die': two-point closed scale]

1222

1223 In terms of scalar structure, *pū* 'pave', *chuī* 'blow', and *dǎ* 'hit' in (56) are non-scalar change

1224 morphemes in the domain of change of state, like *zǒu* 'walk' and *pǎo* 'run' in the domain of

1225 directed motion. In contrast, *kuān* 'wide', *gān* 'dry', and *sǐ* 'dead' are scalar change moprhemes

1226 in that the degree of the result expressed by them can be measured in terms of scales: in the

1227 multi-pt open scale of width (*kuān*), in the multi-pt closed scale of dryness (*gān*), and in the two-

1228 pt scale of alive and dead (*sǐ*) (cf. Kennedy and McNally 2005, Kennedy and Levin 2008,

1229 Rappaport Hovav 2008, among many others). Width is an open scale because an entity can

1230 potentially be infinitely widened; dryness is a closed scale because an entity cannot be drier if

1231 there is no humidity left; death is a two-pt scale because an entity can only be either alive or dead.

1232 In this sense, in terms of boundeness, *kuān* is unbounded, similar to the motion morpheme *shàng*

1233 'ascend', *dry* is bounded, similar to the motion morpheme *huí* 'return', and *sǐ* 'dead' is bounded,

1234 similar to the motion morpheme *jìn* 'enter'. Compared to the traditional two-dimensional

1235 approach that assumes only a "manner (cause)-result" relationship, the scalar theory interprets

1236 the constituent order of a wider range of data.

1237   Finally, we observed that the morpheme *dào* 'arrive' seems idiosyncratic compared with

1238 other two-pt closed scale Ms. Hypothetically, based on the scalar hierarchy, two-pt closed scale

1239 Ms such as *jìn* 'enter', *chū* 'exit', and *dào* 'arrive' are expected to follow other open scale Ms,

1240 e.g., *shàng* 'ascend' or multi-pt closed scale Ms, e.g., *huí* 'return'. However, only *dào* 'arrive' is

1241 found to do so, cf. (57a) and (57b-c).

1242

1243 (57) a. ***Shàng*/*huí-dào***   *èrlóu*   *de*   *fángjiān*

1244   ascend/return-arrive   second.floor MOD room

1245   'go up/return to the room on the second floor'

1246

1247   b. ****Shàng*/*huí-jìn***   *èrlóu*   *de*   *fángjiān*

1248   ascend/return-enter second.floor   MOD room

1249   # '(intended meaning) go up/come/return and enter the room on the second floor'

1250

1251 c. ***Shàng/huí-chū**   *èrlóu*   *de*   *fángjiān*

1252   ascend/return-exit   second.floor   MOD   room

1253   #'(intended meaning) go up/come/return and exit the room on the second floor'

1254

1255 In addition, neither *jìn* 'enter' nor *chū* 'exit' can follow *dào* 'arrive' (58a), although *dào* can

1256 follow *jìn* (58b).

1257

1258 (58) a. **Dào-jìn/chū*   *fángjiān-lǐ*

1259   arrive-enter/exit   room-inside

1260

1261   b. *Jìn-dào*   *fángjiān-lǐ*

1262   enter-arrive   room-inside

1263   'enter into the room'

1264

1265   It is logical to ask why *dào* behaves differently than other two-pt closed scale Ms. We

1266 suggest that among two-pt closed scale Ms, *dào*'s morphological status is different from that of

1267 *jìn/chū*. Compare (59) and (60).

1268

1269 (59) a. *Xiǎotōu*   *pǎo-dào*   *ménkǒu*

1270   little.thief   run-arrive   entrance

1271   'The thief ran to the entrance.'

1272

1273 =/> b. * *Xiǎotōu*   *pǎo*   *dào-lái*   *le*

1274   Little.thief   run   arrive-come   ASP

1275   # '(intended meaning) the thief ran in [towards the speaker who was inside the

1276 entrance].'

1277

1278 *Dào* in M2 position should be always followed by a ground NP (an object of *dào*), but *jìn/chū* in

1279 M2 position can be either followed by a ground NP or by a deictic morpheme *lái/qù*.

1280

(60) a. *Xiǎotōu   pǎo-jìn   ménkǒu*

    little.thief   run-enter   entrance

    'The thief ran into the entrance.'

➜ b. *Xiǎotōu   pǎo   jìn-lái   le*

    little.thief   run   enter-come   PERF

    'The thief ran in [towards the speaker who is inside the entrance].'

In this sense, *dào* is similar to a preposition, which should be followed by an object denoting a location. At the same time, *dào* is different from a pure preposition in that it shows closer constituency with M1 in MMMCs, than with the location object. See (61).

(61) a.* *Xiǎotōu   pǎo-le   dào   ménkǒu.*

    Thief   run-ASP   arrive entrance

    b. *Xiǎotōu   pǎo-dào-le   ménkǒu.*

    Thief   run-arrive-ASP   entrance

    'The thief ran to the entrance.'

The perfective aspect marker *le* is a verbal suffix in Chinese. As in (61b), *le* should immediately follow *dào* rather than *pǎo*. It shows that *dào* is a part of a verbal construction.

In conclusion, *dào*'s morphological status seems to be different from other two-pt closed scale Ms. We will not analyze the morphological status of *dào* further here. However, further study is necessary to explore the relationship between, *dào*'s morphological status and its high productivity in combining with morphemes of various scale structures.

7. Conclusion

In this study, we have shown that the traditional two-way classification of motion morphemes into manner-of-motion morphemes and path morphemes, and simply treating MMMC as a

1311 (sub)type of RVCs cannot cover the entire range of existing natural data of MMMCs in Modern
1312 Chinese.

1313 As an alternative, we have proposed a four-way classification of Chinese motion
1314 morphemes based on the scale structure that the morphemes specify. Specifically, based on the
1315 three scalar features, i.e. existence of a scale, boundedness, and punctuality, Chinese motion
1316 morphemes can be classified into non-scalar change motion morphemes, open scale motion
1317 morphemes, multi-point closed scale motion morphemes, and two-point closed scale motion
1318 morphemes. In addition, we have introduced a set of independent diagnostics to test the features
1319 of the scales lexicalized in each morpheme, and thus determine which category the morpheme
1320 falls into.

1321 We also have proposed a hierarchy of motion morphemes based on their scale structure to
1322 predict morphemes' relative orderings in MMMCs. According to this hierarchy, the left-to-right
1323 word order of the morphemes in an MMMC must follow the left-to-right order in the hierarchy,
1324 which thus shows why certain orders of motion morphemes are not allowed in Chinese MMMCs,
1325 whereas others are acceptable.

1326 Two corpus studies were carried out to verify the predictability of the scalar hierarchy.
1327 The results of the corpus studies suggested that the scalar hierarchy of motion morphemes can be
1328 applied to a comprehensive range of existing motion expressions in natural Modern Chinese data,
1329 and not only to MMMCs consisting of two motion morphemes but also to MMMCs with three
1330 morphemes. More significantly, as shown in Section 6, the semantic relationships between the
1331 elements in a Chinese RVC can be analyzed from the perspective of scale structure as well,
1332 which indicates that we can yield more consistent results by examining the scale structure of
1333 morphemes.

1334 We anticipate that our scalar hierarchy of motion morphemes could be applicable to
1335 serial-verb motion constructions in other languages as well. Therefore, this paper calls for related
1336 studies in other serial-verb languages, including Thai (cf. Thepkanjana 1986, Muansuwan 2001,
1337 Zlatev and Yangklang 2004, among others), Ewe and Akan (cf. Ameka and Essegbey 2001,
1338 among others).
1339
1340

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