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Review Article

Unravelling the Glasgow effect: The relationship between accumulative bio-psychosocial stress, stress reactivity and Scotland's health problems

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ABSTRACT

To date, multiple hypotheses have been proposed for the Scottish effect and, more specifically, Glasgow's high mortality rate and the associated Glasgow effect. Previous authors have highlighted the improbability of a single factor as responsible for this effect with seventeen possible hypotheses presented. These have ranged from socio-economic factors, lifestyle and cultural factors such as sectarianism, and political and economic factors. Although these may all be contributory factors to this paradox, the underpinning reasons for the observed effect remain relatively unexplained. In this paper, we suggest that the compounding effect of a unique blend of accumulating life stressors may predispose Scots, and particularly socially-disadvantaged Glaswegians, to a wide-range of health disorders. In short, a confluence of social, environmental, attitudinal and cultural stressors perhaps combine to negatively influence biological health. Future directions should consider the stress remediating role of physical activity, and the problems presented by barriers to participation in physical activity and exercise during key transitional stages of life.

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1. Introduction

Since the 1950′s, Scottish life expectancy has improved more slowly than in other comparably wealthy nations. Furthermore, 43% of adults are classified as chronically ill or disabled and, despite medical advances, all-cause mortality in younger age categories (15–44 years) remains non-declining at a rate of 142.4 deaths per 100,000 (Bromley and Shelton, 2010). In addition, current suicide rates are 50% higher than in 1968 (Whyte and Ajetunmobi, 2010), obesity is on the rise, and general levels of physical activity are diminishing (Scottish Government and Convention of Scottish Local Authorities, 2010). As a consequence of this poor health record, and mortality rates persistently higher than European averages, Scotland has been dubbed 'the sick man of Europe', and the phenomenon of these unexplained health disparities labelled the 'Scottish effect' (Bromley and Shelton, 2010; Shelton, 2009; Whyte and Ajetunmobi, 2010).

Interestingly, within Scotland, further divergent health disparities are apparent. The West of Scotland, and more specifically the Greater

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Glasgow area, demonstrate particularly pronounced levels of premature mortality and an increased incidence of negative health outcomes and behaviours appear disproportionately common (Whyte and Ajetunmobi, 2010). Despite multiple suggested explanations for the Scottish effect, however, the phenomenon remains poorly understood and the underpinning drivers of the Scottish and Glasgow effects remain unclear. No single contributing factor appears to explain why Scotland, and Glasgow in particular, have different mortality patterns than other UK cities suffering comparable deprivation (McCartney et al., 2011). Indeed, it has recently been suggested that, whilst behavioural, socioeconomic and physiological factors certainly contribute to the Scottish effect, that psycho-emotional distress may exert an even greater contributing influence (McCartney et al., 2011; McCartney et al., 2015; Stults-Kolehmainen and Sinha, 2014).

Accordingly, within this article we explore the potential drivers of the Scottish effect through the lens of an updated 21st century understanding of the impact, on multiple dimensions of health, of excessively accumulating life stress. We suggest that the Scottish effect, and its nested sub-effects, can be explained through the convergence of multiple stress-promoting phenomena all conspiring to expose the Scottish population to unusually high levels of accumulating life stressors. Finally, we suggest that this re-framing of the Scottish effect underlines a crucial, if sometimes overlooked, argument for physical activity (PA) promotion amongst populations exposed to high levels of accumulating life stress: in short, systematic exploitation of the stress moderating benefits of regular PA.

2. Methodology

The electronic databases: *Medline, Embase, Cochrane reviews, Omnifile, ABI inform* and *Google scholar*, were searched for UK and worldwide academic literature published between 1985 and 2016, using the key search terms: Scotland effect; Glasgow effect; stress; health inequalities; Scottish and Glasgow health. Further resources were sought through associated public health journals, and from grey literature such as Government reviews, Glasgow Centre for population health data, and national evaluations. Although the search strategy employed a systematic approach, the breadth of this literature entailed that a full systematic review, as outlined by the Cochrane Collaboration, was not feasible.

3. Scottish, Glasgow and East Glasgow effects: Nested health effects illustrating the consequences of accumulative multi-source stress

In the late 1980's a UK-wide report highlighted that premature mortality in Scotland was more severe than in England or Wales (Carstairs and Morris, 1989; Walsh et al., 2010; Whynes, 2009a; Whynes, 2009b). Although these higher mortality rates were initially attributed to higher levels of deprivation, more recent investigations suggested that these health inequalities were not fully explained by deprivation levels alone. This phenomenon, of elevated mortality levels without a clear origin, was subsequently labelled 'The Scottish Effect' (Carstairs and Morris, 1989; Walsh et al., 2010; Whynes, 2009a,b). Although socio-economic status, cultural factors and other health-related risk factors all undoubtedly contribute to this phenomenon, an explanation as to why these health inequalities are so pronounced, remains elusive (Gray, 2008; McCartney et al., 2011).

As stated in the introduction, this effect seems even more pronounced in certain areas. Like many British cities, Glasgow, Scotland's largest city, underwent severe de-industrialisation in the mid 1980's, representing the fastest industrial decline within the United Kingdom (MacInnes, 1994). This de-industrialisation was accompanied by increasing deprivation and some of the worst premature mortality rates in Europe.

More recently, however, Glasgow has experienced rapid re-industrialisation, and growing prosperity. Nevertheless, as illustrated by recent Medical Research Council findings, Glasgow's health profile remains inferior to the rest of the UK (Gray et al., 2012). This circumstance suggests that the recent prosperity shift has not been reflected in a proportionally increasing health status (Hanlon et al., 2006) and that higher mortality rates are not explained by socio-economic deprivation alone (Hanlon et al., 2006; Walsh et al., 2010). Indeed, on analyzing data from the recent Scottish health survey, a Scottish Government report suggested living in Glasgow was independently associated with poorer health outcomes and increased all-cause mortality (Landy et al., 2010). This phenomenon, a further health disparity nested within the Scottish effect, has been termed 'The Glasgow Effect' (Gray, 2008; Walsh et al., 2010). The evidence linking low socio-economic status with elevated stress markers illustrates a clear link to a range of illnesses abundant in the West of Scotland (McEwen, 2008). Additionally, elevated levels of conditions related to anxiety, myocardial infarction, obesity and high GHQ scores (signifying potential psychiatric disorders) have been shown to be prevalent regardless of socioeconomic status (Landy et al., 2010).

In fact, other studies seem to suggest that even greater challenges exist. Within the Greater Glasgow area, there appears a further nested disparity. For example, males living in Bridgeton and Dennistoun have a life expectancy fifteen years lower than fellow Glaswegians residing, less than 5 miles away, in the more affluent Anniesland and Bearsden areas (Glasgow City Council Regeneration Team, 2011; Hanlon et al., 2006). Such inequalities are preserved across genders, with all-cause mortality rates ranging from 428 and 454 deaths per 100,000 for Anniesland and Bearsden, to 965 per 100,000 for Bridgeton and Dennistoun (Hanlon et al., 2006; National Records of Scotland, 2012). Notably, males from Dennistoun have only a 53% chance of reaching their 65th birthday (National Records of Scotland, 2012). Accordingly, some communities within the Greater Glasgow area exhibit the highest national levels of all-cause mortality, whilst others demonstrate the lowest.

In an international context, in the USA, residents of the Appalachian counties display a similar pattern of excess mortality to that of Scotland, with CHD death rates exceeding the national average by between 15 and 21%. It is hypothesized that these disparities occur as a result of a combination of socioeconomic stressors and cultural barriers to accessing the health care system (Barker et al., 2010; Center for Disease Control and Prevention- CDC, 2002).

1.3.1. The search for an explanation

To date multiple hypotheses have been offered explaining the Scottish and Glasgow effects. A recent report identified seventeen possible hypotheses —ranging from socio-economic; cultural; political; genetic and climatic factors— before concluding:

There was clearly a large number of outstanding deductive hypotheses which could be investigated for their potential causal role in generating the mortality pattern in Scotland (Glasgow in particular). There remains room, however, for further inductive work into the divergence of Scottish mortality from the rest of Europe around 1950 (McCartney et al., 2011).

Against this backdrop, we feel that the cumulative effect of multiple stress-inducing factors, and their interactions, may offer the most parsimonious explanation for this phenomenon.

1.3.2. The evolution of the science of stress

As noted by Wheaton (1994), a clear understanding of the 'stress' phenomenon is inhibited by the many interpretations and connotations associated with the term, as well as its common indiscriminate usage within contemporary culture (Wheaton, 1994). From an academic perspective, stress was historically defined from within discipline-specific constraints. Thus biologically-oriented researchers historically neglected the stress modulating influences of psycho-emotional factors, such as: perception, emotional appraisal, psycho-social coping mechanisms, anticipation and learning (Ganzel et al., 2010). An omission