# Cumulative universal quantification
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Although there is widespread agreement in developmental linguistics that by the age of 5 children have the requisite grammatical knowledge and processing resources to represent and interpret universally quantified sentences like adults, many studies reveal a marked delay in children's performance with distributive universal quantification (e.g., Brooks & Braine, 1996; Brooks and Sekerina, 2006; Drozd, 1996, Drozd, van der Lely & Montalto (under review); Musolino, 2009; Pagliarini et al, 2012; Philip, 1995; Syrett & Musolino, 2015; Smits 2010). One recent finding gaining attention is that children accept sentences with distributive quantifiers *every* and *each* as descriptions of cumulative contexts. Musolino (2009) reported that 5-6-year-old children given a Truth-Value Judgment Task accept sentences like *Three children are holding each balloon* as descriptions of cumulative contexts (two children holding one balloon, a third child holding a different balloon) 54% of the time (adults: 17%). Drozd, van der Lely, & Montalto reported that 4-9-year old children accept sentences like *Every cowboy is pulling two horses* as descriptions of cumulative contexts (one cowboy pulling two horses, another cowboy pulling one of them, and a third cowboy only pulling the other) 41% of the time (adults: 13%).

In this paper I compare two alternative theoretical accounts of these 'cumulative' judgments. Extending Geurts' (2003) explanation of children's quantifier spreading (QS) judgments (Philip, 1995), Musolino (2009) proposed that children who accept (1a) in cumulative contexts assign a distributive interpretation to the sentence but construe the denotation of the indefinite NP rather than the *each* NP as the quantificational domain, yielding (1c). This analysis also captures interpretation (2c) of (2a). and (2b) respectively. An alternative proposal by Drozd, van der Lely & Montalto (under review) claims that children who accept (1a) and (2a) in cumulative contexts assign the cumulative interpretations in (1d) and (2d) to these sentences (CUM account).

(1a)     Three children are holding each balloon.

(1b)     'For each y, y a balloon, there is a set of three children X and x is holding y' (Adult)

(1c)     'For each x, x one of three children X, there is a balloon y and x is holding y' (QS account)

(1d)     'There is a set of three children X and a maximal contextually salient set of balloons Y and for
         every x in X, there is a y in Y such that x is holding y and for every y in Y there is an x in X such that x is holding y.' (CUM account)

(2a)     Every cowboy is pulling two horses.

(2b)     'For every x, x a cowboy, there are two horses Y and x is pulling Y' (Adult)

(2c)     'For every y, y one of two horses Y, there is a cowboy x and x is pulling y' (QS account)

(2d)     'There is a maximal contextually salient set of cowboys X and a set of two horses Y and for every x in X, there is a y in Y such that x is pulling y and for every y in Y there is an x in X such that x is pulling y.'
         (CUM account)

I argue in favor of the CUM account on the grounds that it provides better coverage of the available data, avoids learnability problems encountered by the QS account, and helps to explain variation in children's performance across experiments. I present a formal analysis of children's cumulative judgments drawing on recent work by Brasoveanu (2013), Champollion (2010, 2014), Kratzer (2000), Landman (2000), and Szabolcsi (2010). I then discuss how the CUM account can contribute to our understanding of the often-observed delay in the acquisition of distributive universal quantification and the broader implications of the account for research in developmental semantics and pragmatics.