

The Availability of Modafinil and Methylphenidate Purchased from the Internet in the United Kingdom Without a Prescription

Joanna Hockenull^a , David M. Wood^{a,b}, and Paul I. Dargan^{a,b}

^aClinical Toxicology, Guy's and St Thomas' NHS Foundation Trust, London, UK; ^bClinical Toxicology, Faculty of Life Sciences and Medicine, King's College London, London, UK

ABSTRACT

Background: There are reports of prescription stimulants being purchased online for use as cognitive enhancers or “smart drugs.” **Objectives:** The aim of this study was to investigate availability of modafinil and methylphenidate from internet suppliers from the perspective of a typical United Kingdom (UK) based customer. **Methods:** Using European Monitoring Center for Drugs and Drug Addiction (EMCDDA) internet snapshot methodology, we undertook an English language internet snapshot survey in July–August 2018 to gather information on the availability and price of modafinil and methylphenidate from online retailers. **Results:** A total of 55 modafinil and 14 methylphenidate websites were identified from which the drug could be purchased without a prescription. Minimum purchase quantities ranged from 10 to 90 tablets for modafinil and 1–1,005 tablets for methylphenidate with no apparent upper limit to the number that could be purchased. The price per tablet varied from £0.38–5.31 for modafinil and £0.16–5.70 for methylphenidate. Free shipping was offered if more than a certain amount was spent on 46 (83.6%) modafinil and 7 (50.0%) methylphenidate websites and discounts were offered on 43 (78.2%) modafinil and 4 (28.6%) methylphenidate websites. **Conclusions:** Modafinil and methylphenidate are widely available to purchase via internet from the UK without a prescription. The pricing on websites encourages users to buy greater quantities to qualify for discounts and free shipping. The quantities available suggest these purchases may be used in greater amounts than would be legitimately prescribed, increasing the risk of misuse or diversion to other individuals.

KEYWORDS

Stimulants; cognitive enhancers; smart drugs; modafinil; methylphenidate

Introduction

Prescription stimulants, in particular modafinil and methylphenidate, are prescribed to treat conditions such as attention-deficit hyperactivity disorder (ADHD) and narcolepsy. Additionally, healthy individuals have long reported use for other reasons including: to “achieve a competitive edge,” “cope with pressure to succeed,” “maintain levels of attention when sleep-deprived,” and to “improve task-related motivation” (d'Angelo, Camilla, Savulich, & Sahakian, 2017). As a result, these drugs are also referred to as cognitive enhancers, nootropics, “study drugs” or “smart drugs”. Anecdotal and popular press reports suggest that use of these drugs is popular in high pressure environments such as within the financial or medical sectors, and by students studying for examinations (Carlyle, 2018; Dean, 2013; Edwards, 2016; Hanson, et al., 2013; Plimmer, 2015). In a survey of surgeons at five international conferences in 2011, 8.9% reported using a prescription or illicit drug for

cognitive enhancement at least once in their lifetime (Franke et al., 2013). Surveys by United Kingdom (UK) newspapers report that 8% of UK adults have taken smart drugs to gain an intellectual edge and at least 21% of British higher education students have taken a drug with the aim of increasing their focus and memory (Crouch, 2018; Urban, Rowell, & Kiryango, 2018).

While evidence is limited and the majority of studies are single-dose trials, modafinil and methylphenidate are the two drugs most frequently cited as having positive cognitive effects in healthy individuals (Battleday & Brem, 2015; Dubljević & Ryan, 2015; Nicholson & Wilson, 2017; Repantis, Schlattmann, Laisney & Heuser, 2010). Modafinil reportedly has a positive effect on attention and wakefulness in healthy individuals and appears to maintain memory, wakefulness and executive functions in sleep deprived individuals (Repantis et al., 2010). Methylphenidate is reported to have a positive effect on memory but there is no

consistent evidence for other neuroenhancing effects in healthy individuals (Nicholson & Wilson, 2017; Repantis et al., 2010). Methylphenidate is associated with a range of severe side effects including serious cardiovascular events and addiction (Dubljević & Ryan, 2015). Modafinil seems to possess only minor side-effects, including insomnia, headache and dizziness, but as noted by Dubljević and Ryan its relatively recent appearance on the market means longer term risks may become evident with time (Dubljević & Ryan, 2015).

Both modafinil and methylphenidate are prescription only medicines in the UK; despite this they are reportedly available to purchase online (Crouch, 2018). A study of non-medical use of prescription drugs in the Europe Union found that acquiring via the internet was the least common method of acquisition for all prescription drugs overall; however, prescription stimulants were more frequently purchased online than prescription opioids or sedatives (Novak et al., 2016). While there are no definitive data about the extent to which individuals are using the internet to obtain medicines some estimates predict around two million people in the UK have purchased a prescription drug online and a 2009 study of general practitioners in the UK found 25% had treated a patient who had experienced an adverse effect from a drug purchased online (Clark, 2015).

To our knowledge there are no published data relating to the online availability of prescription stimulants such as modafinil and methylphenidate. To address this gap in the literature, we undertook a study to investigate the availability of modafinil and methylphenidate from internet suppliers from the perspective of a typical UK based customer.

Methods

Using EMCDDA methodology an internet snapshot survey for the availability and pricing of modafinil and methylphenidate was undertaken during two consecutive weeks in July and August 2018 (Hillebrand, Olszewski, & Sedefov, 2010). In order to reduce bias in the way individual search engines retrieve and rank results “bing.co.uk,” “google.co.uk” and “yahoo.co.uk” were all utilized, with Bing searched first followed by Google and then Yahoo! (Boyd et al., 2017). The search terms selected were: “buy modafinil” and “buy methylphenidate”. Sampling was undertaken to exhaustion for each search term, whereby the first 100 unique websites identified were reviewed in full to understand their content and then sampling continued until 20 consecutive unrelated websites were

identified. Websites were excluded based on being unavailable, unresponsive or not relevant.

For each search engine, the number of websites directly offering the drug for sale and the number linking to retail websites were recorded. Websites were excluded at this point based on not selling the desired drug, not shipping to the UK or requiring a prescription or license to complete the purchase. Modafinil or methylphenidate products were selected for purchase and the checkout process continued up until the point of actual purchase. During this process any advice given, the need for a prescription, the product cost, the brand name of drug for sale, the payment method, delivery options, and supplier’s country of origin were recorded.

The cost of the drug per tablet was calculated but as there was variation across websites depending on quantity, dosage, brand, shipping fees and discounts offered; simply looking at price per tablet didn’t provide an accurate picture. Therefore, to account for the variation and minimum tablet purchase quantity, price was also calculated based on purchasing a minimum amount to cover a four months’ therapeutic supply (120 modafinil or extended-release (ER) methylphenidate tablets or 360 immediate-release (IR) methylphenidate tablets) applying any shipping fees and discounts offered. This tablet quantity was a common amount recommended for purchase on the websites but is more than is typically available in the UK, with prescriptions rarely issued for more than three months’ supply and prescriptions for controlled drugs, such as methylphenidate, being limited to 30 days. The cheapest possible combination was selected, for example: two amounts of 60 tablets or four amounts of 30 tablets (in some cases it calculated cheaper to purchase a larger quantity such as 150 tablets than 120 tablets so this option was selected). The advertised formulations were not purchased to test the supplier’s claims of content. Where websites provided costs in US Dollars or Euros, the amounts were converted to British Pound (GBP) using “Reuters.com” currency calculator and daily conversion currency conversion rates at time of use (Reuters, 2018). Due to the purely descriptive nature of this study statistical analysis was not performed except to present data as frequencies and percentages and calculate median and interquartile range (IQR), using Microsoft Excel 2013.

This study did not require Institutional Review Board approval as information was collected only from internet websites that are freely available to the public.

Results

Websites selling modafinil

The initial search revealed a total of 203 websites across the three search engines. The search engine “bing.co.uk” provided 158 websites and both “google.co.uk” (22 new websites) and “yahoo.co.uk” (23 new websites) provided additional websites not identified previously. From the 203 websites, 130 (64.0%) contained content relevant to buying modafinil and of these 39 (30.0%) websites had drugs directly available for sale, 63 (48.5%) redirected to one of 16 online pharmacies and 28 (21.5%) provided reviews, recommendations or links to websites where modafinil could be bought, resulting in 18 new websites being identified. In total 73 websites offering modafinil were examined and from these modafinil could be bought and shipped to the UK without a prescription from 55 (75.3%) websites. Only six (8.2%) websites were excluded on the basis of requiring a prescription (Figure 1).

Websites selling methylphenidate

The initial search revealed a total of 268 websites across the three search engines. The search engine “bing.co.uk” provided 141 websites and both “google.co.uk” (121 new websites) and “yahoo.co.uk” (six new websites) provided additional websites.

From the 268 websites, 107 (39.9%) contained content relevant to buying methylphenidate and of these 46 (43.0%) websites had drugs directly available for sale, 52 (48.6%) redirected to one of 18 online pharmacies and nine (8.4%) provided reviews, recommendations or links to websites where methylphenidate could be bought, resulting in ten new websites being identified. In total 74 websites offering methylphenidate were examined and from these methylphenidate could be bought and shipped to the UK without a prescription from 14 (18.9%) websites. Only two (2.7%) websites were excluded on the basis of requiring a prescription or license (Figure 2).

Advice and indications for use

The majority of modafinil websites (39, 70.9% of those websites from which modafinil can be supplied to the UK without a prescription) provided advice about safe usage including consulting with a medical practitioner before taking, being over the age of 18 to use, dosage guidance and possible side effects. Benefits stated regarding taking modafinil included

increased alertness (50, 90.9%), decreased fatigue (44, 80.0%), improved memory (33, 60.0%), increased concentration (31, 56.4%), performance enhancement (17, 30.9%), increased motivation (16, 29.1%), and increased productivity (13, 23.6%). A total of 45 (81.8%) websites made reference to modafinil being utilized for treatment of sleep disorders and 35 (63.6%) for cognitive enhancement. Other suggested uses included treatment of depression (16, 29.1%), to aid weight loss (9, 16.4%), to ease jet-lag (6, 10.9%), and treatment of drug addiction or dependence (5, 9.1%). Recommended users included shift workers (29, 52.7%), students (22, 40.0%), military personnel (7, 12.7%), executives/entrepreneurs (6, 10.9%), bankers (5, 9.1%), and astronauts (4, 7.3%). For methylphenidate only a minority of websites (3, 21.4%) provided guidance and mainly recommended the drug for treatment of ADHD (11, 78.6%) and sleep disorders (5, 35.7%) with only three (21.4%) websites referencing cognitive enhancement and no websites recommending specific users.

Less than half of modafinil websites mentioned prescription requirement while for methylphenidate the majority of websites specifically noted that a prescription was not required (Table 1).

Product type and brand names

All modafinil websites sold the drug in the form of tablets only under 14 different brand names (Figure 3). The most common brands were Modalert® (37, 67.3%) and Modvigil® (31, 56.4%) followed by the licensed brand in the UK, Provigil® (20, 36.4%). The generic version or products advertised as “Modafinil” without specifying a brand was available from ten (18.2%) websites. Also available, from 42 (76.4%) of the websites, was armodafinil. While not available in the UK, armodafinil (the R-enantiomer of racemic modafinil) is prescribed to treat excessive daytime sleepiness in other countries, such as the United States (US) (Darwish, Kirby, Hellriegel, & Robertson, 2009). Review of the armodafinil products available are beyond the scope of this study as they were not specifically searched for and, therefore, were not investigated further.

Two research chemical websites sold methylphenidate in powder form only and the remaining 12 websites sold the drug in the form of tablets under eight different brand names (Figure 3). The brand Ritalin® was available from all websites selling tablets, Concerta® from four (33.3% of websites selling

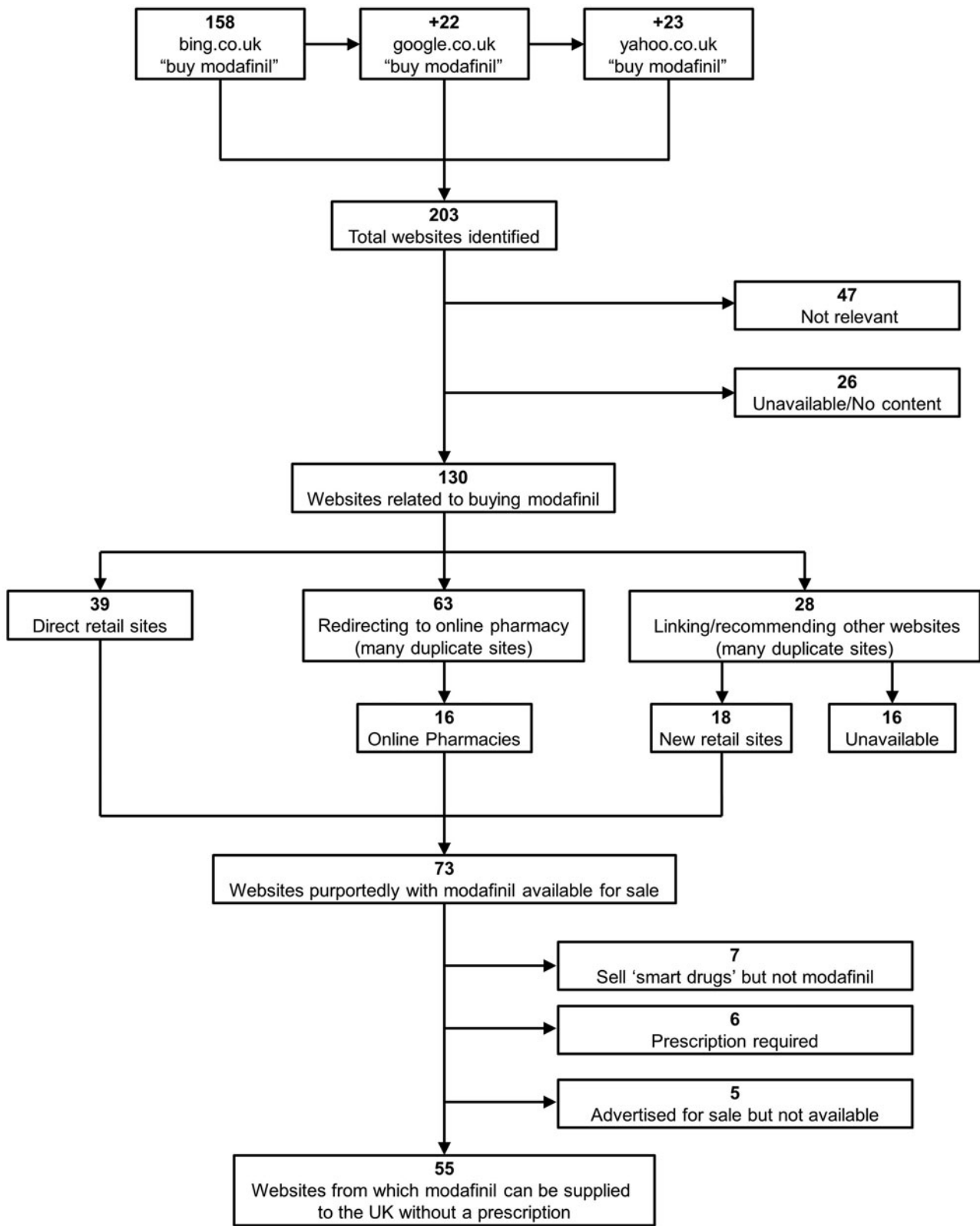


Figure 1. Flowchart showing identification, inclusion and exclusion of websites selling modafinil.

tablets) websites, Phenida, Metadate® and products advertised as “Methylphenidate” without specifying a brand from two (16.7%) websites and Hynidate from one (8.3%) website.

Modafinil tablets were generally sold as multiple 10-tablet blisters (9, 16.4%) or in packets of 30 tablets (21, 38.2%) or 50 tablets (9, 16.4%) and could be bought in minimum quantities ranging from 10 to 90

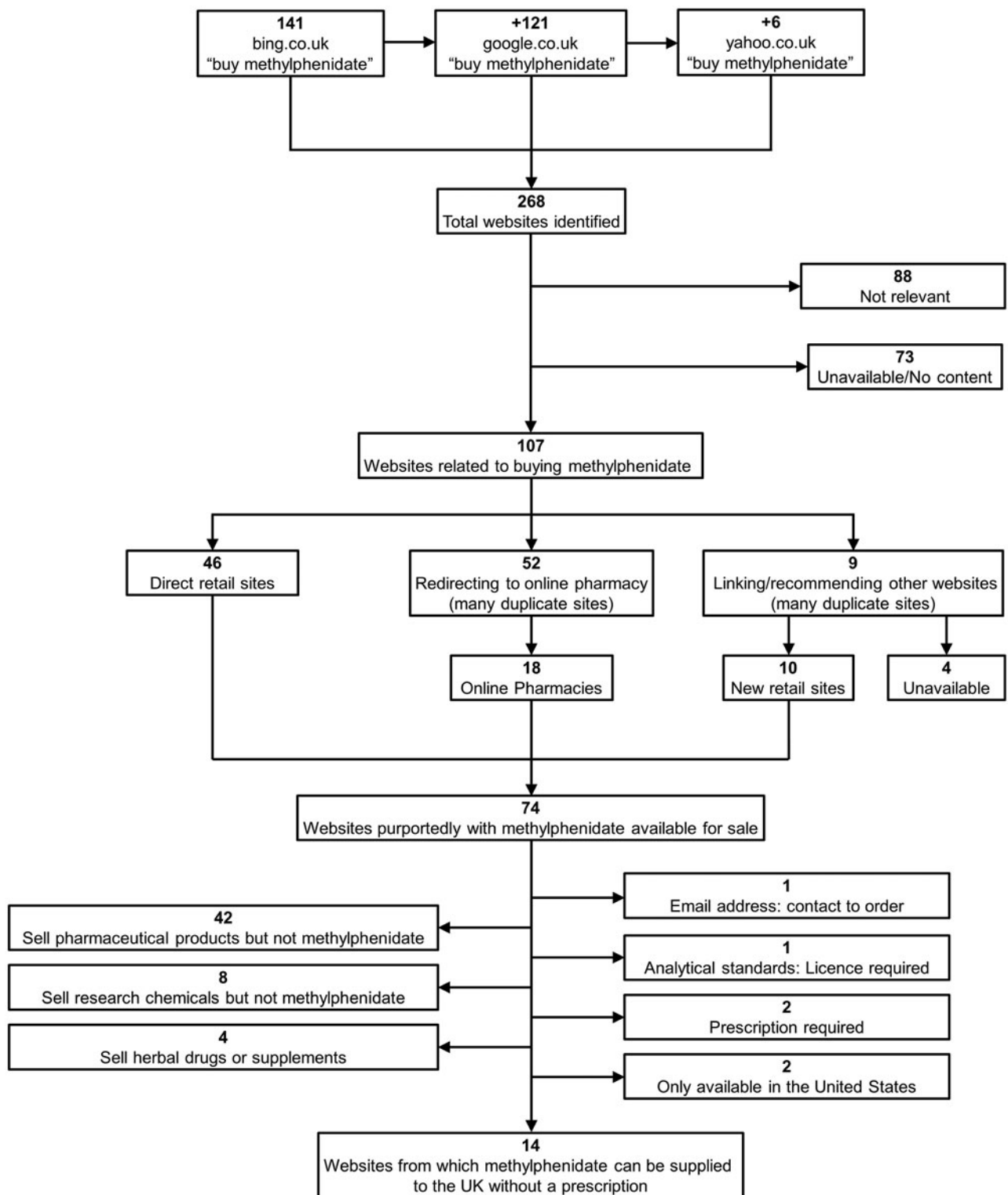


Figure 2. Flowchart showing identification, inclusion and exclusion of websites selling methylphenidate.

tablets (median: 30, IQR 14–40). Methylphenidate tablets were generally sold in multiple packets of 30 tablets (4, 28.6%) or 60 tablets (5, 35.7%). The minimum quantity of Hynidate tablets available to buy was

1,005 tablets but for other products the range was 1–150 tablets (median: 50, IQR 10–60).

For both drugs there appeared to be no upper limit to the number of tablets that could be purchased and

indeed incentives to buy more tablets were often offered.

Supplier's country of origin

A shipping location or office base was mentioned on the majority of websites (Table 1). For modafinil the most common location was India followed by the US and the UK while for methylphenidate the most common location was Pakistan followed by the US. However, when searched online the US and UK postal addresses listed on some of the websites appear not to exist suggesting that the websites may be attempting to conceal their real location.

The majority of the modafinil brands are manufactured by Indian pharmaceutical companies, with the exception of the UK licensed brand Provigil®, Modavigil® (licensed in New Zealand) and Modiodal® (licensed in Mexico). Methylphenidate brands Concerta® and Ritalin® are manufactured by multinational companies while Metadate® is manufactured in the US and both Hynidate and Phenida in Pakistan.

Shipping and delivery

For modafinil the majority of websites offered free delivery while for methylphenidate half of the websites charged a fixed shipping fee (Table 1). A number of the websites specifically promised discreet packaging and it was common to offer free reshipping if the package did not arrive or was seized by customs.

Payment methods and discounts

The majority of the modafinil and methylphenidate retail websites quoted prices in US Dollars followed by British Pound, with methylphenidate also available to purchase in Euros on one website (Table 1). A variety of payment methods were accepted with the most common for modafinil being credit/debit card followed by cryptocurrencies, such as Bitcoin, while for methylphenidate the most commonly accepted payment method was bank transfer/wire, followed by cryptocurrencies. Payment with an "Amazon" gift card or cash on delivery were available for modafinil but not methylphenidate.

Over three-quarters of modafinil websites offered discounts or incentives (Table 1). Discounts of between 10 and 30 per cent were offered for using specific payment methods or for returning customers. Other incentives available included bonus pills (e.g., Viagra®) with every order, discounts or free samples

Table 1. Characteristics of websites selling modafinil or methylphenidate without a prescription to United Kingdom based customers.

	Modafinil N (%)	Methylphenidate N (%)
Reference to prescription requirements		
Not Mentioned	33 (60.0)	4 (28.6)
Not Required	16 (29.1)	10 (71.4)
Required but not Requested	6 (10.9)	0 (0.0)
Supplier's country of origin		
Location mentioned	47 (85.5)	11 (78.6)
• Multiple Locations	9 (16.4)	8 (57.1)
• Canada	8 (14.5)	1 (7.1)
• Hong Kong	2 (3.6)	4 (28.6)
• India	20 (36.4)	2 (14.3)
• Pakistan	1 (1.8)	7 (50.0)
• Singapore	6 (10.9)	2 (14.3)
• United Kingdom	11 (20.0)	4 (28.6)
• United States	11 (20.0)	6 (42.9)
Shipping & delivery		
Fixed shipping cost	9 (16.4)	7 (50.0)
Free Delivery	46 (83.6)	7 (50.0)
• All orders	28 (50.9)	3 (21.4)
• If certain total amount spent	18 (32.7)	3 (21.4)
• If over 30 tablets purchased	0 (0.0)	1 (7.1)
Free Reshipping	41 (74.5)	11 (78.6)
Discreet Packaging	19 (34.5)	8 (57.1)
Payment currency		
US Dollar (\$)	33 (60.0)	12 (85.7)
British Pound (£)	22 (40.0)	1 (7.1)
Euro (€)	0 (0.0)	1 (7.1)
Payment methods		
'Amazon' Gift Card	4 (7.3)	0 (0.0)
Bank/Wire Transfer	14 (25.5)	13 (92.9)
Cash on Delivery	3 (5.5)	0 (0.0)
Credit/Debit Card	45 (81.8)	8 (57.1)
Cryptocurrencies	29 (52.7)	11 (78.6)
PayPal/eCheck	16 (29.1)	5 (35.7)
Discounts & incentives		
Any Discount/Incentive	43 (78.2)	4 (28.6)
• Bonus Pills	7 (12.7)	1 (7.1)
• Using Specific Payment Method	16 (29.1)	3 (21.4)
• Returning Customers	17 (30.9)	0 (0.0)
• Writing Reviews	3 (5.5)	0 (0.0)

for writing reviews, and one modafinil website offered free samples for posting "unboxing" videos on YouTube. Less than a third of methylphenidate websites offered incentives, primarily discounts or extra tablets offered for using specific payment methods but, unlike modafinil, no websites offered discounts for returning customers.

Price per purchase

For most modafinil websites the price per tablet varied and became cheaper as larger quantities were purchased. The price per tablet varied from £0.38 to £5.31 for modafinil. The price was also calculated based on purchasing a four months' supply (minimum of 120 tablets) applying any shipping fees and discounts offered; tablets chosen were 200 mg except for Modavigil® which was only available as 100 mg tablets. The total price to buy a minimum of 120

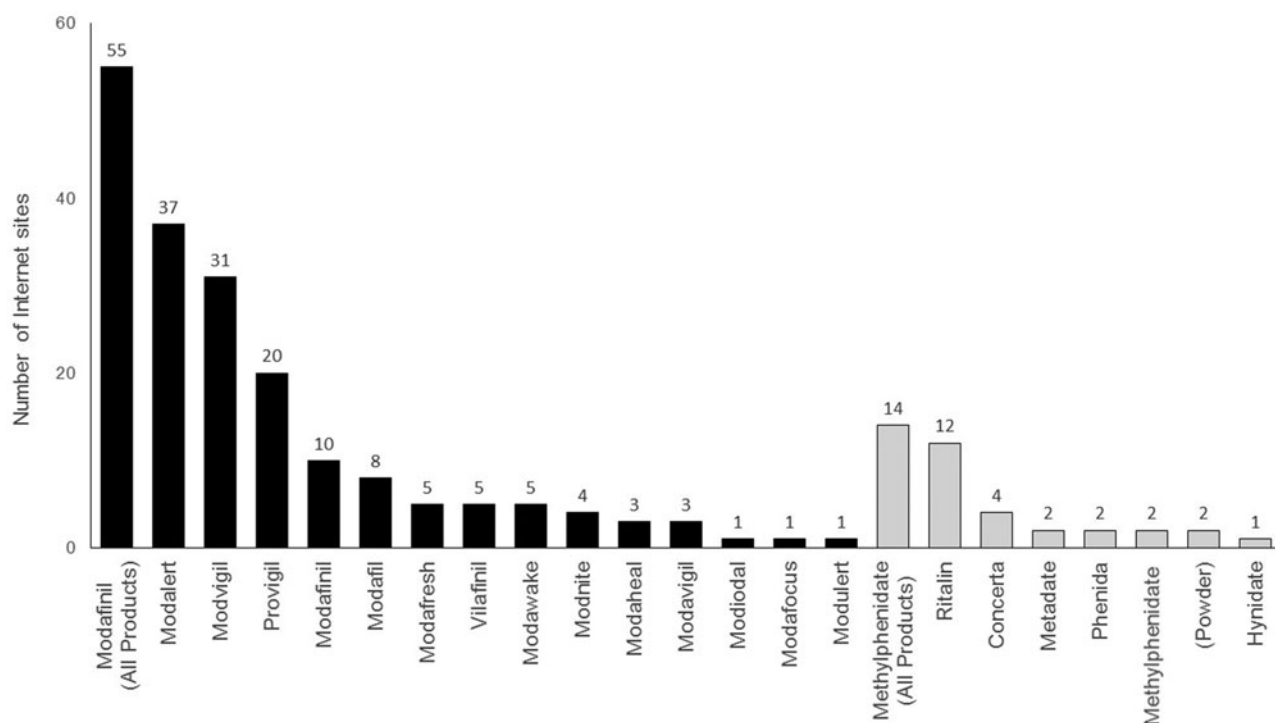


Figure 3. Brand names available for purchase on websites selling modafinil (black bars) or methylphenidate (grey bars).

modafinil tablets, taking into account discounts and shipping fees, varied from £74.06 to £587.16 (median: £154.49, IQR £118.82–240.68) as shown in Figure 4.

For most methylphenidate websites the price per tablet was fixed despite the quantity purchased. A reduction for buying in bulk was offered on only four (28.6%) websites. The price per methylphenidate tablet varied from £0.34 to £5.70 for Ritalin®, from £0.22 to £3.07 for Concerta®, from £1.15 to £1.95 for Metadate® and from £0.16 to £1.95 for other IR product brands. The price of methylphenidate powder ranged from £1.31 to £8.45 per gram. The price was also calculated based on purchasing a four months' supply (minimum of 120 ER tablets or 360 IR tablets) applying any shipping fees and discounts offered. IR tablets chosen were 10 mg Ritalin®, Hynidate, Methylphenidate, and Phenida and ER tablets were 30 mg Metadate® or 36 mg Concerta®. The total price to buy a minimum of 360 IR tablets, taking into account discounts and shipping fees, varied from £153.70–2,128.61 (median: £658.32, IQR £444.93–999.05) and the price to buy a minimum of 120 ER tablets ranged from £176.76–314.43 (median: £229.01, IQR £196.74–307.40) as shown in Figure 4.

Discussion

The findings described in this study suggest online markets for modafinil and methylphenidate are

extensive with an abundance of websites offering to sell and supply the drugs without a prescription to UK users.

The UK National Health Service (NHS) drug tariff price (30 tablets) for modafinil is £7.78 (£0.26 per tablet, £31.12 for 120 tablets) for 200 mg tablets and for methylphenidate is £3.54 (£0.12 per tablet, £42.48 for 360 tablets) for 10 mg IR tablets and £42.45 (£1.42 per tablet, £169.80 for 120 tablets) for 36 mg ER modified-release tablets (British National Formulary, 2018). Even the minimum price for four months' supply purchased online is greater than this despite claims from the websites of cheap prices. The markup in cost is most noticeable for Ritalin® with the available purchase prices over ten to fifty-fold greater than the NHS tariff price. In the US the National Average Drug Acquisition Cost (NADAC) as of August 2018 was \$1.09 (£0.84 per tablet, £100.80 for 120 tablets) for 200 mg modafinil, \$0.26 (£0.20 per tablet, £72.00 for 360 tablets) for generic 10 mg IR methylphenidate and \$7.24 (£5.57 per tablet, £668.40 for 120 tablets) for generic 36 mg ER methylphenidate (Medicaid, 2018). Therefore, while the median online prices for modafinil and IR methylphenidate are greater than the NADAC, the median online price for ER methylphenidate is considerably lower.

The pricing on websites promotes and encourages users to buy greater quantities in order to qualify for discounts and free shipping. The quantities available

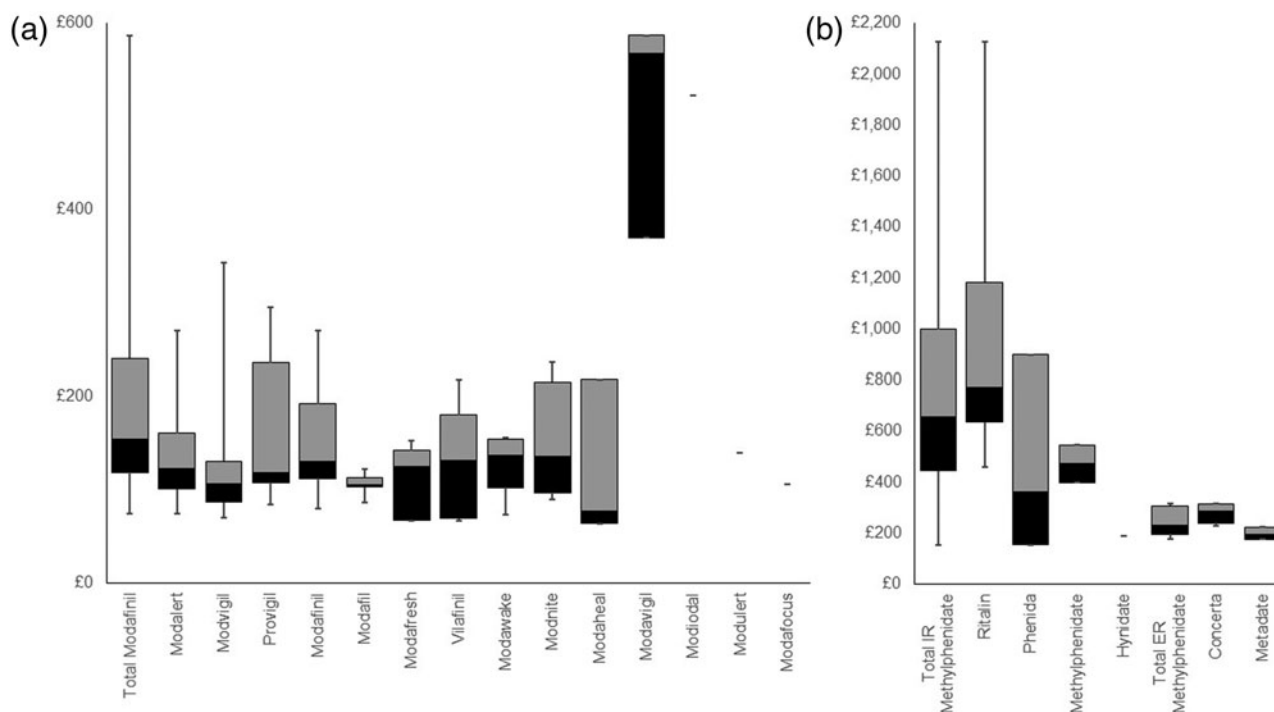


Figure 4. Price per bulk buy of four months' supply by brand name. (a) 120 modafinil tablets (200 mg—except Modavigil® 100 mg). (b) 360 immediate-release (IR) methylphenidate tablets (10 mg) or 120 extended-release (ER) methylphenidate tablets (36 mg Concerta®, 30 mg Metadate®).

suggest these purchases may be used for individuals in greater amounts than would be legitimately prescribed. This increases the risk of misuse of the drugs and/or diversion to other individuals. Methylphenidate is known to have addiction potential and while modafinil is reported to have low abuse potential there are reported cases of dependence (Krishnan & Chary, 2015; Morton & Stockton, 2000; Swapnajeet, Subodh, & Gourav, 2016).

Methylphenidate is a Class B controlled drug under the UK Misuse of Drugs Act, 1971 and Schedule 2 in the Misuse of Drugs Regulations 2001 (UK Government, 1971, 2001). This means it can be supplied via prescription but the maximum quantity issued should not exceed 30 days and a personal import/export license is required to transport the drug in or out of the UK. Modafinil is a prescription only medicine in the UK, but not controlled under the Misuse of Drugs Act or subject to scheduling under the Misuse of Drugs Regulations, meaning it is illegal to supply without a prescription but not illegal possess for personal use (UK Government, 2012). The fact that websites are commenting on discreet packaging, reshipment if the package is seized and encouraging third-party payment methods, especially for methylphenidate websites, demonstrates that the supplier and potentially also purchasers are aware of the questionable

legality of the purchase and supply of these drugs without a prescription.

The main limitation to our study is that products were not purchased to determine the actual contents and formulation of the drugs sold and it was not possible to confirm if websites indeed were vendors given the possibility of fraudulent websites. However, it should be noted that potential users would also be searching using similar techniques to find these products for purchase; and this methodology has been employed for many years to investigate internet markets for NPS (Abouchedid, Gilks, Dargan, Archer, & Wood, 2018; Nizar, Dargan & Wood, 2015; Owen, Wood, Archer, & Dargan, 2016; Siddiqi, Verney, Dargan, & Wood, 2015; Vermette-Marcotte, Dargan, Archer, Gosselin, & Wood, 2014; Wood & Dargan, 2012). Other internet sources such as the “dark web” were not explored (European Monitoring Center for Drugs and Drug Addiction (EMCDDA) & Europol, 2017). This study was undertaken in English only, and therefore it is possible that there may be other unidentified websites selling modafinil or methylphenidate to UK buyers on non-English language websites. We searched using the drug names rather than using individual trade names—there is the potential that individuals may search by a trade name rather than the generic and that our study may under-estimate internet availability of these drugs. Finally, while we

are able to document the availability of modafinil and methylphenidate to buy online we are unable to determine to what extent these websites are actually used by individuals residing in the UK to acquire the drug.

In conclusion, modafinil and methylphenidate are available to purchase on the internet without a prescription. Search engines aid the public to purchase such drugs without any medical guidance or control. This unregulated access is likely to increase use, non-medical use and dependence. Particularly at risk are young people, the biggest users of the internet, and over a third of the websites selling modafinil specifically recommended use of the drug for studying. As drugs are purchased without medical advice it is difficult for medical practitioners to intervene. Therefore, the onus should be on universities, schools and parents to warn young people about the potential dangers of buying drugs online and public health campaigns focused on raising awareness in these target areas.

In April 2019 the General Pharmaceutical Council published new guidance for UK based online prescribing companies (General Pharmaceutical Council, 2019). However, as shown by this study, the majority of online retailers selling modafinil and methylphenidate are based outside of the UK, so are exempt from UK regulations. This highlights the challenges of regulating the global online pharmacy market and the importance of international cooperation, such as Interpol's ongoing "Operation Pangea," to target the online sale of illicit medicines (Interpol, 2019).

This survey methodology, developed by the EMCDDA, has previously provided useful information regarding the availability of NPS drugs and we have shown here that it can also be applied to monitoring internet markets for prescription drugs and could, additionally, be used to monitor the situation globally. Continual monitoring using this methodology will enable law enforcement and policy makers to understand availability of these substances to potential users.

Declaration of interest

The authors report no conflicts of interest.

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ORCID

Joanna Hockenull  <http://orcid.org/0000-0002-3361-7598>

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